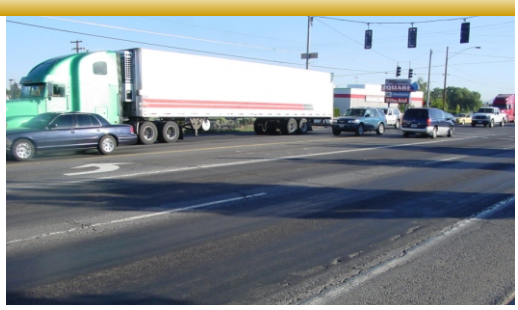
Draft Report for

Redmond
Transportation System Plan Update

Prepared by

DKS Associates
TRANSPORTATION SOLUTIONS

In association with

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1. Executive Summary

Introduction

In June 1999, the City of Redmond adopted their first Transportation System Plan (TSP). Since that time, there have been significant growth and planned growth in Redmond and its surrounding communities, and a few key changes to state highway facility plans in the area. The primary purpose of this update is to address these changes, with focus on:

- Addressing how the new Re-Route of US 97 north of Highland Avenue will affect city street circulation and related access to growing industrial areas to the east.
- Confirm that the plan is consist with latest Statewide Plans and Policies.
- Ensuring that system plans can adequately serve Redmond growth to nearly 60,000 people inside the City's urban planning area and additional development outside the City's limits that influence local conditions (e.g., rural lands and destination resorts).

This plan update is aimed at fulfilling Transportation Planning Rule (TPR) requirements for comprehensive transportation planning in the cities of Oregon, and presents the investments and priorities for the Pedestrian, Bicycle, Transit, and Motor Vehicle systems along with new transportation programs to correct existing shortfalls and enhance critical services.

For each travel mode, a **Master Plan** project map and list are identified to support the City's transportation goals and policies. Projects that can be funded over the next 20 years are referred to as **Action Plans**.

The TSP provides specific information regarding transportation needs to guide future transportation investment in the City and determine how land use and transportation decisions can be brought together beneficially for the City and is based on needs required to meet transportation demand based on 2030 future needs. This executive summary provides the goals and policies, modal plans and financing summaries. For a more detailed analysis, refer to the remaining chapters for more in-depth information.

Plan Process and Committees

The Redmond TSP update was developed in close coordination with Redmond city staff and key representatives from the surrounding communities. Two formal committees participated in the plan development:

- Technical Advisory Committee (TAC) – Agency staff from Oregon Department of Transportation, Deschutes County, and the City of Redmond participated in reviewing the technical methods and

findings of the study. The focus of this group was on consistency with the plans and past decisions in adjoining jurisdictions, and consensus on new recommendations.

- Project Advisory Committee (PAC) – The Redmond Public Advisory Committee served as the representatives for citizens and community members. A series of meetings were held with the PAC to report interim study findings and any outstanding policy issues that required their direction. The meetings were open to participation by the general public.

The committees met regularly through the plan development process to review interim work products, assist in developing and ranking transportation solutions, and to refine master plan elements to ensure consistency with community goals. Additionally, a public open house was held, allowing citizens to comment on the plan, make suggestions and provide feedback.

The Redmond Transportation System Plan process included the following steps:

- Update Goals and Policies
- Inventory/Data Collection to a year 2007 baseline
- Evaluate Existing Conditions and Future Travel Needs Through Forecasting
- Update Needs by Travel Mode and Consider Alternatives
- Refine Improvement Lists to Mitigate Deficiencies by Mode For 2030 Conditions
- Update Planning and Cost Estimates of Improvements
- Identify Financing Sources
- Draft TSP

As with the 1999 TSP, this TSP's planning objective was to optimize each of these modes of transportation within Redmond with the 2030 forecasted travel demand. The following sections summarize the findings of the Transportation System Plan studies.

Public Involvement

Two public open house events were held to present findings, and to gather feedback from the community. The first meeting was held on June 28, 2007 to discuss the overall project process, and to present how safe and effective the system operates today. The second meeting was held on November 8, 2007 to talk about how growth to 2030 will change current transportation needs, and discuss alternative ways that growth can be served.

A final Public Open House is scheduled for 28 February 2008, which will review the findings and conclusions of the Transportation System Plan update.

Goals and Policies

The City's Comprehensive Plan lays out a general policy framework regarding transportation services. The goals and policies[1] of this TSP are not prioritized and are presented in Chapter 2.

[1] Goals are defined as brief guiding statements that describe a desired result. Policies associated with each of the individual goals describe the actions needed to move the community in the direction of completing each goal.

These goals and policies were applied in the development of this Transportation System Plan to formulate strategies and implementing measures for each of the travel modes applied in the City of Redmond. The intent of the updated policies was to simplify and/or clarify statements from the 1999 TSP and to respond to more recent policies that were adopted by the State of Oregon and ODOT.

The transportation policies are summarized below. Further information is provided in Chapter 2.

- **Goal 1**. Provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes serving all residential areas and businesses..
- **Goal 2**. Develop a transportation system that is supportive with the City's adopted comprehensive land use plan and with the adopted plans of state, local, and regional jurisdictions.
- **Goal 3**. Establish a clear and objective set of transportation facility design and development regulations and standards that address all elements of the city transportation system and promote access to and utilization of a multi-modal transportation system.
- **Goal 4.** Develop complementary infrastructure for bicycles and pedestrian facilities to provide a diverse range of transportation choices for city residents.
- **Goal 5**. Provide reliable convenient transit service to Redmond residents and businesses as well as special transit options for the city's elderly and disabled residents.
- **Goal 6**. Ensure that efficient and effective freight transportation infrastructure is developed and maintained to support local and regional economic expansion and diversification consistent with City economic plans and policies..
- **Goal 7**. The Redmond transportation network will be managed in a manner that ensures the plan is implemented in a timely fashion and is kept up to date with respect to local and regional priorities.

New policies incorporate recent initiatives within the city and county as it relates to transportation facilities. The specific areas of the changes address the following key issues, some of which the City has already implemented:

- Street connectivity — The existing local street spacing standards were refined to include walkways, and were applied citywide on a conceptual level to make a Local Street Connectivity Map, which is presented in Chapter 9. This map and the supporting standards and development code will guide future connections to larger vacant lands that work towards reducing out-of-direction travel for autos, bicyclists, and pedestrians.
- Level of Service — ODOT has adopted plans with new standards for mobility during peak periods.
- Street design — New street design guidelines suggest options for narrower residential streets within newer subdivisions. In addition, the city should formalize its application of neighborhood traffic management tools. Furthermore, street improvements along arterials should be constructed to allow provision of fiber optic cable that is being installed to support new communication systems for monitoring and managing regional transportation conditions.
- Transit — As the city grows, a higher level of transit service could be added. Baseline policies were added to design streets and building orientations to better use a future fixed route transit system, support mixed-use centers, and expand services for transportation disadvantaged.

Transportation Plans

The existing system network for each mode (pedestrian, bicycle, motor vehicle, truck and other modes) was updated from the 1999 TSP to reflect completed projects since the original plan was completed. A Master Plan (long term project goals that meet planning requirements) and an Action Plan (projects that are reasonably expected to be funded) were compiled for each transportation mode. These plans are designed to comply with relevant State and adjoining jurisdictions planning documents. The overall findings and conclusions for each travel mode are summarized in the following sections. For full descriptions of the analysis, process, and projects, please refer to individual mode chapters: Chapter 5 – Pedestrian, Chapter 6 – Bicycle, Chapter 7 – Transit, and Chapter 9 – Motor Vehicles.

Pedestrians

A detailed inventory was conducted on collector and arterial streets in Redmond to identify where new or in-fill pedestrian facilities would be most valuable. Key issues included an incomplete arterial/collector sidewalk system, a lack of arterial pedestrian crossings facilities, especially on state highways, and a lack of connected multi-use trails.

The Pedestrian Master Plan was created that cost $46.2 million to add facilities to meet all these needs. The project locations are illustrated in Figure 6-1, which is duplicated following this section. Of these, about $9.4 million was found to be high priority, based on a ranking of pedestrian strategies by the Project Advisory Committee (PAC). The highest valued pedestrian facilities, such as facilities near schools, retail centers, and community centers were selected for the Action Plan. The highest-ranking City projects to be funded over the next 20 years are listed below in Table 1-1.

Table 1-1: Pedestrian System Action Plan

Project Facility	From	To	Cost ($1,000s)
Sidewalks on Existing Arterials and Collectors			
NW 9th St	Highland Ave	Maple Ave	$330
W Antler Ave	Helmholtz Way	23rd St	$1,270
SW 15th St	OR 126	SW Obsidian Ave	$215
SW Obsidian Ave	SW Helmholtz Way	SW 31st St	$870
SW Wickiup Ave	SW 35th St	SW Canal Blvd	$305
NW 10th St	NW Spruce Ave	NW Maple Ave	$135
NW Dogwood Ave	NW Canyon Dr	NW Canal Blvd	$315
NW Canyon Dr	NW 9th St	OR 126	$495
SW Canyon Dr	OR 126	SW Quartz Ave	$330
W Antler Ave	Canyon Dr	9th St	$240
SE/SW Airport Way	SE Veterans Way	SW 19th St	$2,435
SW Obsidian Ave	SW 23rd St	SW Canal Blvd	$415
		Existing Facilities Subtotal	**$7,355**
Pedestrian Crossing Enhancements (Approximately every 500 feet)			
Helmholtz Way Enhancements (35)	NW Maple Ave	SW Wickiup	$350
US 97 Enhancements (27)	US 97 Reroute	South UGB	$270
OR 126 Enhancements (17)	West UGB	SW 15th St	$170
OR 126 Enhancements (17)	SE Lake Rd	East UGB	$170
		Crossing Enhancements Subtotal	**$960**
Other Pedestrian Projects			
ADA Enhancement Program	Location to be determined following ADA audit to establish existing framework		$50/year
		PEDESTRIAN ACTION PLAN COST	**$9,370**

The total Pedestrian Action Plan cost is $9.4 million. This total cost includes sidewalk retrofits on existing streets, and pedestrian crossing enhancements. The cost of new sidewalks on new streets are included in the street cost estimates reflected in Chapter 9, and not explicitly represented in the Pedestrian Action Plan. Similarly, the costs for off-street pathways are included in the Bicycle Action Plan, in Chapter 7. Refer to Table 6-2 for a complete list of Action Plan projects.

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Figure 6-1
PEDESTRIAN MASTER PLAN

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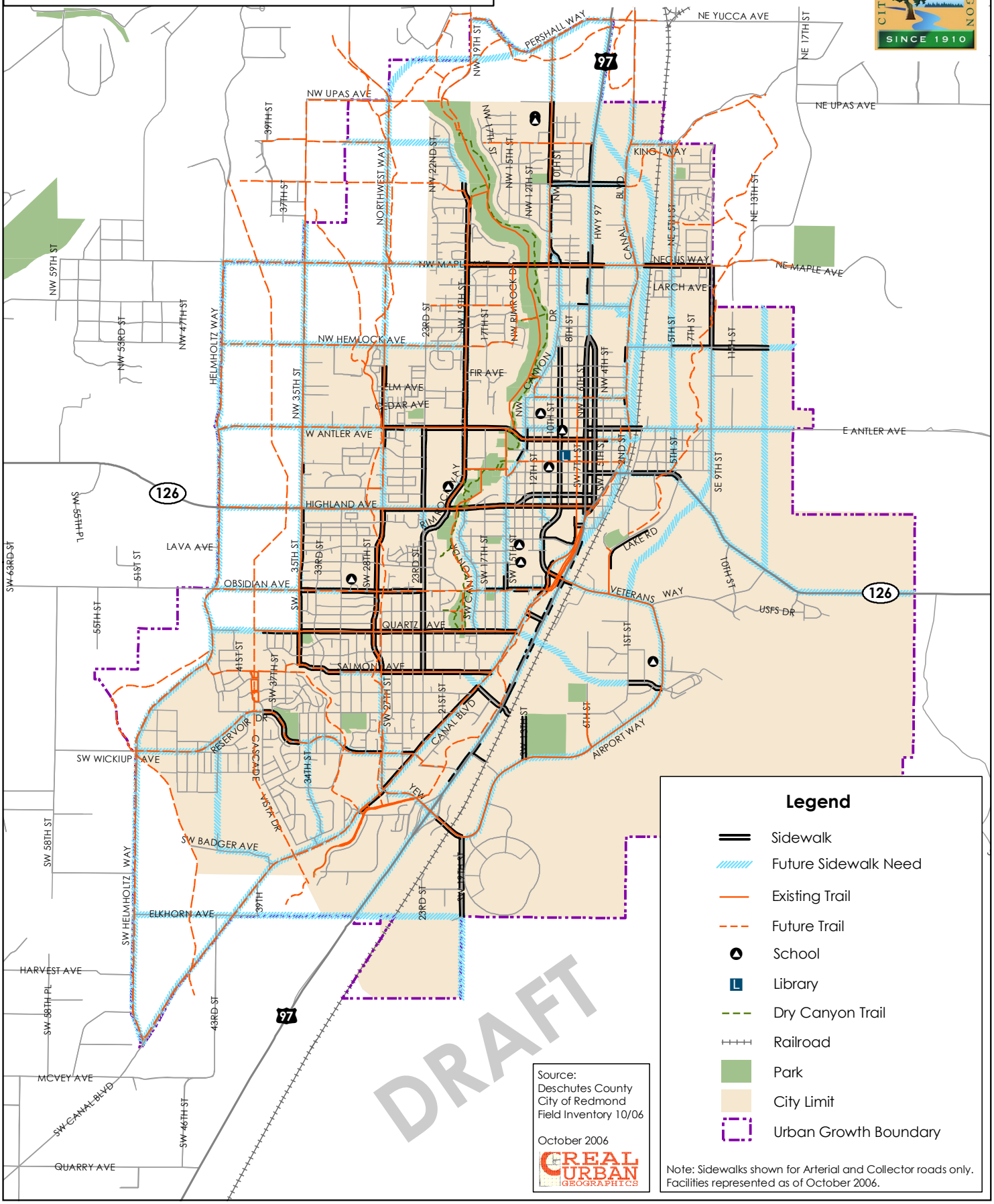
City of Redmond Transportation System Plan



Legend

- Sidewalk
- Future Sidewalk Need
- Existing Trail
- Future Trail
- School
- Library
- Dry Canyon Trail
- Railroad
- Park
- City Limit
- Urban Growth Boundary

Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

CREAL URBAN GEOGRAPHICS

Note: Sidewalks shown for Arterial and Collector roads only. Facilities represented as of October 2006.

Bicycles

The bicycle system network map from the 1999 TSP was updated to reflect completed projects. The majority of the collector and arterial routes in Redmond do provide bike lanes. Consequently, the existing bike lane system provides generally adequate connections to schools, parks, and retail centers. Two areas were highlighted: better connectivity to neighborhoods, and availability of bicycle parking outside of the downtown area.

A Bicycle Master Plan was created that cost $31.6 million to implement in today's dollars. The Master Plan is shown in Figure 7-1, which is duplicated on the next page. Refer to Table 7-1 for additional details about the Master Plan projects. The highest priority bicycle projects totaled about $9.4 million, based on a ranking of bicycle strategies by the Project Advisory Committee (PAC). The Action Plan costs include retrofits on existing streets, and off-street pathways (previously noted in the Pedestrian Action Plan). The bicycle lanes on new streets are included in the street cost estimates reflected in Chapter 9. Refer to Table 7-2 for a complete list of Bicycle Action Plan projects, including expected implementation phasing over the life of the plan.

Table 1-2: Bicycle Action Plan Projects and Cost Estimates

Project Facility	From	To	Cost ($1,000s)
Bicycle Lanes on Existing Arterials and Collectors			
W Antler Ave	Helmholtz Way	23rd St	$1,630
SW Obsidian Ave	SW 23rd St	SW Canyon Dr	$140
		Existing Facilities Subtotal	**$1,770**
Off-street Bicycle Pathways			
NS BPA Trail	NW Maple Ave/N UGB	SW Elkhorn Ave	$1,590
Dry Canyon Trail	SW Highland Ave	SW Quartz Ave	$320
NS Canal Trail	North UGB (Oak)	Existing Trail (S of Hem.)	$445
NS Canal Trail	North UGB (Upas)	Existing Trail (S of Hem.)	$835
NS Canal Trail	SW Salmon Ave	SW Canal Blvd (near Greens Blvd)	$435
NS Canal Trail	Existing Trail (S of Antler)	Existing Trail (S of Canal)	$960
NS Canal Trail	Existing (@Obsidian)	Existing Trail (Yew)	$625
NS Canal Trail	NE Maple Ave	Firemans's Pond Park	$835
Dry Canyon Trail	NW Pershall Way	NW Upas Ave	$250
EW Canal Trail	NE Canal (@Quince)	NE 5th St	$225
EW Canal Trail	NE 5th St	East UGB	$100
NS Canal Trail	SW Helmholtz Way	SW Canal Blvd	$1,050
		Off-Street Facilities Subtotal	**$7,670**
Other Projects			
Bicycle parking	Downtown locations, key destinations, and activity centers		$10
		BICYCLE ACTION PLAN TOTAL	**$9,440**

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Figure 7-1
BICYCLE MASTER PLAN

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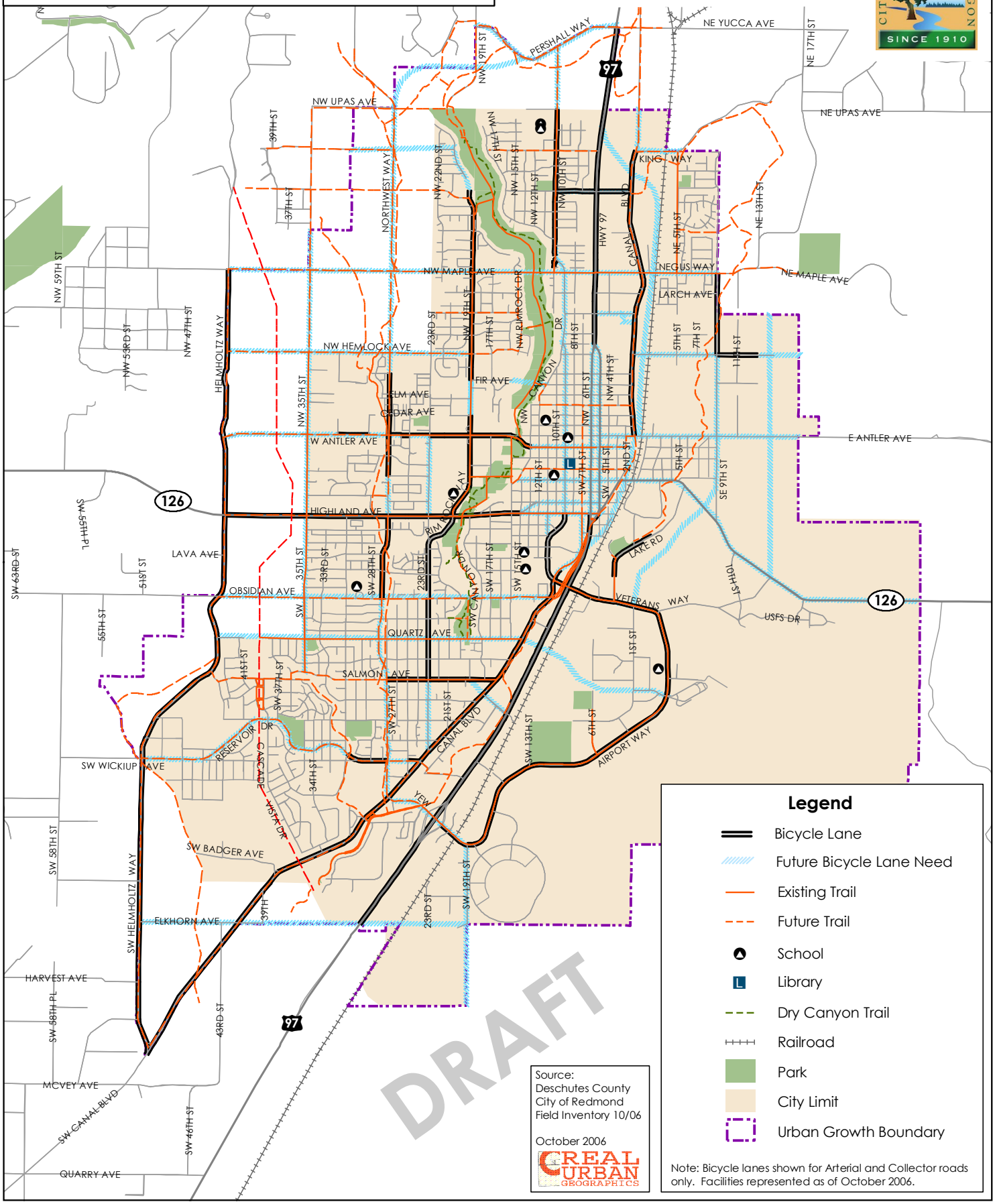
City of Redmond Transportation System Plan



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Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

CREAL URBAN GEOGRAPHICS

Legend

- Bicycle Lane
- Future Bicycle Lane Need
- Existing Trail
- Future Trail
- School
- Library
- Dry Canyon Trail
- Railroad
- Park
- City Limit
- Urban Growth Boundary

Note: Bicycle lanes shown for Arterial and Collector roads only. Facilities represented as of October 2006.

Transit

As Redmond population grows, and more employment opportunities are provided within the city, it is expected that a transit system will become a necessary to adequately balance transportation infrastructure with user needs. To begin planning for this system, the City of Redmond has received a grant from ODOT to undertake a Transit Feasibility Study, which will assess the viability of transit service in Redmond and make recommendations for locations of transit routes, the frequency of service, and user amenities that should be considered at transit stop locations. This TSP identifies needs for future transit service and placeholder strategies that should be implemented to address them.

Several improvement strategies were developed to meet transit needs in Redmond. These strategies were ranked as part of this TSP[2]. The strategies, which rely on coordination with the City of Redmond as well as other regional transit service providers, include (listed in order of importance):

- Provide park-and-ride lots and support van pools/car pools
- Provide commuter service to Bend
- Update roadway design standards to support fixed-route transit service
- Improve the dial-a-ride program (frequency and scheduling)
- Expand regional transit services to surrounding communities
- Provide shuttle service to key destinations
- Explore the feasibility of local fixed-route transit service
- Improve rail facilities to support recreational/commuter rail services

A $3 million transit action plan project list was created to identify projects to be funded by the year 2030, as listed in Table 1-3 below. A major share of those costs are related to providing commuter bus service from Redmond to Bend. The next major project is allocation / acquisition of space for park-and-ride lots.

Table 1-3: Transit Action Plan

Priority	Project	Description	Cost
High	Park-and-ride lots	Implement park-and-ride lot to serve transit and carpool users. Specific location to be determined.	$500,000
High	Transit stop amenities	Construct or plan for future transit stop amenities such as shelters, schedules, lights, and benches	$250,000
High	Commuter service	Provide commuter service to Bend	$100,000 / Year
		Transit Project Total	**$3,050,000**

[2] Technical Advisory Committee Meeting, September 26, 2007.

Motor Vehicle

A broad set of measures were reviewed to best serve growth in the City of Redmond, and it more than doubles in its current population over the next 20 years. Future travel forecasts showed that current planned improvements will not be sufficient to serve long-range growth to 2030, so other measures are required. Reliable and efficient travel on major city and state facilities within the city will require significant investments in Transportation System Management (TSM), Travel Demand Management (TDM), and roadway improvements. A variety of roadway and highway improvement alternatives were analyzed for meeting these needs. The following sections summarize the recommended motor vehicle system plans that meet the demands of future growth and comply with local and state planning requirements.

Street System Design

The 1999 TSP established a functional street classification system for Redmond that includes arterials (major and minor), and collectors (major and minor) for primary travel routes. Changes in the city's urban growth boundary, the addition of the US 97 Re-Route and consideration of on-going neighborhood traffic management issues were addressed by modest changes to the functional class hierarchy. In brief, they are:

- The new US 97 Reroute was classified as a major arterial consistent with other state highways in the city,
- The existing US 97 alignment on 5th / 6th Avenues was downgraded to minor arterial,
- Several streets around the new interchange with US 97 and the existing intersection at O'Neill Highway were redesigned to anticipate long-term changes in access in that part of the city,
- Several key neighborhood streets were classified as minor collector routes, which will be the target for primary Neighborhood Traffic Management solutions,
- Veterans Way and 9th Avenue near the airport protection zone was re-aligned and changed to anticipate the future extension of the Redmond Airport runways,
- Pershall Way and Helmholtz Avenue was upgraded to minor arterial as part of the Westside Arterial corridor element of the TSP, and
- The second phase of the US 97 Re-Route identified in the *US 97 Refinement Plan* as been added to the Functional Class Map.

A revised functional classification map is illustrated in Figure 9-1, which is duplicated on the next page.

In addition, two conceptual roadway extensions are indicated for lands outside the city limit and urban planning area to guide future roadway planning. The first is located in the northwest corner of the map, which would provide a more direct route for the Westside Arterial corridor. The second is in the southeast corner of the map, and it provides guidance for an southerly extension of SE 19th Avenue to an ultimate connection near Quarry Avenue, and extension south to Deschutes-Market Road. Since these concept areas are outside the influence area of the city, they are only guides if and when the urban growth boundary (or an urban reserve area) is extended beyond it present boundary.

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Figure 9-1
PROPOSED FUNCTIONAL CLASS

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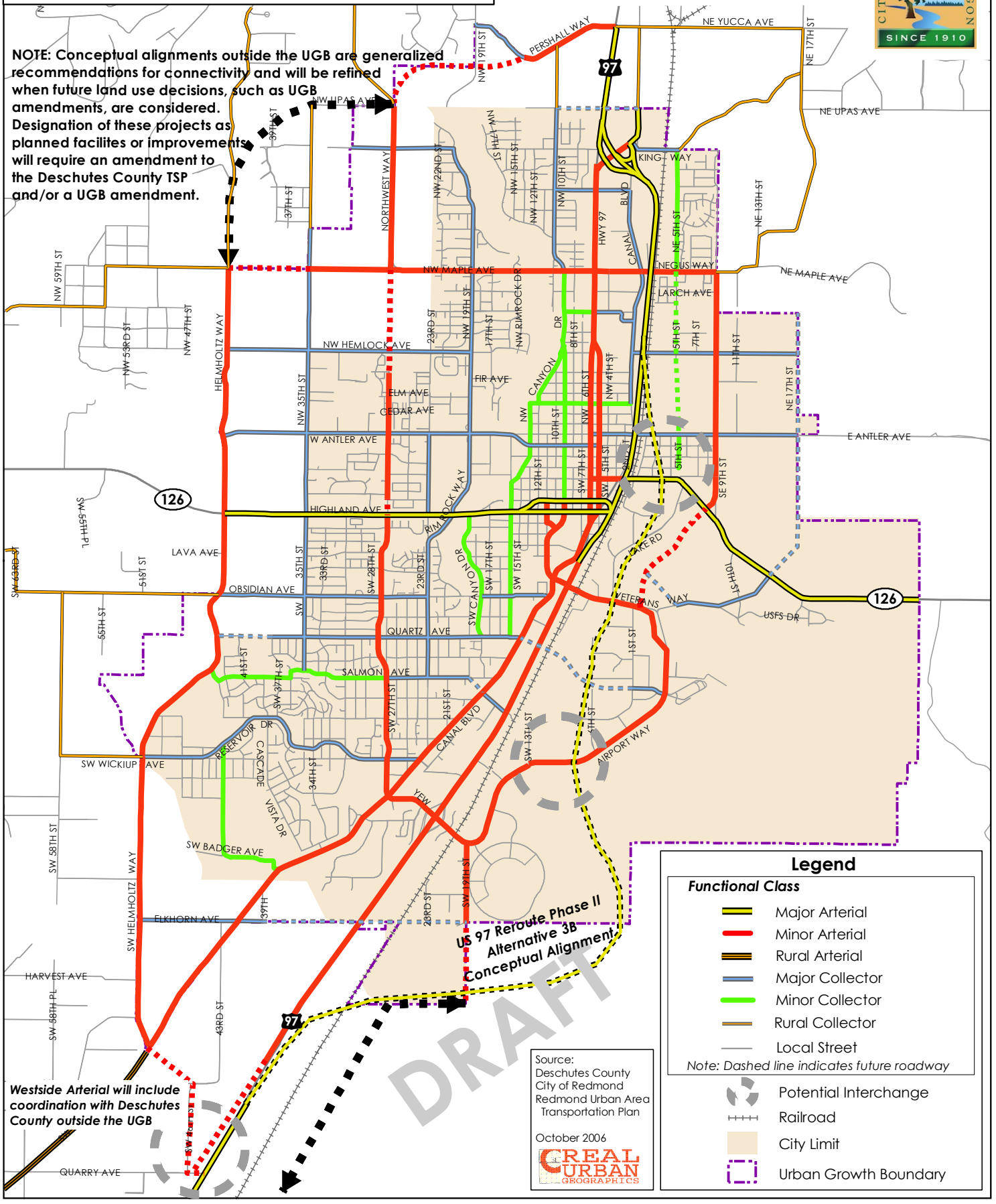
City of Redmond Transportation System Plan

NOTE: Conceptual alignments outside the UGB are generalized recommendations for connectivity and will be refined when future land use decisions, such as UGB amendments, are considered. Designation of these projects as planned facilites or improvements will require an amendment to the Deschutes County TSP and/or a UGB amendment.



Source:
Deschutes County
City of Redmond
Redmond Urban Area Transportation Plan

October 2006

CREAL URBAN GEOGRAPHICS

Legend

Functional Class

- Major Arterial
- Minor Arterial
- Rural Arterial
- Major Collector
- Minor Collector
- Rural Collector
- Local Street

Note: Dashed line indicates future roadway

- Potential Interchange
- Railroad
- City Limit
- Urban Growth Boundary

Transportation System Management (TSM)

Transportation System Management (TSM) focuses on low cost strategies to enhance operational performance of the transportation system by seeking solutions to immediate transportation problems, finding ways to better manage transportation, maximizing urban mobility, and treating all modes of travel as a coordinated system. TSM measures focus primarily on region wide improvements, however there are a number of TSM measures that are recommended for use in Redmond, which include:

Intelligent Transportation Systems (ITS): 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 (and will) make better travel decisions and to transportation system operators so they can better manage the system and improve system reliability. The ITS master plan for Redmond refines a previous ITS plan done by Deschutes County, and provides equipment and communication devices to better manage local travelers. The tools include:

- *Closed circuit TV cameras for use by traffic control centers and general public road conditions reporting.*
- *Variable message signs to inform drivers at strategic decision points about upcoming roadway conditions.*
- *Automated Traffic Recorders to monitor historical and seasonal travel patterns to better understand local conditions throughout the year.*
- *Advanced rail warning systems at all grade-crossing locations.*
- *Communication nodes at city public works and airport facilities to allow communications with ITS devices.*

The following actions should be taken as part of this TSP:

- *Adopt the ITS Master Plan Map, which supplements and refines the general ITS plan prepared for Deschutes County, and shows planned ITS devices and communications in the Redmond area.*
- *Modify City of Redmond standards to include installation of 3" conduit during roadway improvement projects to support the interconnect infrastructure shown in the ITS Master Plan.*

Neighborhood Traffic Management (NTM): The City of Redmond has should adopt a Neighborhood Traffic Management Program to establishes a process to guide implementation of any traffic calming through neighborhood involvement. This program would help prioritize implementation and address issues on a systematic basis rather than a reactive basis. Criteria should be established for the appropriate application of NTM in the City. This would address warrants, standards for design, funding, the required public process, use on collectors/arterials (fewer acceptable measures) and how to integrate NTM into all new development design. NTM projects

on state facilities are required to meet ODOT standards. Pavement textures, chokers, on-street parking and traffic circles are prohibited on state highways.

Access Management: Access Management is a broad set of techniques that balance the need to provide efficient, safe and timely travel with the ability to allow access to the individual destination. Proper implementation of Access Management techniques should guarantee reduced congestion, reduced accident rates, less need for highway widening, conservation of energy, and reduced air pollution.

The following recommendations are made for access management:

- *Update the access management plan for US 97 corridor.*
- *Update the City's policy statement to include maximum spacing recommendations by street functional class, as shown in Table 1-4.*
- *Use ODOT standards for access on highways under their jurisdiction.*
- *Specific access management plans should be developed for arterial streets in Redmond to maximize the capacity of the existing facilities and protect their functional integrity. New development and roadway projects should meet the requirements summarized in Table 1-4. The minimum spacing of roadways and driveways listed in this table is consistent with Multnomah County's access spacing standards.*

Table 1-4: Access Management Standards

Street Facility	Minimum Posted Speed (mph)	Minimum Spacing between Driveways and/or Streets	Minimum Spacing between Intersections	Maximum Spacing between Intersections
Arterial Streets				
Minor Arterial – Downtown Core Grid System	20-25	165 ft	330 ft	660 ft
Major Arterial – Other Areas	35-50	800 ft	½ mile	1 mile
Minor Arterial	30-45	330 ft	¼ mile	½ mile
Collector Streets				
Major Collector	25-35	165 ft	330 ft	660 ft
Minor Collector	25-35	80 ft	330 ft	660 ft
Industrial Collector	25-35	165 ft	330 ft	1,320 ft
Local Streets				
Local Industrial	20-25	*access to each lot*	330 ft	1,320 ft
Local Residential	20-25	*access to each lot*	330 ft	660 ft

Note: The minimum spacing shown for each category is a desirable design spacing for future development; existing spacing will vary.

Roadway Extensions to Improve Circulation

Much of the existing local street network, especially in the downtown area, provides good connectivity with multiple options for travel in any direction. However, some of the newer residential neighborhoods have been developed with limited opportunities for movement into and out of the developments, with some neighborhoods funneling all traffic onto a single street. This type of street network results in out-of-direction travel for motorists and contributes to an imbalance of traffic volumes, which impacts residential frontage. This can result in the need for investments in wider roads, traffic signals and turn lanes that could otherwise be avoided.

A Local Street Connectivity Plan was developed for Redmond, which is shown in Figure 9-5, which is duplicated on the following page. In most cases, the connector alignments are not specific and are aimed at reducing potential neighborhood traffic impacts by better balancing traffic flows on neighborhood routes. To protect existing neighborhoods from potential traffic impacts of extending stub end streets, connector roadways should incorporate neighborhood traffic management into their design and construction. All stub streets should have signs indicating the potential for future connectivity. Additionally, new development that constructs new streets, or street extensions, are required by the current development code to meet the following connectivity standards:

- *Provides full street connections with spacing of no more than 530 feet between connections except where prevented by barriers*
- *Provides bike and pedestrian access ways in lieu of streets with spacing of no more than 330 feet except where prevented by barriers*
- *Limits use of cul-de-sacs and other closed-end street systems to situations where barriers prevent full street connections*
- *Includes no close-end street longer than 200 feet or having no more than 25 dwelling units*
- *Includes street cross-sections demonstrating dimensions of ROW improvements, with streets designed for posted or expected speed limits.*

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Figure 9-5
LOCAL STREET CONNECTIVITY

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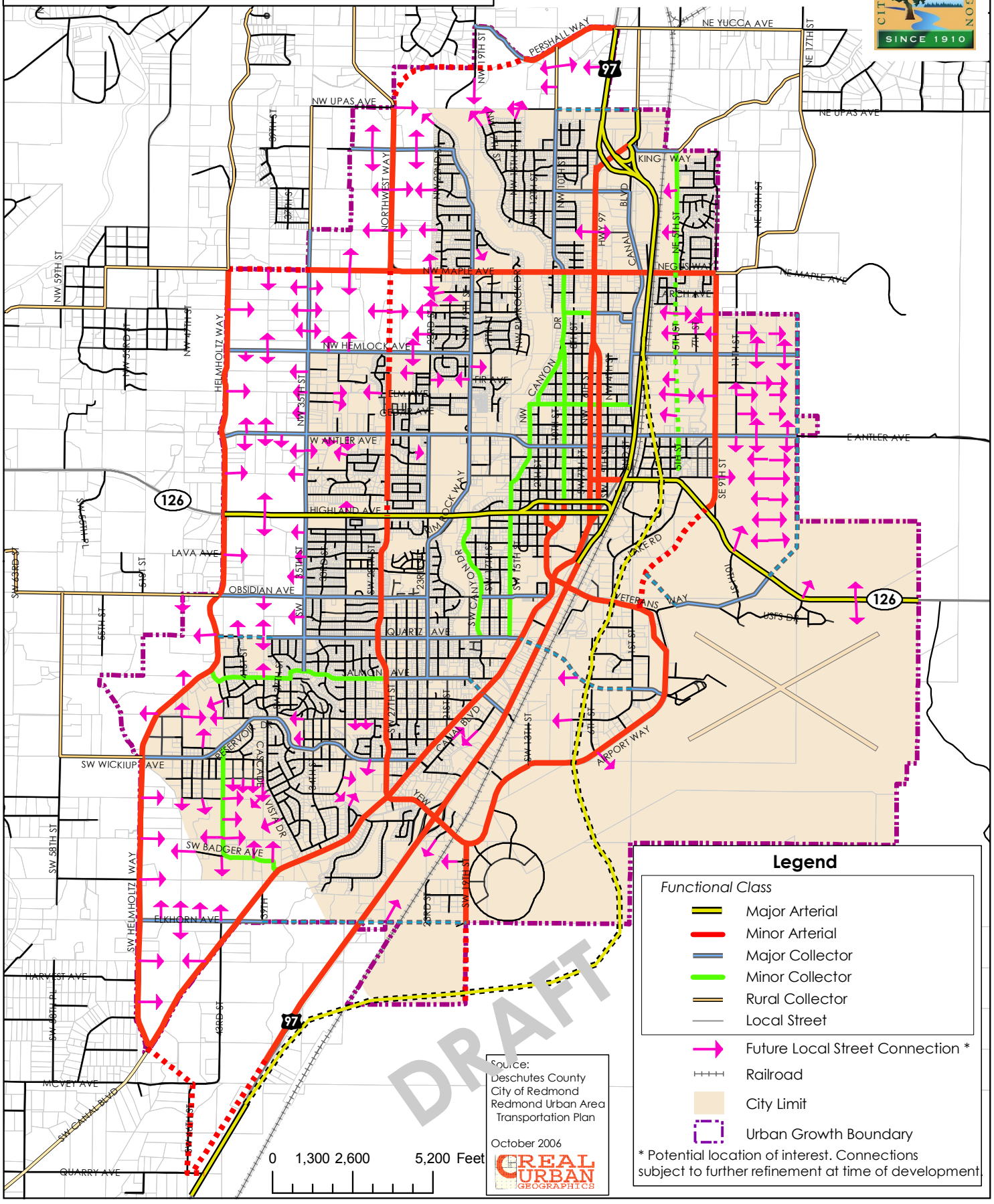
City of Redmond
Transportation System Plan



Transportation Demand Management (TDM)

Transportation Demand Management (TDM) is the general term used to describe any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods. As growth in the Redmond area occurs, the number of vehicle trips and travel demand in the area will also increase. The ability to change a user's travel behavior and provide alternative mode choices will help accommodate this growth.

The City of Redmond and Deschutes County should coordinate to implement the pedestrian, bicycle, and transit system improvements, which offer alternative modes of travel. The recommended TDM action plan includes:

- *Encourage developments that effectively mix land uses to reduce vehicle trip generation. These plans may include development linkages (particularly non-auto) that support greater use of alternative modes.*
- *Implement a motor vehicle maximum parking ratios for new development, to supplement existing policies for minimum parking ratios. .*
- *Continued implementation of street connectivity requirements.*
- *Require new development to install bicycle racks.*
- *Implementation of bicycle, pedestrian, motor vehicle and transit system action plan.*
- *Monitor and manage the parking needs in the Redmond Downtown, which could include long-term strategies such as parking pricing.*

Roadway Improvements

By 2030, several of the major city arterials and state highway facilities in Redmond will not be able to serve peak traffic demands on a regular basis. Key issues to address include:

- ***Lack of north-south capacity**. The primary north-south arterial route is US 97 throughout the length of the city. Adding the Westside Arterial Corridor improvements are essential to serve growth in the western half of the city, but critical shortfalls are forecasted south of Highland Avenue by 2030. Additional north-south capacity is needed to relieve this corridor, and to better serve employment and industrial growth in the eastern half of the city. Concepts tested during the TSP update included the southern extension of the US 97 Re-route, expanding South Canal Boulevard, and extending SE 19th Street to parallel a southerly connection to US 97.*
- ***Lack of alternative access to the airport and county fairgrounds area**. The primary route to the southwest corner of the city is via the Yew Avenue interchange with US 97. Traffic congestion associated with large events at the fairgrounds substantially impacts regional routes, including long*

queues on US 97. Alternative transportation access to these regional facilities would help to less impacts of peak event demands, and provide local circulation options during non-event days. Local circulation options considered an new US 97 overcrossing at Elkhorn Boulevard, a new east-west connection at Quartz Avenue, and extending SE 19th Street to parallel a southerly connection to US 97.

- ***Lack of east-west capacity.*** *OR 126 is the primary highway for regional destinations west or east of the city. By 2030, traffic growth will exceed existing carrying capacity, and further improvements will be needed. Opportunity to expand parallel routes to OR 126 were considered, but now viable alternatives were identified because of existing development. Highway expansion projects were identified to provide adequate improvements to meet state mobility standards. In addition, local circulation constraints posed by US 97 and railroad were addressed by new facilities that cross over them at a separate grade. New overcrossings are identified at Elkhorn Road and NW Upas Road.*
- ***Modernization of rural roadways.*** *There are many existing two-lane rural roadways in town that will need to be upgraded to full urban standards, as development extends outward. This is most significant in the northwest and eastside areas of town, where existing arterial and collector streets are built to a rural standard. As urban development fill in, these basic facilities will need to improved to add turn lanes for higher traffic volumes, and dedicated facilities for pedestrian and bicycle travel. The modernization cost of road upgrades is a significant element of the overall roadway improvement program.*

Based on the needs identified above, a Motor Vehicle Master Plan was created that includes $112.8 million for roadway improvements, $6.5 million at intersections on city arterials and collector roadways, and another $25.6 million on state highways, and another $8 million at intersections.

City street projects summarized in Table 1-5 include all the master plan projects within their jurisdiction. All of those projects were included in the Action Plan, so, for this case, the Master Plan and the Action Plan list are the same.

Table 1-5: Motor Vehicle Master Plan Improvements – City of Redmond Facilities

Location	Description	Project (#)	Planning Cost (x$1,000)
NW Upas Ave	Grade-separated crossing of US 97	14	$3,940
Westside Arterial	O'Neil to Quarry	(Various)	$50,575
NW 27th Ave	Widen to 3 lanes from Maple Avenue to Greenwood	15	$2,640
SW Canal Blvd	Widen to 3 lanes from SW Obsidian Ave to Yew Ave	16	$7,560
SW 19th St	Extend to Deschutes Market Road as 2-lane collector	17	$7,250
SW Quarry Rd	Connect US 97 to 19th Street extension	18	$2,730
NW O'neill Ave	Grade-separated crossing of US 97	19	$1,930
NE 17th St	Eastside collector from OR 126 to Antler Ave	20	$3,200
SE 9th St	Extend from Veterans Way to OR 126 as Minor Art	31	$2,925
E 9th St	Improvements from OR 126 to Hemlock Ave	33	$2,730*
SW Odem Medo Rd	Corridor Improvements	35	$1,040*
SW 15th St	Improvements from SW Quartz to SW Obsidian Ave	36	$480*
Forked Horn Butte	Wickiup Ave to S Canal Blvd Connection	37	$2,650
SW Elkhorn Ave	Helmholtz Way to S Canal Blvd	60	$1,735
SW Obsidian Ave	Western UGB to 35th Street	62	$1,520
W Antler Ave	Helmholtz to 35th Street	63	$1,520
NW 35th St	NW Hemlock to NW Oak Avenue	64	$2,150
NW Spruce Ave	NW 22nd to NW 33rd	65	$1,430
NW 10th St	NW Upas Ave to NW Pershall Way	66	$1,140
NE 5th St	NE Hemlock to E Antler Avenue	67	$1,230
SW Canal Blvd	Widening from SW Yew Ave to SW Badger Ave	68	$3,785
SW Canal Blvd	SW Badger Ave to SW Helmholtz Way	69	$4,465
SW Wickiup Ave/ Reservoir Dr	SW 31st to SW 35th, SW 39th to Helmholtz Way	70	$2,790
SW Veterans Way	Add a center turn lane from RxR to SE 1st St	71	$1,375
	Master Plan Total		**$112,790**

* Costs provided in CIP lists and increased 8% annually to 2007 costs to account for inflation

Major street projects on ODOT facilities are listed in Table 1-6. The most significant project is the US 97 Reroute extension, which accounts for the majority of the total cost. This project and the potential interchange at Airport Road was not included in the Action Plan list, given this high cost and shortfall of state funding in this region.

Table 1-6: Motor Vehicle Master Plan Improvements – ODOT Facilities

Location	Description	Master Plan Project	Action Plan Project (#)	Planning Cost (x$1,000)
Hwy 126	Widen to 3 lanes from Helmholtz to 35th Avenue	X	8	$1,555
Hwy 126	Widen to 5 lanes from 35th Avenue to Rimrock Way	X	9	$5,330
Hwy 126	Widen to 3 lanes from US 97 Reroute to Vet Way	X	10	$7,535
US 97 Reroute Extension*	Extend Reroute Alt 3B to Quarry interchange (no Airport Way interchange)	X		$226,140**
Airport Interchange*	Reroute interchange at Airport Avenue	X		$6,450**
US 97/Quarry Ave	Westside Arterial/Quarry Ave Interchange	X	13	$11,250
	Master Plan Total			**$258,260**
	Action Plan Total			**$25,670**

* Included in Master Plan but not reflected in Action Plan or intersection performance listed in Table 9-7.

** Costs provided in US 97 Refinement Plan Study for Alternative 3B. Cost of Airport Way interchange was removed from the total and listed separately.

The city is already committed to several roadway improvements that are listed in the existing Capital Improvement Program. These projects and their associated costs, along with the city and ODOT improvement projects identified in the Action plan are summarized in Table 1-7, with the total of $174.1 million. For illustration purposes, a local match of 20 percent of construction costs was assumed for ODOT projects, however this does not represent a commitment by the city for this amount. There may be other opportunities or means to support state project on the Action Plan list.

The Action Plan map is illustrated in Figure 9-8, which is duplicated on the next page. Project numbers shown on the map correspond with value listed in the foregoing tables.

Table 1-7: Motor Vehicle Action Plan Cost Summary

Project Type	Cost
Currently Funded CIP Projects	$18,850
ODOT Facility Capacity Improvements - Local Match*	$24,585
City of Redmond Facility Capacity Improvements	$112,790
ODOT Facility Intersection Improvements – Local Match*	$8,000
City of Redmond Facility Intersection Improvements	$6,450
Additional Signalization Projects	$3,705
Total Motor Vehicle Action Plan Cost	**$174,115**

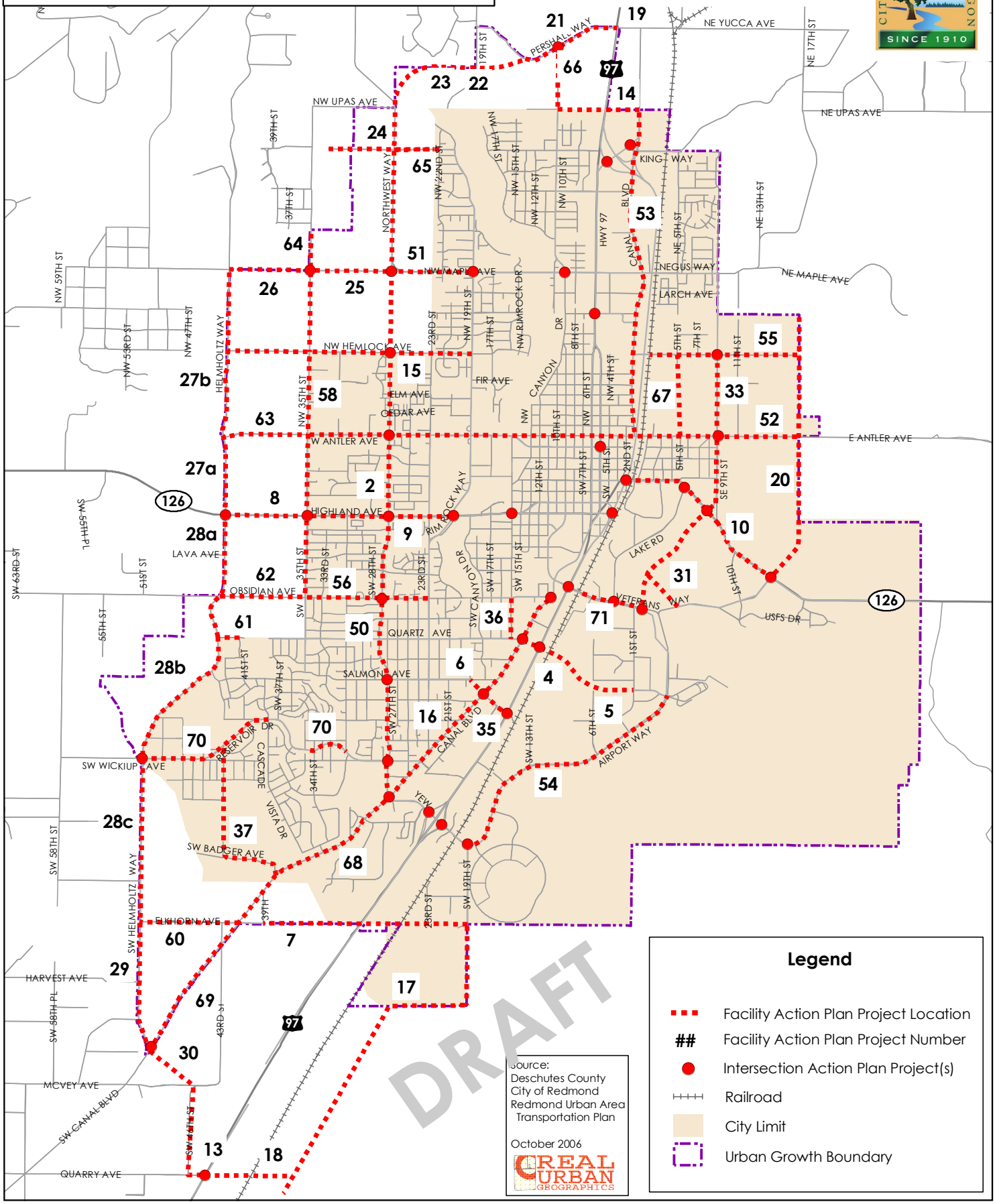
**provided in Draft City of Redmond CIP Update*

DKS Associates
TRANSPORTATION SOLUTIONS

Figure 9-8
MOTOR VEHICLE ACTION PLAN

NOT TO SCALE

City of Redmond Transportation System Plan



Other Modes

While auto, transit, bicycle and pedestrian transportation modes have a more significant effect on the quality of life in Redmond, other modes of transportation must be considered. Future needs for rail, air and pipeline infrastructure are identified by their providers and are summarized below.

Rail

The existing conditions inventory identified nine existing at-grade rail crossing in the study area. This will be reduced by the construction of the US 97 North Reroute, which will grade separate the crossing at Negus Way. The planned roadway system in the City will construct roadways across the rail line at Quartz Avenue and at Elkhorn Avenue. The crossing at Quartz Avenue will be at-grade since grade separation is not feasible due to the proximity of US 97. The crossing at Elkhorn Avenue should be grade-separated for safety and to maintain freight and auto mobility.

Gas Pipelines

Cascade Natural Gas provides natural gas services in Redmond and the surrounding area. The existing pipelines in Redmond are outside of the maintenance responsibilities of the City. As such, no policies or recommendations in this area of transportation are provided for Redmond.

Air

The future growth and expansion of Roberts Field will affect the transportation network of Redmond in several ways. Aside from general growth and the associated traffic use around the airport, two roadway realignment projects (Veterans Way/Airport Way Relocation, and OR 126 Reroute) on the CIP list are associated with providing clearance for runway protection zones and will have a direct impact on the roadway system in Redmond. The realignment of Veterans Way/Airport Way is consistent with the planned extension of SE 9th Street connection to OR 126, and future roundabout control presented in the motor vehicle master plan. The OR 126 Reroute will affect the alignment of the highway but does not impact any local connections.

Financing

Transportation funding is commonly viewed as a user fee system where the users of the system pay for infrastructure through motor vehicle fees (such as gas tax and registration fees) or transit fares. However, a great share of motor vehicle user fees goes to road maintenance, operation and preservation of the system rather than construction of new system capacity. Much of what the public views as new construction is commonly funded (partially or fully) through property tax levies, traffic impact fees and fronting improvements to land

development. The City of Redmond utilizes a number of mechanisms to fund construction of its transportation infrastructure, including:

- Fuel Tax and Vehicle License Fee
- System Development Charge
- Urban Renewal Funds
- Exactions (Developer Required Improvements)

Under the above funding programs, the City of Redmond will collect approximately $5.6 million for street construction and repair each year. Over the 23-year life of this planning period, that is equivalent to $133 million in today's dollars.

The costs outlined in the Transportation System Plan to implement the Action Plans for Streets, Transit, Bicycles, and Pedestrians total $210.8 million, and several other recommended transportation operations and maintenance programs would add $43.8 million for a total cost over 23 years of $254.5 million. This total exceeds the expected 23-year revenue estimate of $133.2 million by approximately $121.3 million. Alternative solutions to address this funding deficit for the Action Plan projects are discussed in the next section.

Table 1-8: Redmond Transportation Action Plans Costs over 23 years (2007 Dollars)

Transportation Element	Approximate Cost ($1,000)
System Improvement Projects (Action Plans projects to be funded by City)	
Motor Vehicle	$174,115
Roadway Reconstruction/Modernization	$18,170
Bicycle	$9,440
Transit	$750
Pedestrian	$8,315
Total Capital Projects	**$210,790**
Operations and Maintenance Programs and Services	
Roadway Maintenance ($1,752,000 per year)	$40,300
ADA Enhancement Program ($50,000 per year)	$1,150
Local Transit Operations ($100,000/yr)	$2,300
Total Operations and Maintenance Programs	**$43,750**
23 YEAR TOTAL COST	***$254,540***
23 YEAR TOTAL FUNDING	***$133,249***
23 YEAR ADDITIONAL NEED	***$121,291***

Note: in 2007 Dollars

The estimated $210 million for capital projects and maintenance exceeds the expected revenue estimate of $133 million by approximately $121 million. Alternative solutions to address this funding deficit for the Action Plan projects were analyzed, including General Fund Revenues, Voter-Approved Local Gas Tax, Street Utility Fee Revenues, Expanded

Transportation SDC, and Debt Financing. It is recommended that the City consider establishing a transportation, or street, utility as the backbone of its operations and maintenance funding approach. It is also recommended that the City consider updating its transportation SDC to cover the new City funded capital projects identified in the TSP. In addition, the City should actively pursue grant and other special program funding in order to mitigate the costs to its citizens of transportation capital construction.

The City shall consider establishing a transportation utility fee as the backbone of its operations and maintenance funding approach. Street utility fees provide a stable source of dedicated revenue useable for transportation system operations and maintenance and/or capital construction. Rate revenues also secure revenue bond debt if used to finance capital improvements. Transportation utilities will be formed by Council action, and billed through the City utility billing system (e.g. water bills).

The City should also consider increasing the System Development Charges (SDCs) to fund the capital projects portion of the TSP Action Plan. An increase from the current amount of $2,877 to $4,700 per PM peak hour trip could generate an additional $38.6 million over the next 23 years.

A transportation utility fee and an increased SDC could generate approximately $36 million in additional funds over the next 23 years, as shown in Table 1-9. If development exactions were also pursued, total additional funds would be approximately $121.6 million, which meets the amount of additional funds needed ($121.3 million) as identified in Table 1-8. These additional funds are expected to reasonably generate sufficient revenues to fully fund the Action Plan projects and maintenance programs.

Table 1-9: Recommended New Funding Sources for Transportation Programs

Transportation Funding Source	Estimated Revenue ($1,000)
SDC – Additional Share (Increase by $1,823 / trip)*	$38,648
Exactions	$46,762
Transportation Utility Fee**	$36,230
23 YEAR TOTAL ADDITIONAL FUNDING (in 2007 Dollars)	**$121,640**

* Note that this additional revenue is based on $4,700 / trip

** Assumes utility fee corresponding to $40 per capita per year (a typical single family household may be charged approximately $6 per month)

2. Goals and Policies

Overview

The transportation-related goals and objectives established by the 1999 TSP were adopted to improve future mobility and evaluate elements of the TSP. Since 1999, there have been changes to state transportation plan policies and regulations that should be addressed as a part of this TSP update. In addition to retaining previously adopted goals and objectives that are still applicable, new goals and objectives are suggested to incorporate recent initiatives within the state and county as it relates to transportation facilities.

Relevant documents were reviewed in order to assist in determining which goals and objectives should be established in addition to those that exist under the 1999 TSP. A summarized review of relevant documents and a revised list of goals and policies appear in the following sections.

Goals and Objectives

This section identifies goals and objectives for development of the Redmond TSP update. The existing goals and policies were taken from the current adopted TSP. Our review of these goals and objectives found that significant additions would be required to fully address current regulations and good planning practices, so, rather than suggesting minor edits we recommend a new set of goals and policies to replace them. The new goals and policies that modify or add to the current policies were developed to:

- Provide a more general framework for a extending and enhancing transportation services within the city,
- Fully addresses current requirements in the Transportation Planning Rule (TPR),
- Clearly identify appropriate actions to be taken for implementation, and
- Provides more balanced treatment of all travel modes and services provided by the transportation system.

The City's Comprehensive Plan lays out a policy framework regarding transportation services. Goals are defined as brief guiding statements that describe a desired result. Policies and strategies are associated with each of the goals and describe how to move the community in the direction of completing each goal. The policy element of the plan would generally be organized as follows:

- Goal Statement - A statement that describes an ideal condition that the city desires to attain over time for various aspects of the transportation system. For example, provide access to safe, affordable and reliable transportation choices for all Redmond residents and businesses;

- Policy Statements – One or more statements that are intended to help define positions, requirements, or rules that the city will use to achieve the goal; and

- Strategy statements – One or more statements that are intended to outline specific action steps that will be taken to achieve a policy or goal.

The following summarizes the proposed transportation policies and strategies. It includes specific language for modified and/or new policies that are proposed in response to local, regional or state regulations, such as the state Transportation Planning Rule and portions of the Oregon Transportation Plan.

Existing TSP Goals and Objectives

These goals and objectives were taken from the current adopted transportation system plan. These are recommended to be replaced by the new goals and policies suggested in the next section.

Goal 1 - Reduce through traffic, congestion, and improve circulation along Highway 97, especially along the 5th and 6th Street couplet.

Objective 1: Develop a safe and efficient arterial and collector system, which provides additional north-south routes, maintains the integrity of the downtown business district, and minimizes the impact on street-side parking.

Objective 2: Improve intersection operations by adding left-turn phases, installing additional traffic signals, actuating and coordinating traffic signals, and/or increasing sight distance as needed.

Objective 3: Protect residential and commercial areas from air quality, noise, and visual impacts resulting from truck traffic.

Objective 4: Provide signage directing vehicles to business, industrial, and recreational centers.

Objective 5: Identify transportation demand management measures, which could reduce peak hour demand.

Goal 2 - Enhance east/west circulation.

Objective 1: Develop a safe and efficient east-west arterial and collector system.

Objective 2: Enhance existing crossings and determine the best locations for additional crossings of Dry Canyon, Highway 97, Pilot Butte Canal, and BNSFRR line to link east and west Redmond.

Objective 3: Enhance east-west circulation in the vicinity of schools, institutions, and major developments.

Goal 3 - Identify roadway system needs to serve undeveloped areas so that steps can be taken to preserve rights-of-way and maintain adequate traffic circulation.

Objective 1: Integrate new arterial and collector routes into the existing city grid system.

Objective 2: Identify improvements to existing policies and standards that address street connectivity and spacing.

Objective 3: Address Forked Horn Butte access and circulation.

Goal 4 - Increase the use of alternative travel modes through improved safety and service.

Objective 1: Provide additional sidewalks and improve existing sidewalk pavement for pedestrian safety and access.

Objective 2: Provide additional bicycle routes and plan regular maintenance of existing routes for bicyclist safety and access (per Redmond Bicycle Master Plan).

Objective 3: Provide pedestrian and bicycle access, especially when direct motor vehicle access is not possible.

Objective 4: Identify opportunities to expand transit service in conjunction with the Deschutes County Transit Study.

Objective 5: Address linkages with the Deschutes County carpool program.

Recommended New Goals & Policies for TSP Update

Goal 1: Provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes serving all residential areas and businesses.

Policy 1 – The City shall ensure that public roads and streets are planned to provide safe, convenient, efficient and economic movement of persons, goods and services between and within major land use activities.

Policy 2 - Existing streets shall be classified and improved and new streets built based on the type, origin, destination and volume of current and future traffic.

Policy 3 – Through traffic shall be provided with routes that do not congest local streets and impact residential areas.

Policy 4 - Outside traffic destined for Redmond business and industrial areas shall have convenient and efficient access to commercial and industrial areas without the need to use residential streets.

Policy 5 – Local traffic routes within Redmond shall be planned to provide convenient circulation between home, school, work, recreation and shopping.

Policy 6 - Convenient access to major out-of-town routes shall be provided from all areas of the city.

Policy 7 – The City shall encourage the use of more energy-efficient and environmentally sound alternatives to the automobile by:

a. The designation and construction of bike paths and pedestrian ways;

b. The development of new mass transit and commute bus systems to meet local resident needs; and

c. Encouraging the development of mixed-use neighborhoods, providing a wide range of land use activities within a single area.

Policy 8 — The City shall work cooperatively with the Redmond Airport and local governments in the region to ensure sufficient air passenger access for Redmond residents.

Policy 9 – The City shall work to ensure the transportation system is developed in a manner consistent with state and federal standards for the protection of air, land and water quality, including the State Implementation Plan for complying with the Clean Air Act and the Clean Water Act.

Policy 10 – The City of Redmond shall foster transportation services to the transportation-disadvantaged including the young, elderly, handicapped, and poor.

Strategies

1. Make traffic safety a continuing effort through effective law enforcement and educational programs.
2. Adopt an acceptable level of service standard for the roadway network that is consistent with state and regional transportation policies.
3. Develop an array of transportation assets and services to meet the needs of the transportation-disadvantaged.
4. Evaluate, identify, and map existing and future neighborhoods for potential small-scale mixed-use centers to primarily serve local residents.

Goal 2: Develop a transportation system that is supportive with the City's adopted comprehensive land use plan and with the adopted plans of state, local, and regional jurisdictions.

Policy 1 – The City shall implement a transportation plan based on the functional classification of streets.

Policy 2 – The City shall maintain a transportation plan map that shows the functional classification of all streets within the Redmond urban growth area. Changes to the functional classification of streets must be approved through an amendment to the Redmond Comprehensive Plan - Transportation Element.

Policy 3 – The Redmond transportation system plan shall support the city's adopted land use plan and with transportation system plans and policies of Deschutes County.

Policy 4 – The City shall support pedestrian and bicycle facilities in locations that are consistent with comprehensive land use plans as areas likely to generate and pedestrian and bicycle use.

Policy 5 — The City shall work with Deschutes County and other regional transportation partners to implement regional transportation demand management programs where appropriate.

Strategies

1. Develop an intergovernmental agreement between Redmond and Deschutes County, consistent with ORS 195.065, to establish urban service boundaries and responsibilities for transportation facilities within and adjacent to the City of Redmond.
2. Work cooperatively with ODOT and Deschutes County to develop a corridor management plan for US 97 and OR 126 to balance local and regional mobility on state highways and local arterial and collector streets.
3. Define transportation corridors including streets and alternative bicycle/pedestrian trails in advance through long range planning efforts
4. Coordinate planning of the transportation network with adjacent governmental agencies, such as Deschutes County and the State.
5. Coordinate with ODOT in implementing their Six-Year Plan and the State Highway Improvement Program.

Goal 3: Establish a clear and objective set of transportation facility design and development regulations and standards that address all elements of the city transportation system and promote access to and utilization of a multi-modal transportation system.

Policy 1 – The City of Redmond shall adopt requirements for land development that mitigate the adverse traffic impacts and ensure all new development contributes a fair share toward on-site and off-site transportation system improvement remedies.

Policy 2 – The City of Redmond shall require dedication of land for future streets when development is approved. The property developer shall be required to make street improvements to mitigate their impact on the roadway network in proportion to the benefit the improvement provides the development.

Policy 3 – The City of Redmond shall require developments that generate a significant volume of traffic (as defined in the development code), to prepare a traffic impact analysis.

Policy 4 – The City of Redmond shall adopt a uniform set of roadway design guidelines that provide one or more typical cross section associated with each functional street classification. For example, the City may allow for a standard roadway cross-section and a boulevard cross-section for arterial and collector streets.

Policy 5 – The City shall require sufficient right-of-way to provide for necessary roadway, bikeway, and pedestrian improvements.

Policy 6 – The City shall adopt roadway design guidelines and standards that ensure sidewalks and bikeways be provided on all arterial and collector streets for the safe and efficient movement of pedestrians and bicyclists between residential areas, schools, employment, commercial and recreational areas.

Policy 7 – The City of Redmond shall require whenever possible direct property access from the street with the lowest functional classification.

Policy 8: The City shall adopt access control standards for all arterial and collector streets to improve safety and promote efficient through street movement. Access control measures shall be consistent with ODOT and Deschutes County guidelines to ensure consistency on state, city and county roads.

Policy 9 - The City shall establish guidelines and standards for the use of medians and islands for regulating access and providing pedestrian refuge on arterial and collector streets.

Policy 10 - The City shall develop uniform traffic control device standards (signs, signals, and pavement markings) and uniformly apply them throughout the city.

Policy 11 - The City of Redmond shall adopt parking control regulations as needed. On-street parking shall not be permitted on any street designated as an arterial, unless allowed by special provision or through the road modifications process outlined in the Redmond Development Code.

Strategies

1. Incorporate typical street cross section guidelines in the City's public works design standards that address vehicular, bicycle, pedestrian, and transit needs.
2. Include a Road Modification Process in the Redmond Development Code to provide a procedure for granting variances from street design standards for parking, pedestrian facilities, signals, and other roadway features.
3. Incorporate guidelines in the City's development code that establish when a local street refinement plan must be prepared and the process for preparing such a plan.
4. Amend the city development code as necessary to regulate vehicular access and parking consistent with plan policies.
5. Amend the city development code as necessary to include specific guidelines for determining the proportional benefit contribution associated with requirements for street dedication and the construction of off-site transportation improvements.
6. Amend the development code to include standards and procedures for a transportation impact analysis (TIA).
7. Develop a list to prioritize refinement plan needs, such as corridor plans and interchange area management plans.
8. Amend development code to include provisions for implementing traffic calming

mechanisms.

9. Create a map that identifies locations targeted for on-street parking, such as in neighborhood commercial areas and the town center that support multi-modal options.
10. Develop minimum and maximum parking ratios for all land use types.
11. Develop a "conceptual new local street network plan" map for all contiguous areas of vacant and redevelopable parcels of 5 (five) or more acres planned or zoned for residential or mixed-use development, and adopt the map as part of the TSP.

Goal 4: Develop complementary infrastructure for bicycles and pedestrian facilities to provide a diverse range of transportation choices for city residents.

Policy 1 – The City of Redmond shall provide a supportive transportation network to the land use plan that provides opportunities for transportation choices and the use of alternative modes.

Policy 2 – Sidewalks and bike lanes shall be provided on all arterial and collector streets for the safe, convenient and efficient movement of pedestrians and bicyclists between residential areas and neighborhood and community activity nodes such as schools, and employment, commercial and recreational areas.

Policy 3 – The City of Redmond shall pursue development of local and regional multi-purpose trail system.

Policy 4—The City of Redmond shall provide design standards for roadway traffic calming features such as roundabouts, curb extensions, speed tables, and speed humps.

Policy 5 – The City of Redmond shall include requirements for the provision of bicycle parking on commercial, industrial, and multi-family residential projects.

Policy 6 – The City of Redmond shall coordinate the multi-purpose trail system with adjacent jurisdictions, especially Deschutes County.

Policy 7 – The City or Redmond shall work to eliminate architectural barriers from buildings and public improvements that limit elderly and handicapped use of the transportation system.

Strategies

1. Include pedestrian and bike projects in the capital improvement plan to ensure investment in alternative modes;
2. Use intergovernmental agreements with Deschutes County for the coordination of urban services per ORS 196.065 to coordinate the multi-purpose trail system;
3. Include design standards for sidewalk bike lane and multi-purpose trail facilities in the city's public improvement design standards;

4. Include provisions for planning the location of pedestrian and bike routes for connecting residential areas with neighborhood and community activity nodes such as school, commercial, employment and recreational areas in the development code guidelines for preparing local street refinement plans;
5. Include a system of bike lanes along collector and arterial roadways as illustrated on the Transportation Plan Map;
6. Include requirements in the development code for private development to provide bike and pedestrian facilities as indicated on the Transportation Plan Map;
7. Include design standards for sidewalks, bicycle and multi-purpose trail facilities in the city's public improvement design standards;
8. Pursue traffic calming techniques for neighborhood and local streets so as to provide safe passage for pedestrians and bicyclists, and a more livable neighborhood environment for residents.

Goal 5: Provide reliable convenient transit service to Redmond residents and businesses as well as special transit options for the city's elderly and disabled residents.

Policy 1 – Public transportation should be considered as an alternative means of transportation in Redmond.

Policy 2 – Park-and-ride facilities shall be located adjacent to the arterial system for the maximum convenience of commuters and transit riders.

Policy 3 – Require the construction of bus shelters and park-n-ride lots within developments in the vicinity of planned transit corridors.

Policy 4—The City of Redmond shall participate in regional efforts for the preservation and development of appropriate rail rights-of-way for future passenger rail service.

Policy 5 – The City of Redmond shall encourage the provision of special transportation services (i.e., van pools, or car pools, dial-a-ride, etc.) to transportation disadvantaged by community-based service providers.

Strategies

1. Provide sufficient building setback and right-of-way required for the design elements associated with future bus service on major routes.
2. Work with local rail providers to extend transit options to Redmond, which may include:
    - Potential commuter rail line from Madras to Bend on the existing rail line; and
    - Other regional transit service connections, such as frequent bus, interurban bus, as appropriate.

Goal 6: Ensure that efficient and effective freight transportation infrastructure is developed and maintained to support local and regional economic expansion and diversification consistent with City economic plans and policies.

Policy 1—The City of Redmond shall collaborate with federal, state and neighboring local governments and private business to ensure investment in transportation infrastructure and services deemed necessary by the City to meet current and future demand for industrial and commercial freight movement.

Policy 2—The City of Redmond shall adopt public facility and site design standards that provide for safe and convenient access to industrial and commercial areas for commercial vehicles, including freight loading and transfer facilities.

Policy 3—The City of Redmond shall work cooperatively with local, regional and state agencies to protect the viability of truck and freight service routes within, through, and around the City of Redmond, especially for US 97 and Oregon Highway 126 corridors.

Policy 4—The City of Redmond shall work cooperatively with local, regional and state governments to ensure there is adequate air transportation infrastructure to serve local needs at regional airport facilities, including the Redmond Airport.

Policy 5—The City of Redmond will strongly encourage the preservation of rail rights-of-way for future transportation uses, and will work with appropriate agencies to ensure the availability of rail services to its industrial lands.

Policy 6—The City of Redmond will cooperate with Deschutes County, and other economic development agencies to ensure the availability of inter-modal connectivity facilities deemed necessary to facilitate seamless freight transfer between all transport modes.

Strategies

1. Revise the Redmond Development Code as necessary to include clear and objective standards for the provision of freight loading and handling facilities, such as restricted on-street parking, loading docks, truck access ways, and rail spurs, in all industrial and commercial development districts.
2. Participate in regional economic development transportation planning efforts related to inter-modal transportation facilities.
3. Adopt appropriate standards to ensure the preservation of rail access corridors to Redmond's industrial land base.

Goal 7: The Redmond transportation network will be managed in a manner that ensures the plan is implemented in a timely fashion and is kept up to date with respect to local and regional priorities.

Policy 1 – The City of Redmond shall develop a systematic approach to implementing the transportation network.

Policy 2 – The City of Redmond shall pursue a diversified funding strategy to implement the transportation system plan including private, public and regional sources.

Policy 3 – The City of Redmond shall incorporate identified transportation improvement projects from the TSP into the city's adopted capital improvement plan and schedule transportation projects based upon need as identified in the Transportation System Plan and validated by data collected through field observations and development traffic impact studies.

Policy 4 – Project scheduling shall be performed in a systematic manner based on the priority rating process outlined in the Transportation System Plan and available financial resources.

Policy 5 – The Transportation System Plan shall be periodically updated, preferably on a five-year cycle, to assure consistency with changing needs, philosophies, and related policies.

Strategies

1. Participate in state and regional advisory bodies to promote Redmond transportation system improvements.
2. Local private financing resources shall include right of way dedication and developer contributions to street improvements, and local improvement districts.
3. Public resources shall include local system development charges and bonding authority. Regional sources shall include other applicable state and federal grant assistance programs.
4. Develop a method for scheduling improvement projects based on priority and funding sources.
5. Assign city staff and elected officials to participate in regional transportation planning processes.
6. Secure intergovernmental agreements between Redmond, Deschutes County and regional service providers that outline cooperative measures for coordinating transportation investment and regulation per ORS 195.065.

Background Plan Review

Relevant materials and documents that may affect the Redmond TSP were reviewed. These documents include local, regional and statewide plans and guidelines. A summary of these documents follows.

Transportation Planning Rule (OAR 660-12-060)

The purpose of OAR 660-12 is to implement Statewide Planning Goal 12 (Transportation) and promote the development of safe, convenient, and economic transportation systems that are designed to reduce reliance on the automobile. Key elements include direction for preparing, coordinating, and implementing Transportation System Plans. In particular, rule 660-12-060 addresses amendments to plans and land use regulations and includes measures to be taken to ensure allowed land uses are consistent with the identified function and capacity of existing and planned transportation facilities. This rule includes criteria for identifying significant effects of plan or land use regulation amendments on transportation facilities, actions to be taken when a significant effect would occur, identification of planned facilities, and coordination with transportation facility providers.

Access Management Rules (OAR 734-051)

ODOT has adopted the identified administrative rules to establish procedures and criteria used to govern highway approaches, access control, spacing standards, medians and restriction of turning movements in compliance with statewide planning goals and in a manner compatible with acknowledged comprehensive plans and consistent with Oregon Revised Statutes, Oregon Administrative Rules, and the *1999 Oregon Highway Plan*. Any new street or driveway connections, as well as any changes to existing street or driveway connections to US 97, OR 126, or OR 370 must be found to be in compliance with these rules by the Department. Applicable spacing standards in the study area are described in the "Performance & Design Standards" section of this memorandum.

Mobility Standards

ODOT has adopted standards for mobility for state facilities through the *1999 Oregon Highway Plan* (OHP) and the *Highway Design Manual*[3]. The OHP mobility standards are intended to be used for identifying needs, while the *Highway Design Manual* standards represent the level of operation for which state facilities are to be designed. For this study, the OHP standards will be applied to existing and future no-build analysis, while the future build alternatives will be compared to the standards in the *Highway Design Manual*.

Table 6 in Policy 1F of the OHP displays the maximum allowable volume to capacity ratios for the 30th highest annual hour of traffic in areas outside of the Portland Metropolitan Area.

Table 10-1 in the *Highway Design Manual* displays the maximum allowable volume to capacity ratios for the 30th highest annual hour of traffic for use in the design of highway projects. These standards are to be applied to conditions forecasted to exist 20 years after completion of the proposed improvement. If the applicable mobility standard can not be met, a design exception should be sought.

Refer to the *Performance & Design Standards* section of this chapter for details.

[3] Highway Design Manual, Oregon Department of Transportation, 2003, p. 10-38

City of Redmond Comprehensive Plan

The City of Redmond Comprehensive Plan, which is currently being updated, acts as a guide for future growth and development within the urban area using a framework of goals and policies that respond to current needs and conditions in addition to guiding future City programs, major capital projects, and other funding decisions through the year 2020. The updated plan will extend this period through 2025.

The key goals and policies for consideration during this project will be those pertaining to transportation. Policies of particular interest include:

- The reduction of through traffic and congestion and the improvement of circulation along US 97, especially along the 5th and 6th Street couplet; and
- Enhancing east/west circulation.

Based on these goals, policies were designed for implementation through the Redmond Urban Area Transportation Plan addressing transportation system management, treatment of state highways, development of local street systems, street design, and other transportation elements.

In addition, the City of Redmond Comprehensive Plan and Zone Map show the type, location, and density of land development and redevelopment permitted in the future. The City of Redmond Development Code (Chapter 8 – Development Regulations), which was written to implement the comprehensive plan, provides descriptions of zone designations and allowable uses within those zones.

City of Redmond Transportation System Plan

The City's Transportation System Plan (TSP) provides a plan for the development of the City's transportation infrastructure, addressing improvements to existing roadways, new pedestrian and bicycle facilities, improvements in public transit service, and transportation demand management strategies. It also includes a capital improvement program (CIP), listing projects required to address the City's transportation needs for a 20-year planning period. The projects in the CIP are prioritized based on current needs and the expected growth of the city. Projects planned in the city are displayed in Figure 1.2, with specific projects of interest that could effect traffic circulation on US 97 listed below.

Planning year 2000 – 2005

- US 97 Reroute (currently under construction);
- Highland – Glacier Couplet (currently under construction);
- Maple Avenue connection between North Canal Boulevard and Highway 97 (including traffic signal at Highway 97) (currently under construction); and
- NW Maple Avenue Bridge Project (Dry Canyon Crossing) (currently under construction).

Planning year 2006 – 2010

- 27th Street reconstruction/modernization from Yew Avenue Interchange to Highland Avenue; and
- Quince Avenue construction from NW 10th Street to North Canal Boulevard.

Planning year 2011 – 2015

- 27th Street extension from Highway 126 (Highland Avenue) to Antler Avenue (including traffic signal at 27th Street and Highland Avenue); and

- Quartz Avenue extension from South Canal Boulevard to Airport Way (including traffic signal at Quartz Avenue and Highway 97).

Planning year 2016 – 2020

- 27th Street extension from Antler Avenue to Maple Avenue.

When Warranted

- Traffic Signal at Black Butte Boulevard at 5th Street (Highway 97);
- Traffic Signal at Kingwood Avenue at Highway 97;
- Traffic Signal at Canyon Drive at Highway 126;
- Traffic Signal at Sisters Avenue at Highway 126;
- Traffic Signal at East 9th Street at Highway 126;
- Traffic Signal at Quartz Avenue at South Canal Boulevard;
- Traffic Signal at Yew Avenue at South Canal Boulevard; and
- Traffic Signal at Odem Medo Road at South Canal Boulevard.

New transportation facilities proposed as a result of this study that will be owned by the City of Redmond must be designed in accordance with the City's TSP, incorporating the appropriate characteristics (cross-section design, treatment of pedestrian and bicycle facilities, etc.) for any applicable street functional classification. Recognition of needed street cross-sections for different functional classifications should be monitored closely, as it will affect the amount of right of way required. In addition, transportation improvements proposed to accommodate future traffic will need to be reviewed for compatibility with the identified projects in the City's Capital Improvement Program.

City of Redmond Code: Chapter 8 – Developmental Regulations

These regulations have been adopted for the purpose of promoting the health, safety, peace, comfort, convenience, economic well-being, and general welfare and to carry out the City of Redmond Comprehensive Plan and Statewide Planning Goals. They are intended to promote an orderly use of land within the city to avoid detrimental effects to other land uses and City facilities. Any uses of land within the city proposed as part of the US 97 Redmond Refinement Plan must be in compliance with these ordinances.

The Development Regulations establish and define the zoning designations for the City of Redmond, which are assigned to individual properties as shown on the City's Comprehensive Plan and Zone Map.

Article III of the Development Regulations includes standards for subdividing and partitioning land within the city. These include regulations pertaining to the location and design of future streets, procedures for street dedications, and requirements for the sizes, shapes, and orientation of individual lots.

City of Redmond System Development Charges

The transportation system development charge (SDC) for the City of Redmond is $2,722 per PM peak hour trip. This SDC is a function of the PM peak hour trip generation of the proposed development, as calculated per the Institute of Transportation Engineers (ITE) manual, Trip Generation, 6th Edition or by

an approved Trip Generation study performed by a registered professional engineer. Pass-by trips are excluded. The yearly inflation factor for this area is 6.4%.

The City updated its general SDCs for transportation in 2004. In August of 2006, the city adopted special SDC fees for the Northwest Area to address system improvements that are needed to accommodate growth in that urban expansion area.

Framework Plan

The City of Redmond Framework Plan as a graphical depiction of the future pattern that urban development is expected to take in areas of Redmond's urban growth boundary (UGB) that have not yet completed the comprehensive land use planning process. In addition to showing land use concepts, the plan also indicates where significant regional and mountain views are to be protected and where parks, schools, trails, and other public facilities need to be developed. The plan was adopted by the City of Redmond through a non-binding resolution in August of 2006.

Although the Framework Plan is not binding, it provides important guidance for completing the land use planning process after rural land is brought into the UGB. The City of Redmond and Deschutes County are jointly responsible for planning for land that is included in the Redmond UGB until it is annexed to the city. Redmond's UGB is required to include enough land to satisfy expected growth for a 20-year planning horizon. Over time, all land in the UGB is expected to be developed for urban uses or for amenities like schools, parks, and public facilities that serve urban uses. Beyond the UGB, Deschutes County and the City have identified and planned within an area of mutual interest, which includes rural land expected to be converted to urban uses some time during the next 50 years. This land is designated Redmond Urban Reserve Area on the County's Comprehensive Land Use Plan.

To make the transition from rural land use to urban use predictable, the City and County have agreed to the following sequence for adding land to the UGB and then planning for its development:

1. Update the City of Redmond land needs analysis for housing and employment using coordinated population and employment forecasts (three to five year intervals);

2. Bring land into the UGB commensurate with identified needs and modify the Redmond Urban Area Framework Plan, if necessary, to reflect identified land needs in the context of the existing urban area plan. UGB amendments may be initiated by the City for any amount of land or by private parties when encompassing an area greater than 150 acres;

3. Land brought into the UGB will be designated Urban Holding Area (UHA) until land use planning is completed that enables the adoption of urban land use designations. UHA land is zoned UH-10, which allows rural uses and a 10-acre minimum lot size;

4. Master plans are prepared sequentially for the land added to the UGB. Master plan approval results in a comprehensive plan amendment that converts land from UHA to urban plan and zoning designations so that the land may be developed. As such, master plan approval requires legislative (city council) approval and special notices to state agencies and affected property owners. Annexation to the City is expected to occur when the Master Plan is approved.

5. Site development plans are subsequently approved for individual parcels of land, which enables the construction of homes and businesses. In some circumstances, this step may be combined with master planning to expedite development approval.

The Framework Plan and master planning are integrated in the sequence because the former provides guidance for the later. The City of Redmond's adopted master planning requirements (RDC 8.0300) make reference to the Framework Plan. Applicants are required to generally conform to the urbanization concept presented in the Framework Plan. Where master plans differ from the Framework Plan, applicants are required to demonstrate how the urban framework and development objectives envisioned in the current Framework Plan can be accommodated elsewhere.

The current Framework Plan illustrates urban design and development concepts that are consistent with the development principals Redmond citizens embraced in a visioning process (Envision Redmond, 2005). The plan also presents a land use framework that is consistent with documented urbanization needs on which the city and county based their decision to expand the Redmond UGB. In this context, the Framework Plan represents more than an image of what Redmond might look like in 20 years. It helps establish the legal basis for where and how the city should expand. The city will update the framework plan periodically. Property owners seeking master plan approval need to consider their development programs carefully to ensure consistency with the Framework Plan.

Redmond Urban Reserve Studies

Deschutes County and the City of Redmond jointly agreed to establish an urban reserve area (URA) surrounding the City of Redmond's UGB. On September 7, 2005, the Deschutes County Board of County Commissioners adopted an amendment to the County's Comprehensive Plan that established a 5,661-acre URA surrounding Redmond. The URA became effective December 12, 2005.

- Creating an urban reserve area achieves four objectives:
- Designates lands outside Redmond's UGB to be reserved for eventual inclusion in the UGB;
- Protects lands outside the UGB from patterns of development that would impede urbanization;
- Provides Redmond with the greatest protection of its fringe area by designating up to a 30-year supply of land as urban reserve; and
- Enables the City to plan for cost-effective public facilities and services when these lands are finally incorporated into the UGB.

Both the City and County have proposed amendments to their TSPs to incorporate additional roadways to serve the urban reserve areas. Refinements to the Redmond TSP, namely the US 97 Redmond Refinement Plan, have been developed to account for and serve the URA. Land for the 2,299-acre UGB expansion adopted in August 2006 was drawn from the Redmond URA. New roadways and their functional classifications were proposed as part of the UGB amendment, and these are shown in Appendix A. Specific transportation improvements to serve portions of the UGB expansion area are being developed as part of the Northwest Area Plan (NAP) and Highway Area Plan (HAP).

Area Traffic Studies

Previously completed traffic studies in the project area were obtained from ODOT to review findings and utilize any current traffic count data. Traffic studies obtained include:

- "Highland Extension Project", ODOT (1998);
- "Redmond, Highland Avenue Project", ODOT (2000);

- "Highland – Glacier Couplet Project", ODOT (2003);
- "Redmond US 97 Reroute Project", ODOT (2001);
- "Yew Avenue to Deschutes Market Road", ODOT (2002); and
- "Analysis of South Canal Boulevard as a Local North/South Arterial", ODOT (2000).

The "Highland – Glacier Couplet Project" was an update to the "Redmond, Highland Avenue" and "Highland Extension" projects. These projects were focused on addressing safety and congestion on Highland Avenue between West 15th and West 5th Streets, especially at the intersections with West 6th and West 5th Streets (US 97 Couplet), which experience high congestion due to insufficient capacity and queue storage. The recommended alternative included the creation of two couplets. The first couplet would be on Highland and Glacier Avenues, running eastbound and westbound, respectively, extending from the proposed truck route (now the US 97 Reroute) at the east terminus and 14th and 15th Streets at the west terminus. The second couplet would be located at 11th and 9th Streets, southbound and northbound, respectively, running from Highland to Glacier Avenues.

The "US 97 Reroute Project" grew out of the concept for a truck route around downtown and was initiated to address the high traffic volumes and through truck traffic on US 97 through downtown Redmond, as well as congestion experienced at the Highland Avenue intersections with West 6th and West 5th Streets (US 97 Couplet) resulting from insufficient capacity and queue storage. The resulting alternative recommended from this project included a four-lane alternate alignment of US 97 located about four blocks to the east of the current US 97 alignment with connections to the existing highway at the City UGB or Quince Avenue to the north and just south of the proposed Highland/Glacier couplet and South Canal Boulevard on the south.

The "Yew Avenue to Deschutes Market Road" project was originated to determine the needs and evaluate both long-term and short-term solutions for the area from the Yew Avenue interchange to the Deschutes Market Road interchange. The preferred short-term build alternative included installing traffic signals at several intersections including the northbound and southbound Yew Avenue interchange ramp terminals, as well as improvements to the signalized intersections on US 97 at Sisters Avenue and Odem Medo Road. The preferred long-term build alternative included a rebuild of the Yew Avenue interchange with a five-lane cross-section on Yew Avenue under US 97 and traffic signal installations at the Yew Avenue interchange ramp terminals and the intersection on Airport Way at 21st Street. It also included an extension of 19th Street south to a proposed interchange at the US 97/Quarry Avenue intersection and then approximately another four miles to the south to the existing US 97/Deschutes Market Road interchange.

The "Analysis of South Canal Boulevard as a Local North/South Arterial" was initiated in response to a need for a roadway system that would allow local north-south traffic south of Highland Avenue to stay on the local street system instead of using US 97. This study examined three options to utilize the section of South Canal Boulevard between Veteran's Way and Highland Avenue as a local arterial. All options were analyzed assuming the US 97 Alternate Route (aka Reroute) had been built. No options examined fully met the goals of the project and no preferred build alternative was recommended.

Deschutes County Code

These regulations have been adopted for the purpose of promoting the health, safety, peace, comfort, convenience, economic well-being, and general welfare and to carry out the Deschutes County Comprehensive Plan and Statewide Planning Goals. They contain zoning and subdivision ordinances intended to promote an orderly use of land within the county to avoid detrimental effects to other land

uses and County facilities. Any uses of land within the county proposed as part of the US 97 Redmond Refinement Plan must be in compliance with these ordinances.

The zoning ordinances establish zoning districts and regulations governing the development and use of land within portions of the county.

The County Code also includes ordinances governing the subdivision and partition of lands within the county. These include regulations pertaining to the location and design of future streets, procedures for street dedications, and requirements for subdividing and partitioning lots.

Deschutes County Comprehensive Plan

The Comprehensive Plan for Deschutes County acts as a guide for future growth and development through the formation of goals and policies that respond to current and future needs over a 20-year planning period. Goals and policies pertaining to land use are implemented through zoning ordinances that are used to define various land use designations and create zone maps for the county identifying where these land use designations will be applied. The zoning of lands in Deschutes County surrounding the project area will be described in the discussion of the county's zoning and subdivision ordinances found in the "Regulations" section of the memorandum.

The Transportation chapter focuses on developing a transportation system that meets the needs of Deschutes County residents, while also considering regional and state needs at the same time. The plan addresses a balanced transportation system that includes automobile, bicycle, rail, transit, air, pedestrian and pipelines and reflects existing land use plans, policies and regulations that affect the transportation system. The Deschutes County Transportation System Plan implements these goals and policies and provides a Transportation Project List to address deficiencies. Management policies for State Highways are also developed in the Transportation Chapter and carried forward through the Transportation System Plan.

Deschutes County Transportation System Plan

The Deschutes County Transportation System Plan (TSP) addresses both short and long-term transportation needs. In the short-term, the study identifies and provides recommended solutions to immediate safety and congestion problems. For the future, the study looks at the next 20 years in Deschutes County, and identifies through goals and policies, how best to efficiently move people and goods throughout the County. Long-term projects are identified and prioritized. Planning for the transportation needs within the Bend, Redmond and Sisters urban growth boundaries is covered by those cities' respective transportation system plans, which are adopted by the County inside those areas. Long-term projects planned in the County's Transportation Project List that were identified within the study area are listed below.

- 27th Street: New Arterial between Hemlock Avenue and Maple Avenue;
- Maple Avenue: New Collector between 27th Street and Helmholtz Way; and
- US 97 at Quarry Avenue: grade separation (includes State funding).

With respect to management of state highways, Deschutes County supports an ODOT policy to develop highways through a "four-phased" approach, taking place incrementally as traffic volumes increase and levels of service decrease. Beginning with a standard two-lane highway, the improvement phases are as follows:

- Addition of passing or climbing lanes;

- Widening to a four-lane section;
- Adding grade-separated interchanges and raised medians; and
- Develop full grade-separated interchanges and frontage roads.

In general, traffic signals are not deemed appropriate on state highways outside of UGB's. Rather, as intersections develop safety or operational problems, they shall be grade-separated, restricted, or closed (where alternate access is available).

Deschutes County Intelligent Transportation System (ITS) Plan

ODOT, the City of Bend, the City of Redmond, Deschutes County, the Bend Metropolitan Planning Organization, Deschutes County 9-1-1, and the Federal Highway Administration (FHWA) collaborated in developing the Deschutes County Intelligent Transportation System (ITS) Plan. The 20-year deployment plan of ITS projects employs advanced technologies and management techniques in order to improve the safety and efficiency of the transportation system. This plan is coordinated with plans put developed in other regions statewide so that the ITS measures are integrated and compatible.

ITS projects planned in the Redmond vicinity over the 20-year planning horizon include video monitoring cameras on US 97 between Redmond and Bend as well as the following projects planned throughout the Redmond area.

- Video monitoring cameras
- Electronic message signs
- Count stations
- Advanced signal timing improvements
- Advanced rail warning systems
- A weather station

Oregon Transportation Plan (April 1997)

The Oregon Transportation Plan guides the State's transportation facility and mode plans by setting the general direction for transportation development statewide for the next twenty years and providing overall direction for allocation of resources and coordination of modes of transportation. It provides policies to increase livability in the State of Oregon by emphasizing alternative forms of transportation to the single occupant vehicle. The plan seeks to develop public transit, rail lines, bicycling and pedestrian facilities, airports and pipelines, while also emphasizing the maintenance and improvement of highways, roads and bridges. Thus, the plan calls for a transportation system that has a modal balance, is both efficient and accessible, provides connectivity among rural and urban places and between modes, and is environmentally and financially stable.

The OTP is currently in the process of being updated to address all modes and state and local transportation systems over the next 20 years. Update work elements and products include:

• Trend analysis;

• Policy refinement;

• Inventory of system condition & needs;

• Financial forecast;

• Identification of system priorities;

• Identification of investment strategies;

• Public outreach program; and

• Plan implementation strategies.

The update of OTP implementation is focused on mitigating congestion, strengthening transportation's role in economic development, serving the needs of an aging population, reducing traffic fatalities and serious injuries, increasing technology's role in improving safety and efficiency, protecting and sustaining resources, prioritizing investments and making the most strategic use of limited funding. The draft updated 2006 OTP is now undergoing final review.

1999 Oregon Highway Plan

The *1999 Oregon Highway Plan* (OHP) defines policies and investment strategies for Oregon's state highway system for the next 20 years by further refining the goals and policies of the *Oregon Transportation Plan* (OTP). One of the key goals of the OHP is to maintain and improve safe and efficient movement of people and goods, while supporting statewide, regional, and local economic growth and community livability. The implementation of this goal occurs through a number of policies and actions that guide management and investment decisions by defining a classification system for state highways, setting standards for mobility, employing access management techniques, supporting intermodal connections, encouraging public and private partnerships, addressing the relationship between the highway and land development patterns, and recognizing the responsibility to maintain and enhance environmental and scenic resources.

ODOT's management objectives for US 97 through this area vary, as the highway passes through both rural and urban areas, experiences several posted speed changes, and maintains an expressway designation at the northern and southern limits. The management objectives for various segments of US 97 through this area, as adopted in the OHP, are described below.

Statewide Highways (NHS): Rural Expressways
(MP 118.52 – MP 119.02 & MP 124.37 – MP 132.16)

- Provide for safe and efficient high-speed and high-volume traffic movements with the primary objective of connecting larger urban areas, ports, and major recreation areas with minimal interruptions;
- Discourage private access by eliminating approaches as opportunities occur or alternate access becomes available, purchasing access rights, and developing local road networks;
- Control public road connections to provide appropriate spacing and grade separated crossings where needed;
- Discourage traffic signals;
- Prohibit parking; and
- Construct non-traversable medians through modernization projects.

Statewide Highways (NHS): Urban Expressways
(MP 123.60 – MP 124.37)

- Provide for safe and efficient high-speed and high-volume traffic movements with the primary objective of connecting larger urban areas, ports, and major recreation areas with minimal interruptions;
- Discourage private access by eliminating approaches as opportunities occur or alternate access becomes available, purchasing access rights, and developing local road networks;

- Control public road connections to provide appropriate spacing and grade separated crossings where needed;
- Discourage traffic signals. Where traffic signals area allowed, their impact on through traffic must be minimized by ensuring that efficient progression of traffic is achieved;
- Prohibit parking; and
- Consider median treatments in accordance with criteria in Action 3B.3 of the *1999 Oregon Highway Plan*.

Statewide Highways (NHS): Urban Other
(MP 119.02 – MP 123.60)

- Provide high to moderate speed operations with limited interruptions in traffic flow;
- Direct access to abutting properties is a minor objective;
- Purchase access rights as opportunities arise, with a preference for purchasing rights in full; and
- Provide connections to larger urban areas, ports, and major recreation areas not served by freeways or expressways.

The new US 97 alignment created by the Reroute is intended to be access controlled and could become an extension of the expressway that currently terminates at the northern Redmond urban growth boundary. If this highway segment is designated in the future as an expressway, the management objectives for Urban Expressways described above would apply.

US 97 has also been designated as a Freight Route by ODOT, which emphasizes efficient operation to ensure the timely and dependable movement of goods. ODOT has developed special management objectives for freight routes, including the following objectives:

- Application of higher highway mobility standards than other Statewide Highways;
- Examination of options to treat designated freight routes as expressways where the routes are outside of UGBs and unincorporated communities and continue to treat freight routes as expressways within UGBs where existing facilities are limited access or where corridor or transportation system plans indicate limited access; and
- Consider the importance of timeliness in freight movements in developing and implementing plans and projects.

A new interchange in northern Redmond is currently being planned along with an Interchange Area Management Plan (IAMP) for land in the vicinity of the interchange. Policy 3C in the OHP provides specific direction for management of access in interchange areas including the following.

- Action 3C.2: To improve an existing interchange or construct a new interchange:
  - Necessary supporting improvements, such as road networks, channelization, medians and access control in the interchange management area must be identified in the local comprehensive plan and committed with an identified funding source, or must be in place;
  - Access to cross streets shall be consistent with established standards for a distance on either side of the ramp connections so as to reduce conflicts and manage ramp operations. The Interchange Access Management Spacing Standards supersede the Access Management Classification and Spacing Standards (Policy 3A), unless the latter distance standards are greater (see "Performance & Design Standards" section of this memorandum);
  - The design of urban interchanges must consider the need for transit and park-and-ride facilities, along with the interchange's effect on pedestrian and bicycle traffic;

- When possible, access control shall be purchased on crossroads for a minimum distance of 1320 feet (400 meters) from a ramp intersection or the end of a free flow ramp terminal merge lane taper; and
- Interchanges on Statewide, Regional or District Highways may connect to state highways, major or minor arterials, other county or city roads, or private roads, as appropriate.

- Action 3C.3: Establish criteria for when deviations to the interchange access management spacing standards may be considered.
- Action 3C.6: Plan for and operate traffic controls within the Interchange Access Management Area with a priority of moving traffic off the main highway, freeway or Expressway and away from the interchange area. Within the Interchange Access Management Area, priority shall be given to operating signals for the safe and efficient operation of the interchange.
- Action 3C.7: Use grade-separated crossings without connecting ramps to provide crossing corridors that relieve traffic crossing demands through interchanges.

Oregon Highway Design Manual (2003)

This manual contains standards for the design of state highways and various highway elements. While detailed design drawings will not be created as part of this study, elements such as the general alignments, roadway widths, and criteria for installation of turn lanes will be considered for evaluating the feasibility of construction and determination of right of way needs for the alternatives developed.

Railroad Regulations

The US 97 Reroute through Redmond is proposed to be located east of the existing US 97 alignment and nearly adjacent to the west side of the Burlington Northern Santa Fe (BNSF Railway) freight rail line that parallels the highway. Should the alignment of the reroute or any supporting local street improvements create or modify railroad crossings (at, above, or below grade), the affected road authority must apply for authority to alter the crossing from the ODOT Rail Division. ODOT, through its Rail Division, has exclusive jurisdiction over all public railroad-highway crossings in the state. The following are key requirements and considerations that may affect proposed improvement alternatives:

- Per ORS 824.202, authority to control and regulate the construction, alteration and protection of public railroad-highway crossings is vested exclusively in the state, and in ODOT.
- ODOT's Rail Division works cooperatively with all road authorities (including ODOT) and all railroads to address crossing safety matters in conformance with federal and state laws, rules and regulations.
- A crossing Order is required for the construction of a new public railroad-highway crossing (at-grade or grade-separated), or the alteration of an existing public crossing. Alterations are defined in OAR 741-100-0020(1) and include any change to the roadway or railroad tracks at a crossing that materially affects use of the crossing by railroad equipment, vehicles, or pedestrians. Changes in the roadway configuration roadway widening or construction of sidewalks within 500 feet of a crossing, installing or removing protective devices at a crossing, changing the direction of traffic flow, or closing a crossing (removal of track or roadway) may be alterations. Information on obtaining an Order is available from the ODOT Rail Division (http://www.oregon.gov/ODOT/RAIL/).
- An application for a crossing Order involves an administrative process that typically takes6 to 8 months from design completion to the authorization of construction. If the application for an Order is contested a formal hearing may be required to resolve the contested application. The Order resulting from the hearing may be appealed under state law. Contested cases may take 12 to 18 months or longer.
- Prior to seeking a crossing Order, the Department highly recommends the parties involved work together during project development/preliminary design. Experience has shown that dialogue between the railroad,

road authority and Rail Division can significantly reduce formal application processing time. The Rail Division encourages crossing Order applicants to submit a draft application for review and comment.

US 97 Corridor Strategy (Madras – California Border), 1995

This document is the outcome of the initial strategy development phase of corridor planning, intended to set the stage for more detailed analysis of modal trade offs and improvement priorities. The Corridor Strategy evaluates long-term transportation requirements, multimodal issues and recommends general improvement objectives to address corridor-wide requirements. The strategy developed is then used in the second phase of corridor planning, which specifically addresses the objectives set forth in the Corridor Strategy by identifying and prioritizing specific transportation improvements.

The strategy development process for the US 97 Corridor included surveys and interviews with stakeholders, several public meetings and workshops where corridor issues, concerns and opportunities were discussed. Based on the input received from these meetings and relevant technical information on transportation trends, congestion, travel time and safety, the overall goal for the US 97 Corridor was:

> *"To promote commerce by efficiently distributing good and services, while enhancing travel safety, maintaining environmental integrity and preserving regional quality of life."*

In addition, the following six underlying corridor strategy themes were identified during the strategy development process:

- Enhancing Safety;
- Facilities Management and Improvement;
- Intermodal Connections;
- Interpretive Opportunities and Preservation of Environmental Quality;
- Economic Development; and
- Partnering.

TSPs adopted by the City of Redmond and Deschutes County in addition to recent facility plans – the US 97 Redmond Refinement Plan and North Redmond US 97 IAMP – have essentially overridden the need to further develop a corridor plan for US 97 in the Redmond vicinity.

US 97 Redmond Refinement Plan

Within the City of Redmond, a reroute of US 97 is in the last phases of design, with construction anticipated to begin in 2007. Its location will be east of the current alignment, paralleling the Burlington Northern Santa Fe (BNSF) railroad, and will extend from approximately OR 126 to the northern UGB. The original intent of this reroute was to remove large trucks from the downtown area. However, the project has since been expanded to remove all through traffic on US 97 from the downtown as well.

The purpose of the US 97 Redmond Refinement Plan was to evaluate alternative improvements to US 97 to meet adopted operational standards through the year 2025, considering anticipated growth in the city of Redmond, as well as through-traffic growth on the highway. While the main focus of the study was within the US 97 corridor from OR 126 to the south, future deficiencies and improvement alternatives where considered for the north end of the corridor as well, extending as far as the intersection with O'Neil Highway. The plan is currently still under development and improvement alternatives have been evaluated, but a preferred alternative has not been recommended.

To address the forecasted deficiencies in the US 97 corridor through the City of Redmond, several improvement alternatives have been considered, including:

- Alternative 1: No Build;
- Alternative 2: Upgrade the existing alignment of US 97 from Veteran's Way to Yew Avenue;
- Alternative 3A: Extension of US 97 Reroute from OR 126 to Yew Avenue;
- Alternative 3B: Extension of US 97 Reroute from OR 126 to Quarry Avenue; and
- Alternative 4: US 97 Bypass of Redmond.

In addition, Alternatives 3A, 3B, and 4 included options that modified access to the Reroute and Bypass, including a potential interchange on the Alternative 3B alignment between the Yew Avenue interchange and the airport and the option to relocate the OR 126 interchange (included in all alternatives other than Alternative 2) to Antler Avenue.

The impacts to traffic volumes throughout the city varied significantly between improvement alternatives.

- Alternative 2: This alternative had virtually no impact on traffic volumes compared to the No Build alternative north of OR 126.
- Alternative 3A: Between the North Redmond interchange and the downtown area, traffic volumes on the existing US 97 alignment increase by approximately 200 vehicles during the peak hour. Conversely, traffic volumes on the US 97 Reroute decrease by approximately 350 vehicles during the peak hour. However, north of the North Redmond interchange traffic volumes remain relatively unchanged.
- Alternative 3B: The impacts of Alternative 3B are nearly identical to those associated with Alternative 3A, with approximately 50 more vehicles on the existing US 97 alignment during the peak hour and approximately 50 fewer vehicles on the US 97 Reroute.
- Alternative 4: Under this alternative, 250 vehicles during the peak hour are removed from the existing US 97 alignment and 700 vehicles are removed from the US 97 Reroute south of the North Redmond interchange. In the segment of US 97 between the North Redmond interchange and the northern bypass terminus, traffic volumes drop by approximately 950 vehicles during the peak hour.
- If the interchange on OR 126 included in Alternatives 3A, 3B, and 4 is relocated to Antler Avenue, more traffic will remain on the existing US 97 alignment rather than diverting to the US 97 Reroute. Compared to the No Build alternative, 550 vehicles will be added to the existing US 97 alignment south of the North Redmond interchange during the peak hour and 650 fewer vehicles will use the US 97 Reroute.

North Redmond US 97 Interchange Area Management Plan (Draft)

The North Redmond US 97 Interchange Area Management Plan (North Redmond IAMP) is intended to protect the function of the proposed North Redmond interchange being constructed as part of the US 97 Reroute and ensure safe and efficient operations are provided through the 20-year planning horizon. The IAMP area within which improvements were identified is bounded by O'Neil Highway (OR 370)/NW Pershall Road to the north, NE 17th Street/NE Negus Way to the east, NW Kingwood Avenue to the south, and NW 22nd Street to the west.

To address the future deficiencies identified in the Refinement Plan and the IAMP analysis, and ensure safe and efficient traffic operations in the interchange area, projects such as installing traffic signals, building local streets, and changing access spacing are proposed in the IAMP. Cost estimates for projects were developed and the projects were prioritized into short, medium, or long-range improvements. Recommendations for projects are summarized below. A map illustrating proposed

projects within the IAMP area is provided in Figure 5.6 of the IAMP. Illustrations of local connectivity and access management plans are provided in Figures 5.4 and 5.5 of the IAMP.

Short-range Improvements (implemented at time of construction of interchange)

- Short-range actions from access management plan.

Medium-range Improvements (implemented 5 to 10 years after the construction of the interchange)

- Construct "High-Priority" public streets according to adopted Local Connectivity Plan
- Restrict turning movements at the US 97/O'Neil Highway intersection to allow right-in and right-out movements only.
- Medium-range actions from access management plan.

Long-range Improvements (implemented within 20 years after the construction of the interchange)

- Construct remainder of public streets according to adopted Local Connectivity Plan
- Construct grade-separated crossing over US 97 at O'Neil Highway
- Long-range actions from access management plan.

Statewide Transportation Improvement Program (ODOT)

The Statewide Transportation Improvement Program (STIP) is Oregon's four-year transportation capital improvement program. It is the document that identifies the funding for, and scheduling of, transportation projects and programs. It includes projects on the federal, state, city, and county transportation systems, multimodal projects (highway, passenger rail, freight, public transit, bicycle and pedestrian), and projects in the National Parks, National Forests, and Indian tribal lands. Oregon's STIP covers a four-year construction period, but is updated every two years in accordance with federal requirements. The currently approved program is the *2004-2007 STIP*. The *Draft 2006-2009 STIP* is currently under development, and is available for public viewing and comment.

The *2004-2007 and Draft 2006-2009 STIP's* were reviewed for projects that should be considered during the US 97 Redmond Refinement Plan study for complimentary or conflicting traffic impacts. The identified projects include:

- OR 126: Glacier – Highland Couplet, mile points 110.90 to 111.94, construct two one-way couplets, widening Highway 126, add center turn lane, improve pedestrian access, Phases 1 & 2;
- OR 126: Mile point 97 – Rimrock Way, mile points 97.0 to 111.0, pavement preservation, installation of flashing beacon at OR 126 & Helmholtz, upgrade sidewalks;
- US 97: Crooked River Bridge – Spruce Place, mile points 113.14 to 119.90, pavement preservation;
- US 97: Reroute, realign and improve connection for OR 126 at US 97, construction new alignment of US 97, Phase 1, Units 1A and 1B;
- US 97: Reroute, realign and improve connection of OR 126 at US 97, construct new US 97 alignment, Phase 1, Unit 2;
- US 97: Crooked River Bridge – Redmond Reroute, mile points 113.14 to 118.77, pavement preservation, access management, shoulder widening, safety upgrades;

- US 97: NW 10th – Wimp Way, mile points 113.14 to 119.90, operations (close accesses, reroute traffic, upgrade guardrail); and
- Dry Canyon Trail: SW Highland Avenue – SW Quartz Avenue, construct shared-used path and add stairways for access.

1995 Oregon Bicycle and Pedestrian Plan

The provision of safe and accessible bicycling and walking facilities in an effort to encourage increased levels of bicycling and walking is the goal of the Oregon Bicycle and Pedestrian Plan. The Plan provides actions that will assist local jurisdictions in understanding the principals and policies that ODOT follows in providing bike and walkways along state highways. In order to reach the plan's objectives, the strategies for system design are outlined, including:

- Providing bikeway and walkway systems that are integrated with other transportation systems;
- Providing a safe and accessible biking and walking environment; and
- Development of education programs that improve bicycle and pedestrian safety.

The document includes two sections, including the *Policy & Action Plan* and *Bikeway & Walkway Planning Design, Maintenance & Safety*. The first section contains background information, legal mandates and current conditions, goals, actions, and implementation strategies ODOT proposes to improve bicycle and pedestrian transportation. The second section assists ODOT, cities and counties in designing, constructing and maintaining pedestrian and bicycle facilities. Design standards are recommended and information on safety is provided.

2001 Oregon Rail Plan

This plan serves as a combination of the State's rail planning, freight rail and passenger rail systems and contains three elements:

- Summary of the state's goals and objectives related to passenger and freight rail;
- Quantification and measurement of the state's performance to-date; and
- Identification of projected costs, revenues and investment needs for rail transportation of people and goods.

The plan also establishes a system of integration between freight and passenger elements (there currently is no passenger rail service to Redmond) into the land use and transportation planning processes and calls for cooperation between state, regional and local jurisdictions in completing the plan.

2000 Oregon Aviation Plan

The Oregon Aviation Plan establishes expands on the goals and policies of the OTP as they relate to aviation planning and establishes five categories of airports in the state based on their functional roles. The Plan provides both forecasts and inventories for the public access airports in the state. Key issues in state aviation include:

- Local government ownership of most airports;
- Federal government ownership of most of the navigational system; and
- FFA control of funding levels and prioritization of expenditures.

Roberts Field in Redmond is classified as a Category 1 – Commercial Service Airport, whose function is to accommodate scheduled major/national or regional/commuter commercial air carrier service. Future roadway improvements should reflect the need to provide for adequate intermodal access for passengers and freight.

Bureau of Land Management (BLM) Upper Deschutes Resource Management Plan

The Upper Deschutes Resource Management Plan guides the use, protection, and enhancement of resources on BLM land, including land in the Redmond vicinity. After undergoing the federal review and Environmental Impact Statement process, Alternative 7 emerged as the Preferred Alternative, and it addresses wildlife habitat in parts of the Redmond Urban Reserve Area. The alternative's objectives relating to transportation are provided below.

Objective 1: Provide new or modified rights-of-way for transportation/utility corridors and communication/energy sites to meet expected demands and minimize environmental impacts.

Objective 2: Provide an integrated, functional, safe, efficient, transportation system to:

- *Support approved land uses that cannot be met on private, state, or county lands;*
- *Provide links between local communities;*
- *Reduce or minimize conflicts with adjacent landowners;*
- *Support approved common guidelines of joint jurisdictions; and*
- *Balance public access needs with resource protection.*

Objective 3: During the design and application process for proposed new or expanded rights-of-way, incorporate mitigating measures in the plan of development for land restoration, habitat improvement, recreation opportunities, and visual resources.

Objective 4: Identify and develop a long-term transportation system for military training use that meets specific training objectives, maximizes benefits to other users, including recreation use of public lands, and minimizes impact to natural resources.

Objective 5: Consolidate transportation and utility systems with consideration for ecological and recreational values, while providing for regional transportation systems and meeting regional objectives.

Objective 6: Provide motorized access to facilitate reasonable entry and operations for administrative purposes.

In order to address Objective 5, recommending the consolidation of transportation and utility systems, two transportation corridors were proposed in US 97 Redmond Refinement Plan study area. These corridors are described below and illustrated in Figure 1.8 of the Refinement Plan.

- *Designate a transportation corridor, approximately ½-mile wide and extending from approximately the end of 19th Street in Redmond to*

Deschutes Market Road. This includes a corridor connection to Quarry Avenue that would allow for a future Federal Highway interchange.

- *Designate a corridor between the existing Antler Avenue north of OR 126 and connecting with the existing OR 126 outside of the Redmond Airport runway protection zone for future realignment of OR 126.*

Performance & Design Standards

Within the study area, there are roadways under the jurisdiction of ODOT, the City of Redmond, and Deschutes County, with each jurisdiction maintaining its own standards for facility performance and design. This section describes the standards adopted by each jurisdiction and identifies which study area roadways they will be applied to.

Oregon Department of Transportation (ODOT)

Highway Classifications

US 97 (The Dalles – California Highway), OR 126 (McKenzie River Highway and Ochoco Highway), and OR 370 (O'Neil Highway), are all owned an operated by ODOT, which has established management objectives and operational standards for each of these facilities based on the assigned classifications and segment designations described below.

US 97 (*The Dalles – California Highway*)

Within the study area, US 97 is classified as a Statewide Highway on the National Highway System and is a designated Freight Route. In addition, the segments of US 97 north of the Redmond UGB and south of the Yew Avenue interchange (milepoints 118.52 to 119.02 and from 123.60 to 132.16) have been designated as expressways.

OR 126 *(McKenzie River Highway & Ochoco Highway*)

This highway is also classified as a Statewide Highway on the National Highway System and is a designated Freight Route. In addition, the segments of OR 126 west and east of the Redmond UGB (west of milepoint 110.65 on Hwy 15 and east of milepost 1.37 on Hwy 41) have been designated as expressways.

OR 370 (*O'Neil Highway*)

The O'Neil Highway is classified as a District Highway.

It should be noted that operational standards for any given classification or special designation will change as a highway crosses over urban growth boundaries and passes through different speed zones, as shown below.

Mobility Standards

ODOT has adopted standards for mobility for state facilities through the *1999 Oregon Highway Plan* (OHP) and the *Highway Design Manual*[4]. The OHP mobility standards are intended to be used for identifying needs, while the *Highway Design Manual* standards represent the level of operation for which state facilities are to be designed. For this study, the OHP standards will be applied to existing and future no-build analysis, while the future build alternatives will be compared to the standards in the *Highway Design Manual*.

Table 6 in Policy 1F of the OHP displays the maximum allowable volume to capacity ratios for the 30th highest annual hour of traffic in areas outside of the Portland Metropolitan Area. Sections from that table relevant to the study area are presented below in Table 2.1.

Table 2-1: Maximum Volume to Capacity Ratios from the 1999 Oregon Highway Plan

Highway Category	Land Use Type/Speed Limits		
	Inside Urban Growth Boundary		Outside Urban Growth Boundary
	Non-MPO outside of STAs where non-freeway speed limit <45 mph	Non-MPO where non-freeway speed limit >= 45 mph	Rural Lands
Interstate Highways and Statewide (NHS) Expressways	0.70	0.70	0.70
Statewide (NHS) Freight Routes	0.75	0.70	0.70
Statewide (NHS) Non-Freight Routes and Regional or District Expressways	0.80	0.75	0.70
District/Local Interest Roads	0.85	0.80	0.75

At signalized intersections, these standards are to be applied to the intersection as a whole. At unsignalized intersections, these standards are applicable only to movements that are not required to stop. For other movements at unsignalized intersections that are required to stop or otherwise yield the right of way, the standards for District/Local Interest Roads shall be applied for areas within urban growth boundaries and a maximum volume to capacity ratio of 0.80 shall be applied for areas outside of urban growth boundaries. However, when an intersection acts as an interchange ramp terminal, the applicable volume to capacity ratio will be the smaller of the values of the volume to capacity ratio for the crossroad or 0.85.

Table 10-1 in the *Highway Design Manual* displays the maximum allowable volume to capacity ratios for the 30th highest annual hour of traffic for use in the design of highway projects. These standards are to be applied to conditions forecasted to exist 20 years after completion of the proposed improvement. If

[4] Highway Design Manual, Oregon Department of Transportation, 2003, p. 10-38.

the applicable mobility standard can not be met, a design exception should be sought. Sections from that table relevant to the study area are presented below in Table 2.2.

Table 2-2: Maximum Volume to Capacity Ratios from the 2003 Highway Design Manual

Highway Category	Land Use Type/Speed Limits		
	Inside Urban Growth Boundary		Outside Urban Growth Boundary
	Non-MPO outside of STAs where non-freeway speed limit <45 mph	Non-MPO where non-freeway speed limit >= 45 mph	Rural Lands
Interstate Highways and Statewide (NHS) Expressways	0.70	0.65	0.60
Statewide (NHS) Freight Routes	0.70	0.70	0.60
Statewide (NHS) Non-Freight Routes and Regional or District Expressways	0.75	0.70	0.60
District/Local Interest Roads	0.80	0.75	0.75

Access Management Spacing Standards

Policy 3A of the *1999 Oregon Highway Plan* establishes access management objectives for state facilities based on assigned classifications and sets standards for spacing of approaches. As previously discussed, these standards have also been adopted as part of OAR 734-051, which provides the regulatory basis for implementation. Tables 2.3 and 2.4 below show the applicable access management spacing standards for state facilities in the study area. US 97 within the UGB is by default designated "Urban Other" for purposes of access spacing. It should be noted that these standards are applicable only to approaches on the same side of the roadway and that measurement of approach spacing is to be taken from center to center.

Table 2-3: Access Spacing Standards for Statewide Highways (measured in feet)

Posted Speed (mph)	Rural		Urban	
	Expressway (at-grade only)	**Other**	**Expressway** (at-grade only)	**Other**
≥ 55	5280	1320	2640	1320
50	5280	1100	2640	1100
40 & 45	5280	990	2640	990
30 & 35		770		770
≥ 25		550		550

Table 2-4: Access Spacing Standards for District Highways (measured in feet)

Posted Speed (mph)	Rural		Urban	
	Expressway (at-grade only)	**Other**	**Expressway** (at-grade only)	**Other**
≥ 55	5280	700	2640	700
50	5280	550	2640	550
40 & 45	5280	500	2640	500
30 & 35		400		400
≥ 25		400		400

ODOT also maintains spacing standards for interchanges and approaches within interchange areas that are based on the type of highway and size of crossroad. The proposed locations of any new interchanges or street connections within interchange areas shall be evaluated in accordance with the applicable standards.

Highway Design Standards

As noted in the "Background Documents" section of this memorandum, the *Oregon Highway Design Manual (2003),* contains standards for the design of state highways and various highway elements. The design criteria in this manual shall be used when proposing improvements to state facilities such as right and left turn lanes, median treatments, and new highway cross-sections and alignments.

Deschutes County

In the project area, Deschutes County owns and maintains non-state facilities located outside of the Redmond UGB. Most of these roads are classified as rural collectors, but South Canal Boulevard, Helmholtz Way, Northwest Way, and a segment of Maple Avenue are classified as rural arterials. According to the Deschutes County Transportation System Plan, the County has adopted a goal to maintain a level of service of "D" or better during the peak hour throughout the County arterial and collector road system over the next 20 years.

The County does not maintain adopted access management spacing standards for application to public transportation improvement projects, but does have general policies indicating that access points to arterials and collectors should be limited.

Deschutes County also maintains design standards for rural roads that shall be applied to any proposed County-owned facilities.

City of Redmond

All non-state roadways within the Redmond UGB are under the jurisdiction of the City of Redmond. The City has adopted standards for performance of City streets requiring operation of level of service E or better during the peak 15 minutes of the peak hour of the average weekday. A lesser standard is allowed at unsignalized intersections with low volume minor street approaches, requiring operation at a volume to capacity ratio less than 0.90 and a 95th percentile vehicle queue less than four vehicles during the peak hour.

The City has also adopted access spacing guidelines for various classes of streets, which are displayed in the following table taken from the City of Redmond Transportation System Plan.

Table 2-5: City of Redmond Access Management Guidelines

Functional Classification	Minimum Posted Speed	Minimum Spacing between Driveways and/or Streets	Minimum Spacing between Intersections
Arterial Streets			
Major Arterial - Downtown Grid System	15-25 mph	165 feet	330 feet
Major Arterial - Other Areas	35-50 mph	800 feet	½ mile
Minor Arterial	30-45 mph	330 feet	¼ mile
Collector Streets			
Major Collector	25-35 mph	165 feet	330 feet
Minor Collector	25-35 mph	80 feet	330 feet
Industrial Collector	25-35 mph	165 feet	330 feet
Local Streets			
Local Industrial	20-25 mph	access to each lot	330 feet
Local Residential	20-25 mph	access to each lot	330 feet

Note: The minimum spacing shown for each category is a desirable design spacing; existing spacing will vary.

The City of Redmond Public Works Department maintains street design standards that shall be incorporated in the design or construction of any facilities intended to be owned by the City.

3. Existing Conditions

Overview

As part of the City of Redmond Transportation System Plan (TSP) Update, an analysis of existing conditions and deficiencies was performed. The analysis is based upon the transportation system inventory performed during the fall of 2006. Much of this data provides a benchmark of existing conditions to serve as a basis of comparison for future assessment of transportation performance in Redmond relative to existing and proposed policies.

Forty-one intersections within the study area were selected for focused analysis of operational performance and safety. The study intersections are identified in Figure 3-1.

The following sections describe the characteristics, level of utilization, and performance of the existing transportation system in the City of Redmond for motor vehicle, pedestrian, bicycle and transit use.

Pedestrians

To assess the adequacy of pedestrian facilities in Redmond, an inventory of sidewalks and off-street trails was conducted along arterial and collector streets. The location of existing activity centers such as parks, schools, and the city library were identified to determine possible pedestrian trip generators. Figure 3-2 shows existing pedestrian facilities provided in Redmond as well as the location of major activity centers.

The existing sidewalk inventory shows that sidewalks cover less than half of the total length of arterials and collectors in Redmond. Connectivity exists in the downtown area and some neighborhoods to provide for primary pedestrian generators such as schools and businesses. Veterans Way, Airport Way and both US 97 and OR 126 outside of the downtown couplets have limited or no sidewalks. While a number of businesses are located along the south portion of US 97, sidewalk locations are sparse and are only provided along the frontage of some businesses.

Pedestrian volumes at the study intersections during the PM peak hour are listed in Table 3-1. Most intersections serve approximately five or fewer pedestrians during the PM peak hour, with many serving no pedestrians. The study intersections with the highest level of pedestrian usage are along the Highland Avenue/Glacier Avenue and US 97 couplets where five intersections serve ten or more pedestrians during the PM peak hour.

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Figure 3-1
STUDY AREA

NOT TO SCALE

City of Redmond
Transportation System Plan

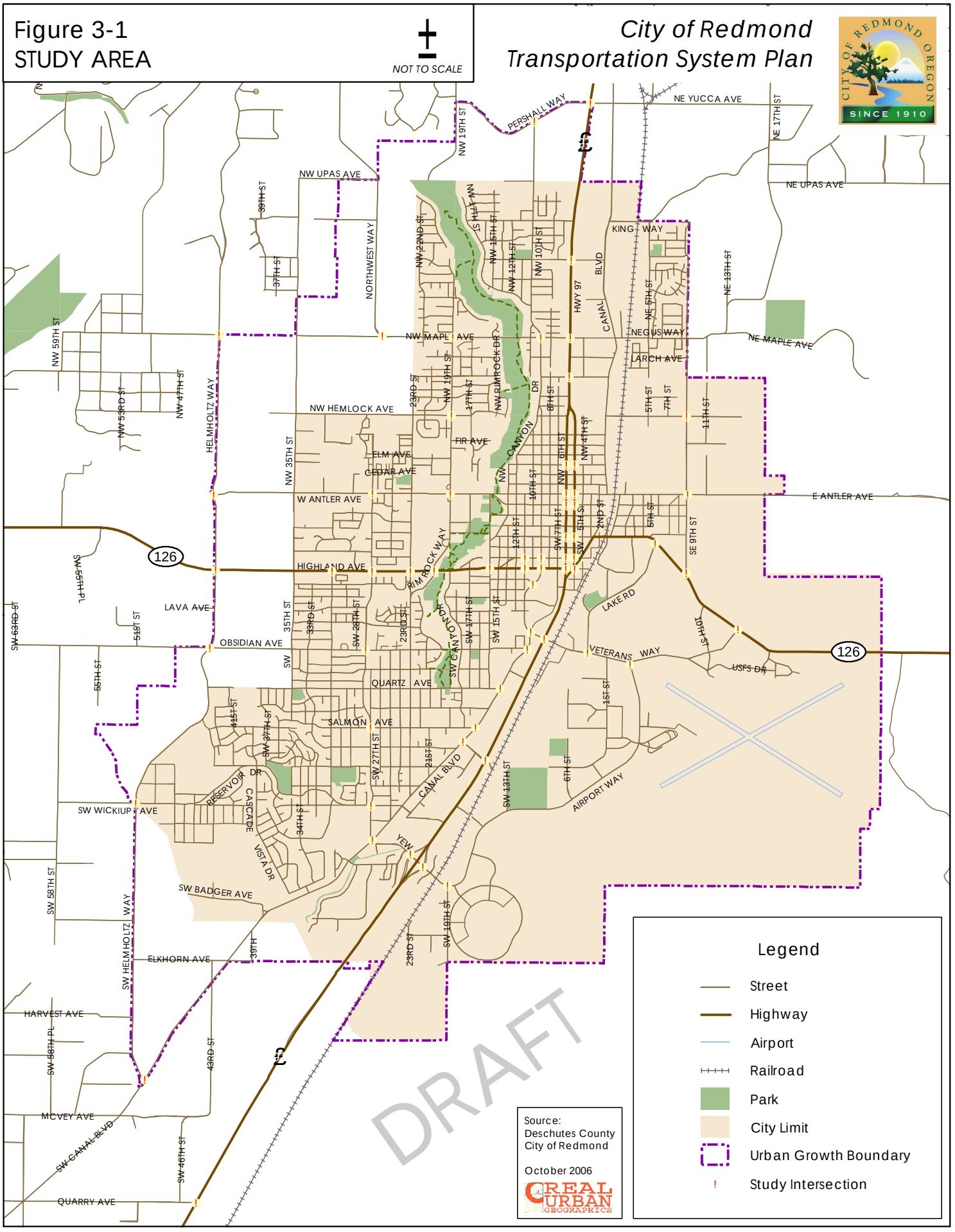

Table 3-1: Pedestrian Volumes at Study Intersections

Intersection	PM Peak Hour Pedestrian Use
10th St/Pershall Way	0
11th St/Glacier Dr	10
11th St/Highland Dr	17
19th St/Antler Ave	2
19th St/Hemlock Ave	2
19th St/Hwy 126	6
19th St/Maple Ave	6
27th St/Antler Ave	2
27th St/Hwy 126	1
27th St/Obsidian Ave	1
27th St/Salmon Ave	0
27th St/Wickiup Ave	0
9th Street/Fred Meyer Access	3
9th Street/Glacier Dr	2
9th St/Highland Dr	17
9th St/Antler Ave	0
9th St/Hemlock Ave	0
9th St/Maple Ave	3
Airport Rd/19th St	0
Airport Rd/Veterans Way	0
Hemholtz Way/Hwy 126	0
Hemholtz Way/Maple Ave	0
Hemholtz Way/S. Canal Blvd	0
Hemholtz Way/Wickiup Ave	0
Hwy 126/Veterans Way	0
O'Neil Hwy/US 97	0
US 97 Business(NB)/Antler Ave	6
US 97 Business (NB)/Dogwood Ave	2
US 97 Business (SB)/Antler Ave	6
US 97 Business (SB)/Dogwood Ave	2
US Business 97/Kingwood Ave	5
US Business 97/Maple Ave	1
Quarry Road/US 97	0
S. Canal Blvd/Obsidian Ave	3
S. Canal Blvd/Salmon Ave	7
US 97 (NB)/Yew Ave	1
US 97 (SB)/Yew Ave	2
US 97/ Veterans Way	2
Helmholtz Way/Antler Ave	0
Helmholtz Way/Obsidian Ave	0
31st St/Hwy 126	1
23rd St/Hwy 126	8
US 97 Business NB/Black Butte Ave	5
US 97 Business SB/Evergreen Ave	15
US 97 Business NB/Evergreen Ave	6

Intersection	PM Peak Hour Pedestrian Use
S Canal Blvd/Quartz Ave	2
S Canal Blvd/Odem Medo	8
Lake Rd/Veterans Way	3
15th St/Highland Ave	11

Pedestrian data is not available for the following study intersections: 27th St/S Canal Blvd, S Canal Blvd/Veterans Way, US 97/Odem Medo, Northwest Way/Maple Ave, US 97 Business/Quince Ave, US 97 Business (SB)/Black Butte Ave, US 97 Business SB/Glacier Ave, US 97 Business NB/Glacier Ave, US 97 Business SB/Highland Ave, US 97 Business NB/Highland Ave, Lake Rd/Hwy 126, SE 9th St/Hwy 126

Issues to be Addressed

Deficiencies in the existing pedestrian facility network include:

- Sidewalks throughout the City should be ADA compliant and meet ODOT grant requirements.
- Sidewalks exist only in limited areas along US 97 outside of the 5th Avenue/6th Avenue couplet
- Sidewalks do not exist west of Rimrock Way on OR 126
- There is a lack of safe pedestrian crossings on US 97

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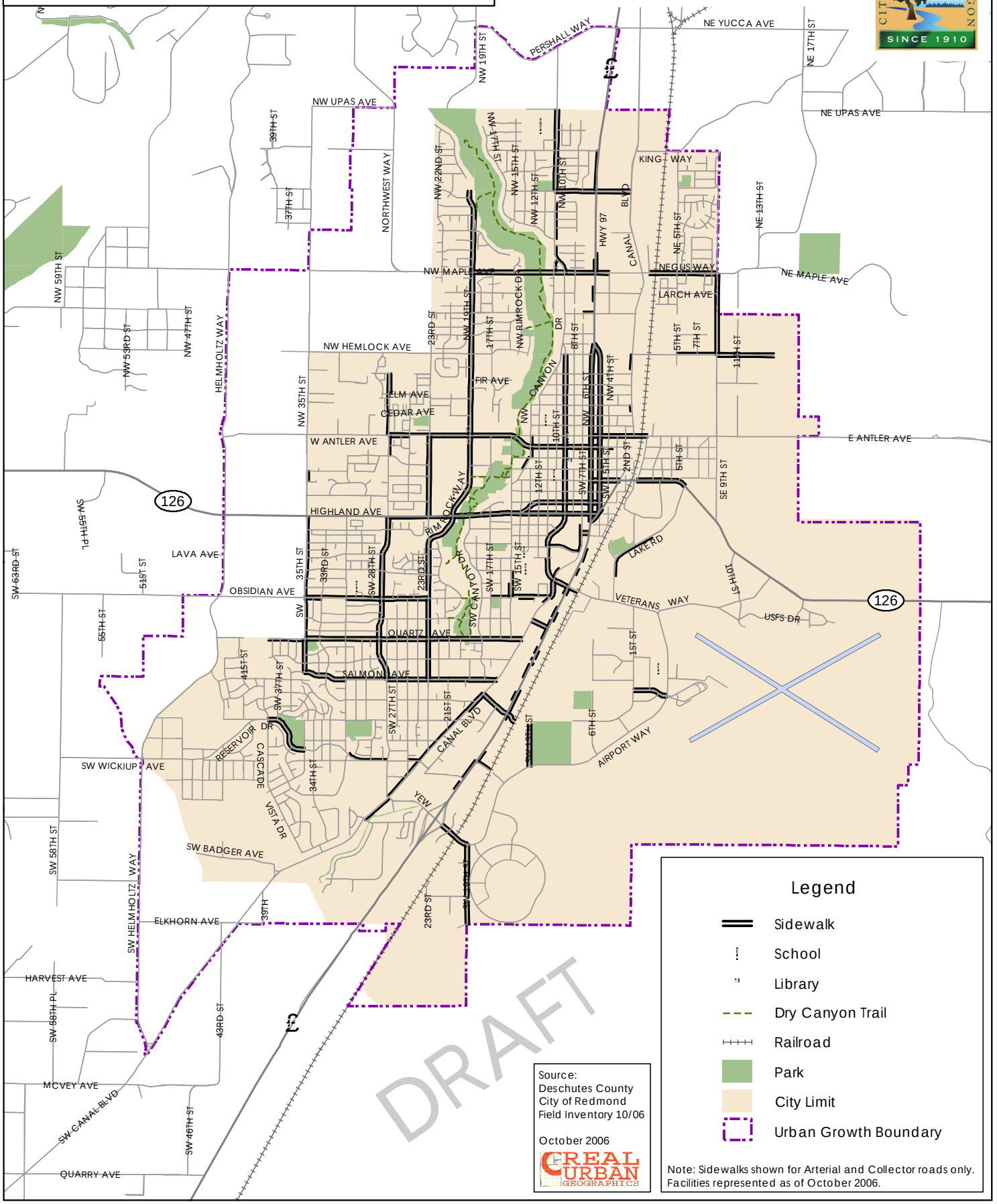
Figure 3-2
PEDESTRIAN FACILITIES

NOT TO SCALE

City of Redmond
Transportation System Plan



Bicycles

To assess the adequacy of bicycle facilities in Redmond, an inventory of designated bike lanes, shoulder bikeways, identified shared roadways and off-street trails was conducted along arterial and collector streets. The location of existing activity centers such as parks, schools, and the city library were identified to determine possible bicycle trip generators. Figure 3-3 shows existing bicycle facilities in Redmond as well as the location of major activity centers.

The arterial and collector roadway system in Redmond has a limited amount of designated bicycle lanes. These conditions require the bicyclist to share the travel lane with motor vehicles or use the shoulder if available, particularly in the downtown area and neighborhood streets where on-street parking exists. The low vehicle volumes (under 3,000 average daily traffic) and slow speeds (25 miles per hour or less) of neighborhood streets do not require designated bike lanes, as right of way under these conditions can be shared between motor vehicles and bicyclists. However, higher motor vehicle volumes along the downtown couplets deter bicycle usage. Adequate bicycle facility connections should be provided to allow for safe travel between neighborhoods and activity centers. The identified bicycle issues are summarized below.

Issues to be Addressed

Deficiencies in the existing bicycle facility network include:

- Bicyclists in the downtown area are forced to share the roadway with vehicles or the sidewalk with pedestrians due to the lack of designated bicycle lanes
- There are a lack of dedicated bicycle lanes along major roadways in Redmond
- Many roadways are potentially wide enough to support bicycle use but striping for such use is not provided

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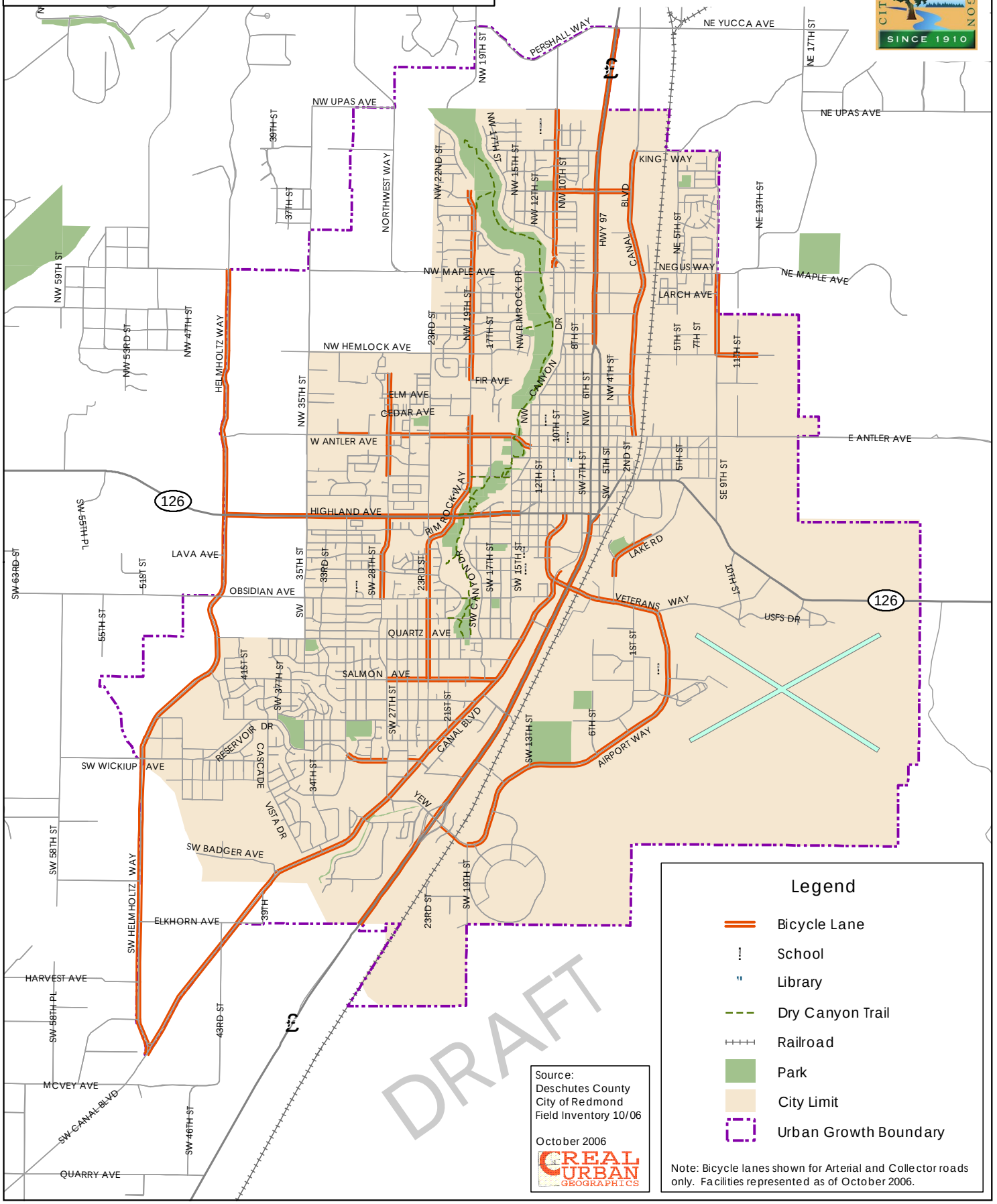
Figure 3-3
BICYCLE FACILITIES

NOT TO SCALE

City of Redmond
Transportation System Plan



Transit

Dial-A-Ride, managed by Central Oregon Council on Aging (COCOA), is the sole provider of transit service that exists in Redmond. Dial-A-Ride serves the needs of transportation dependant people for medical and business appointments, shopping, the Senior Mealsite, social activities and personal errands. Use requires a 24 hour reservation. The fleet is composed of five vans with capacities ranging from 12 to 22 people each. Dial-A-Ride serves approximately 70 people daily in Redmond[5].

The Oregon Public Transportation Plan Minimum Level of Service Standards for cities with a population between 2,500 and 25,000 call for the following:

- Coordination between intercity senior/disabled service and intercity general public bus and van services.
- Connection between local public transportation, senior/disabled services, and intercity bus services.
- Accessibility for rides to anyone requesting service.

Issues to be Addressed

- There is not a scheduled, fixed-route bus service in Redmond
- The Dial-a-Ride is not flexible for quick planning since it requires 24-hour advance reservations

[5] Phone conversation with Tom Obgal, Central Oregon Council on Aging, October 24, 2006.

Motor Vehicles

Roadway Characteristics

The functional classes of the roadways in Redmond were recently updated for the Redmond Urban Area Transportation Plan, and are shown in Figure 3-4. The jurisdiction of a roadway dictates the design and operational standards that must be met for a roadway or intersections along that roadway. Most facilities in the city are operated by the City of Redmond, except US 97 and OR 126 which are under the jurisdiction of ODOT. Roads that lie between the city limits and UGB are controlled by Deschutes County. Roadway jurisdiction is shown in Figure 3-5, with various road characteristics including intersection control (for study intersections only), posted speed limits and road widths shown in Figure 3-6. The majority of the 60 study intersections are two-way stop controlled or signalized intersections. The signalized study intersections are primarily located along the state-controlled facilities.

Activity Levels

An inventory of peak hour traffic conditions was performed in the fall of 2006 as part of the Redmond TSP Update. Sixty study intersections where selected for focused analysis in coordination with City of Redmond and ODOT staff in order to address areas of concern along major roadways. Three-hour PM peak manual turn movement counts were taken at 21 of the study intersections in August and September 2006. Counts for seven locations were provided by ODOT in February 2007. Previously collected counts were utilized at the remaining intersections.

Methodology from the ODOT Analysis Procedures Manual[6] was applied to determine the 30th highest annual hour (30HV) volume for the study intersections. The 30HV volume represents the level of congestion that typically is encountered during the summer PM peak when traffic volumes are higher than other seasons. Traffic counts taken during the peak season do not require additional factoring, though those taken at other times of the year require a factor to increase them to the levels that would be observed during the peak season. Traffic counts taken in August reflect the annual peak travel period and therefore no seasonal factors were applied to these counts. However, other counts were increased to reflect the 30HV. In addition, a growth factor of 4% was applied to counts taken in 2005 to represent volume present in 2006. Figure 3-7 shows the two-way PM peak hour motor vehicle traffic levels at selected locations in Redmond. Traffic counts for the study intersections are located in the Appendix.

[6] Analysis Procedures Manual, Oregon Department of Transportation, April 2006.

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Figure 3-4
FUNCTIONAL CLASS

NOT TO SCALE

City of Redmond
Transportation System Plan

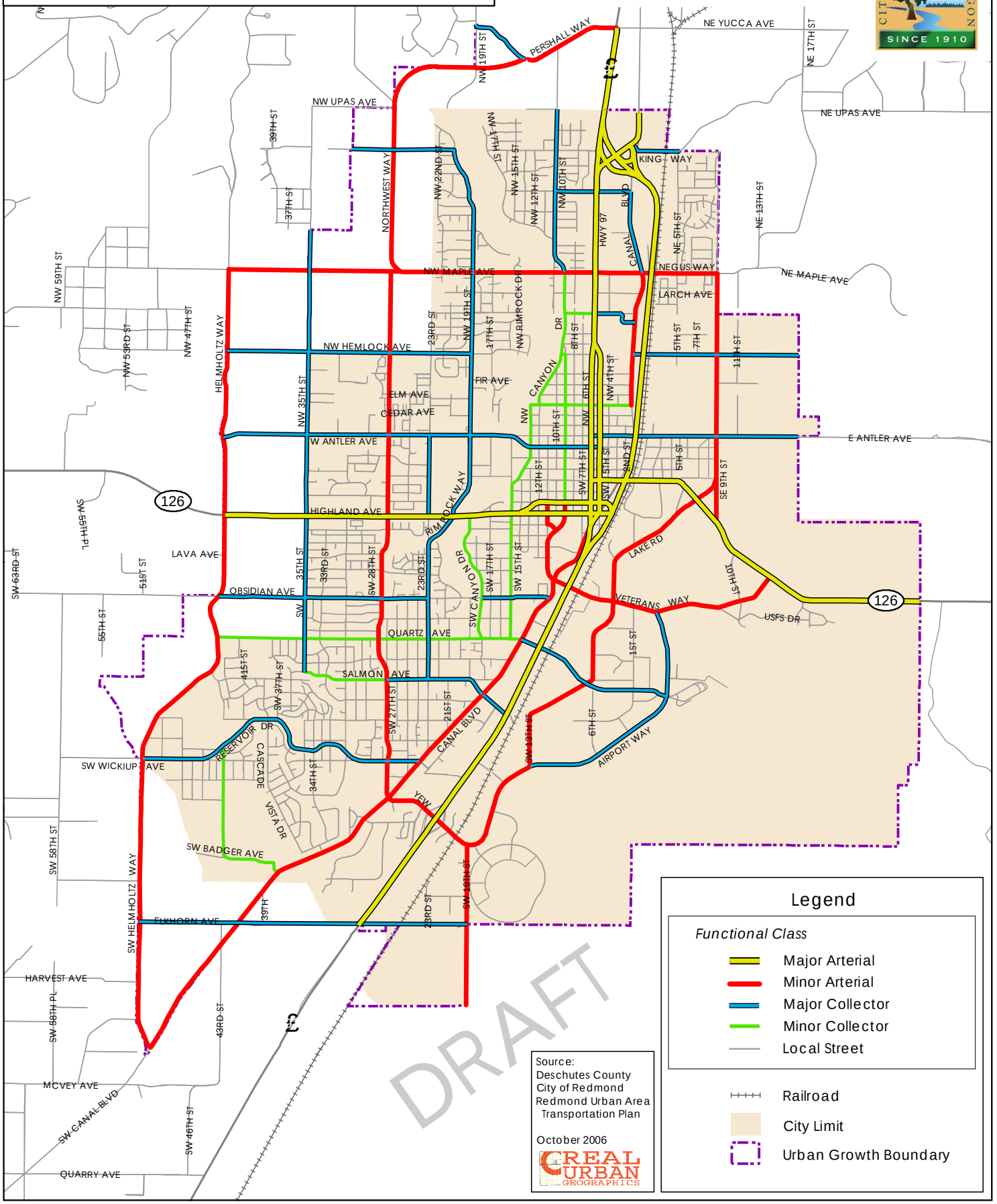

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Figure 3-5
ROADWAY JURISDICTION

NOT TO SCALE

City of Redmond
Transportation System Plan

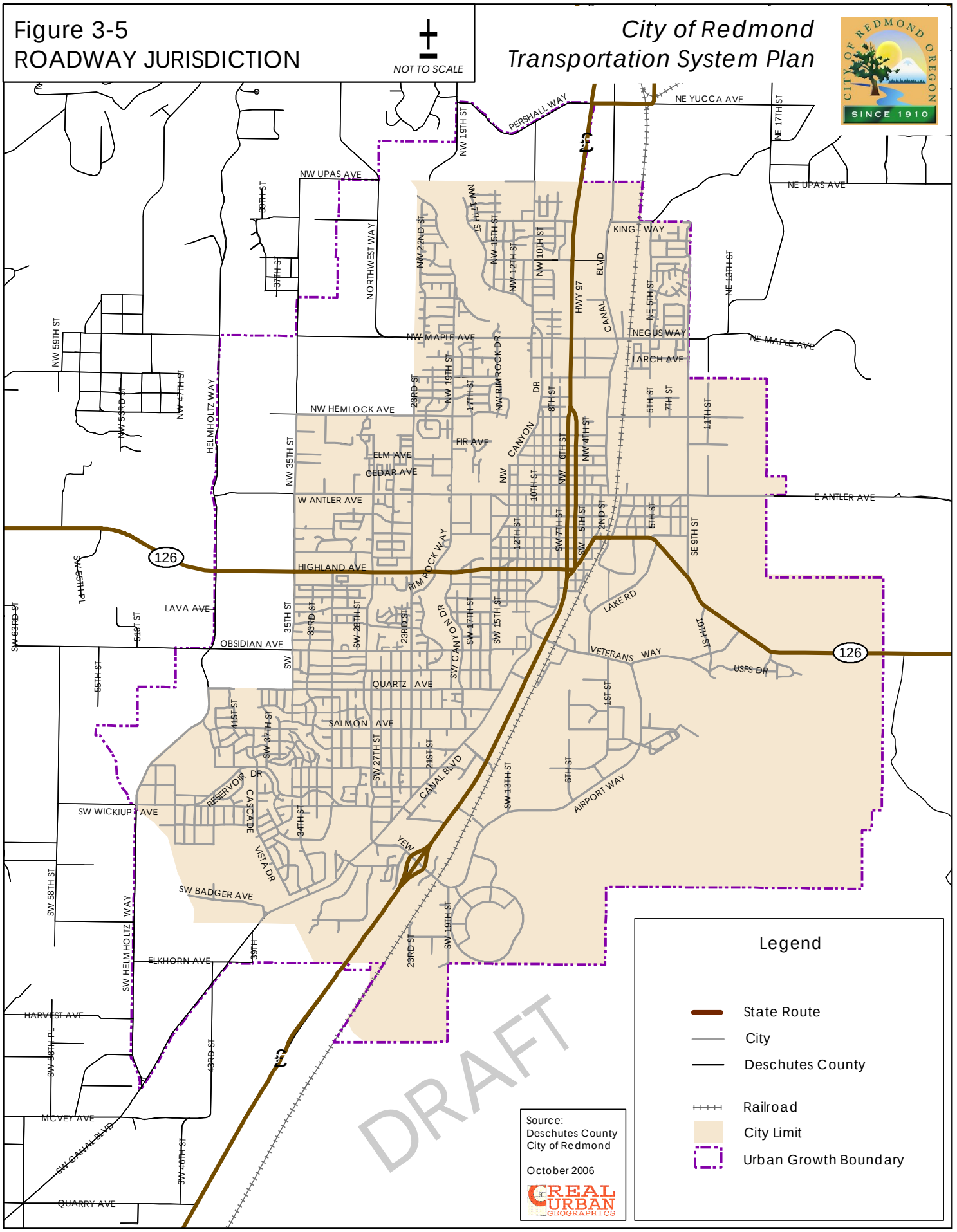

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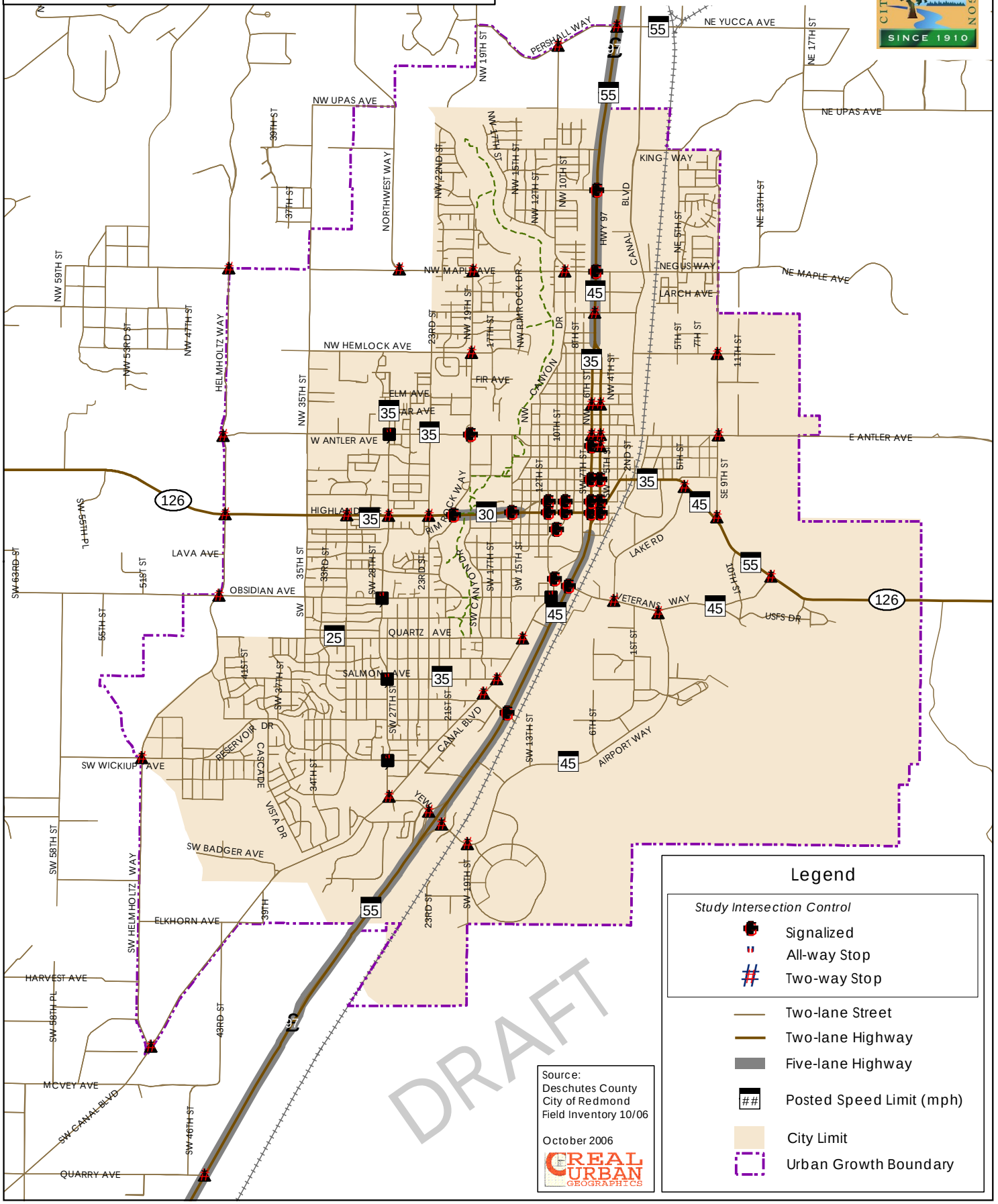
Figure 3-6
ROAD CHARACTERISTICS

NOT TO SCALE

City of Redmond
Transportation System Plan



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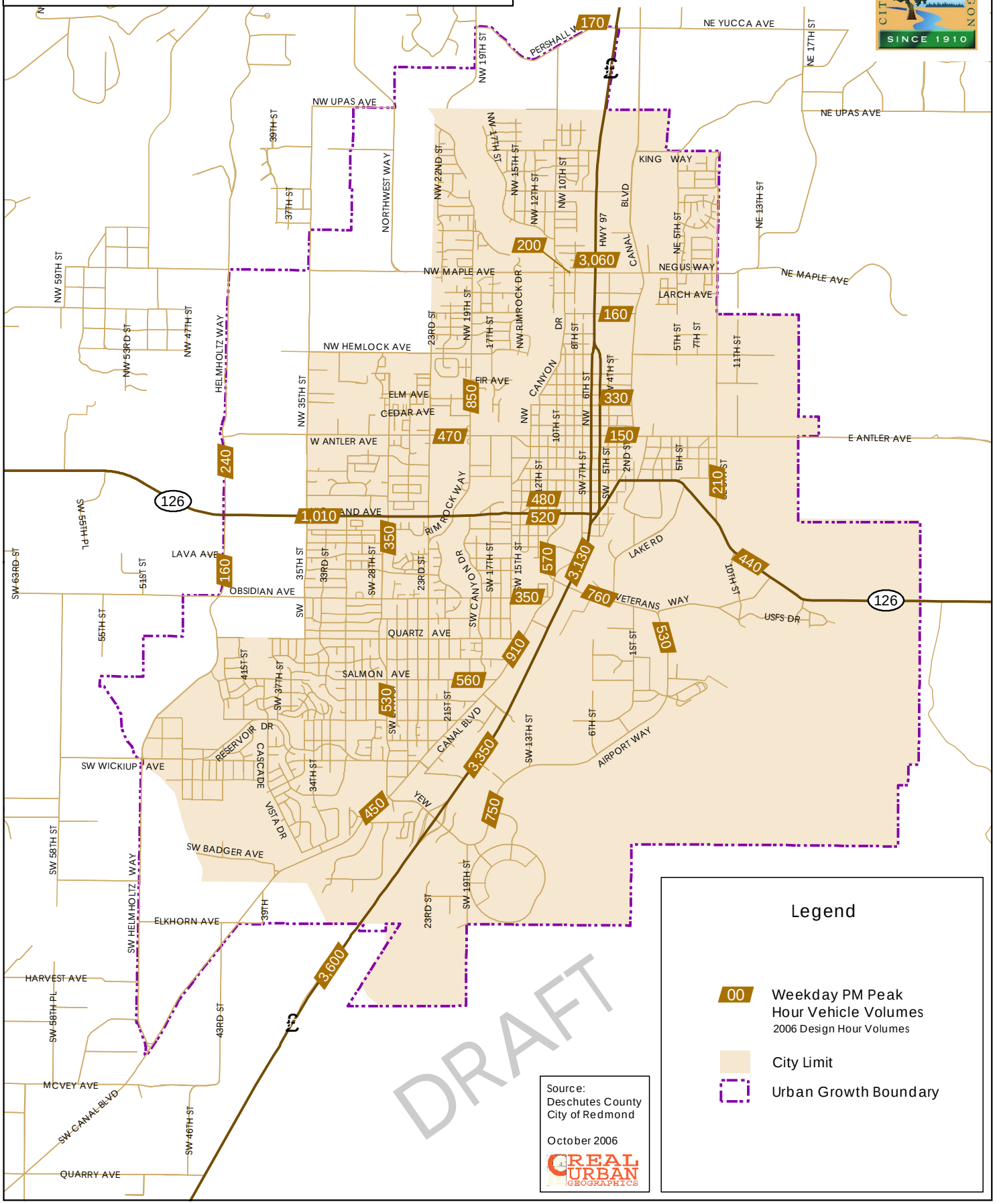
TRANSPORTATION SOLUTIONS

Figure 3-7
TWO-WAY PM PEAK HOUR VOLUMES

NOT TO SCALE

City of Redmond
Transportation System Plan



Traffic Operations

Definition of Traffic Level of Service

Level of Service (LOS) and volume to capacity (v/c) ratios are both used as measures of effectiveness for intersection operation. LOS is similar to a "report card" rating based upon average vehicle delay. Level of Service A, B, and C indicate conditions where traffic moves without significant delays over periods of peak hour travel demand. Level of Service D and E are progressively worse peak hour operating conditions. Level of Service F represents conditions where average vehicle delay exceeds 80 seconds per vehicle entering a signalized intersection and demand has exceeded capacity. This condition is typically evident in long queues and delays. Unsignalized intersections provide levels of service for major and minor street turning movements. For this reason, LOS E and even LOS F can occur for a specific turning movement; however, the majority of traffic may not be delayed (in cases where major street traffic is not required to stop). LOS E or F conditions at unsignalized intersections generally provide a basis to study intersections further to determine availability of acceptable gaps, safety and traffic signal warrants.

A volume to capacity ratio (v/c) is the peak hour traffic volume at an intersection divided by the maximum volume that intersection can handle. For example, when a v/c is 0.80, peak hour traffic is using 80 percent of the intersection capacity. If traffic volumes exceed capacity, queues will form and will lengthen until demand subsides below the available capacity. When the v/c approaches 1.0, intersection operation becomes unstable and small disruptions can cause traffic flow to break down.

Operating Standards

Level of service, delay and volume to capacity ratios are used as measures of effectiveness for study intersection performance. The intersection operational standards for ODOT, Deschutes County, and City of Redmond are summarized below.

ODOT has adopted mobility standards for state facilities through the 1999 Oregon Highway Plan (OHP)[7] to be used for identifying needs of existing facilities. Table 6 in Policy 1F of the OHP displays the maximum allowable volume to capacity ratios for the 30th highest annual hour of traffic in areas outside of the Portland Metropolitan Area. Sections from that table relevant to the study area are presented below in Table 3-2.

[7] 1999 Oregon Highway Plan, Oregon Department of Transportation, August 2006 update.

Table 3-2: Maximum Volume to Capacity **Ratios from the 1999 Oregon Highway Plan**

Highway Category	Land Use Type/Speed Limits			
	Inside Urban Growth Boundary			Outside Urban Growth Boundary
	Non-MPO Oustside of STA where non-freeway speed <=35 mph	Non-MPO outside of STAs where non-freeway speed limit >35 and <45 mph	Non-MPO where non-freeway speed limit >= 45 mph	Rural Lands
Statewide Expressways	0.70	0.70	0.70	0.70
Statewide Freight Routes	0.80	0.75	0.70	0.70
Regional or District Expressways	0.85	0.80	0.75	0.70
District/Local Interest Roads	0.90	0.85	0.80	0.75

At signalized intersections, these standards are to be applied to the intersection as a whole. At unsignalized intersections, these standards are applicable only to movements that are not required to stop. For other movements at unsignalized intersections that are required to stop or otherwise yield the right of way, the standards for District/Local Interest Roads shall be applied for areas within urban growth boundaries and a maximum volume to capacity ratio of 0.80 shall be applied for areas outside of urban growth boundaries. However, when an intersection acts as an interchange ramp terminal, the applicable volume to capacity ratio will be the smaller of the values of the volume to capacity ratio for the crossroad or 0.85.

In the project area, Deschutes County owns and maintains non-state facilities located outside of the Redmond UGB. Most of these roads are classified as rural collectors, but South Canal Boulevard, Helmholtz Way, Northwest Way, and a segment of Maple Avenue are classified as rural arterials. According to the Deschutes County Transportation System Plan, the County has adopted a goal to maintain a level of service of "D" or better during the peak hour throughout the County arterial and collector road system over the next 20 years.

All non-state roadways within the Redmond UGB are under the jurisdiction of the City of Redmond. The City has adopted standards for performance of City streets requiring operation of level of service E or better during the peak 15 minutes of the peak hour of the average weekday. A lesser standard is allowed at unsignalized intersections with low volume minor street approaches, requiring operation at a volume to capacity ratio less than 0.90 and a 95th percentile vehicle queue less than four vehicles during the peak hour. Note that the City of Redmond is using a future (year 2030) performance standard of LOS D for the purposes of this TSP.

Existing Operating Conditions

The 30HV intersection volumes for the PM peak hour were used to determine the existing study intersection operating conditions based on the *2000 Highway Capacity Manual*[8] methodology for signalized and unsignalized intersections. Traffic volumes and level of service calculation sheets can be found in the Appendix. All nine signalized study intersections and approximately half of the unsignalized intersections along US 97 do not currently meet ODOT performance standards. Four unsignalized intersections also fail to meet City of Redmond performance standards. Table 3-3 summarizes the existing weekday PM peak hour intersection operation at study intersections.

Table 3-3: Existing Weekday PM Peak Hour Intersection Level of Service (2006)

Intersection	Level of Service	Average Delay (s)	Volume / Capacity	Performance Standard	Standard Met?
Signalized Intersections – ODOT					
11th St/Glacier Dr	A	10.0	0.34	0.70	YES
11th St/Highland Dr	A	10.0	0.28	0.70	YES
19th St/Hwy 126	B	11.2	0.59	0.70	YES
9th St/Glacier Dr	B	12.5	0.44	0.70	YES
9th St/Highland Dr	B	16.9	0.37	0.70	YES
US 97/Odem Medo	E	77.3	>1.0	0.70	**NO**
US 97/Veterans Way	E	58.5	>1.0	0.70	**NO**
15th St/Hwy 126	A	7.4	0.53	0.70	YES
US 97 Business/Quince Ave	A	2.9	0.49	0.70	YES
US 97 Business (SB)/Black Butte Ave	B	18.8	0.81	0.70	**NO**
US 97 Business (SB)/Evergreen Ave	B	15.3	0.85	0.70	**NO**
US 97 Business (SB)/Glacier Ave	B	11.2	0.77	0.70	**NO**
US 97 Business (SB)/Highland Ave	B	13.2	0.73	0.70	**NO**
US 97 Business (NB)/Evergreen Ave	D	41.8	1.0	0.70	**NO**
US 97 Business (NB)/Glacier Ave	A	8.1	0.78	0.70	**NO**
US 97 Business (NB)/Highland Ave	C	28.5	0.88	0.70	**NO**
Signalized Intersections – City of Redmond					
9th St/Fred Meyer Access	A	5.6	0.42	E	YES
19th St/Antler Ave	A	7.9	0.57	E	YES
Unsignalized Intersections – ODOT					
27th St/Hwy 126	A/E	-	0.31/0.30	0.70	YES
Hemholtz Way/Hwy 126	A/E	-	0.06/0.49	0.70	YES
Hwy 126/Veterans Way	A/B	-	0.17/0.36	0.70	YES
O'Neil Hwy/US 97+	B/F	-	0.32/>1.0	0.80	**NO**
US 97 Business (NB)/Antler Ave	A/F	-	0.76/0.55	0.85	YES
US 97 Business (NB)/Dogwood Ave+	A/F	-	0.60/>1.0	0.85	**NO**
US 97 Business (SB)/Antler Ave	A/F	-	0.54/0.67	0.85	YES
US 97 Business (SB)/Dogwood Ave+	A/F	-	0.47/>1.0	0.85	**NO**
US 97 Business/Kingwood Ave+	C/F	-	0.64/>1.0	0.80	**NO**
US 97 Business /Maple Ave+	C/F	-	0.53/>1.0	0.80	**NO**
US 97 /Quarry Road	C/F	-	0.77/0.35	0.70	YES
US 97 (NB)/Yew Ave+	A/F	-	0.18/>1.0	0.85	**NO**
US 97 (SB)/Yew Ave+	A/F	-	0.27/>1.0	0.85	**NO**
31st St/Hwy 126	A/B	-	0.27/0.13	0.70	**NO**
23rd St/Hwy 126	B/F	-	0.46/>1.0	0.70	**NO**
US 97 Business (NB)/Black Butte Ave	A/F	-	0.12/>1.0	0.85	YES
E 9th St/Hwy 126	A/B	-	0.15/0.20	0.70	YES

[8] *2000 Highway Capacity Manual*, Transportation Research Board, 2000.

Intersection	Level of Service	Average Delay (s)	Volume / Capacity	Performance Standard	Standard Met?
Lake Dr/Hwy 126	A/B	-	0.06/0.27	0.70	YES
Unsignalized Intersections – Deschutes County					
10th St/Pershall Way	A/A	-	0.05/0.06	D	YES
Unsignalized Intersections – City of Redmond					
19th St/Hemlock Ave	A/B	-	0.03/0.03	E	YES
19th St/Maple Ave	A/B	-	0.12/0.14	E	YES
27th St/Antler Ave*	A	8.0	0.23	E	YES
27th St/Obsidian Ave*	A	8.8	0.28	E	YES
27th St/S. Canal Blvd+	A/F	-	0.41/0.17	E	**NO**
27th St/Salmon Ave*	B	13.1	0.60	E	YES
27th St/Wickiup Ave*	B	12.8	0.61	E	YES
9th St/Antler Ave	A/B	-	0.01/0.07	E	YES
9th St/Hemlock Ave	A/B	-	0.17/0.06	E	YES
9th St/Maple Ave	A/B	-	0.02/0.19	E	YES
Airport Rd/19th St	A/C	-	0.27/0.09	E	YES
Airport Rd/Veterans Way	A/C	-	0.10/0.43	E	YES
Helmholtz Way/Maple Ave	A/A	-	0.03/0.05	E	YES
Helmholtz Way/S. Canal Blvd	A/A	-	0.10/0.09	E	YES
Helmholtz Way/Wickiup Ave	A/B	-	0.04/0.07	E	YES
S. Canal Blvd/Obsidian Ave*	B	12.6	0.57	E	YES
S. Canal Blvd/Salmon Ave+	A/F	-	0.36/0.57	E	**NO**
S. Canal Blvd/Veterans Way**+	A/F	-	0.35/>1.0	E	**NO**
Helmholtz Way/Antler Ave	A/B	-	0.11/0.10	E	YES
Helmholtz Way/Obsidian Ave	A/B	-	0.01/0.03	E	YES
S Canal Blvd/Quartz Ave	A/D	-	0.46/0.53	E	YES
S Canal Blvd/Odem Medo+	A/F	-	0.24/>1.0	E	**NO**
Northwest Way/Maple Ave	A/A	-	0.02/0.08	E	YES
Lake Dr/Veterans Way	A/E	-	0.08/0.67	E	YES

Notes: Unsignalized Intersection Operations:

A/A = Major street turn LOS / Minor street turn LOS

#/# = Major street turn v/c / Minor street turn v/c

Signalized and All-Way Stop Intersections:

Delay = Average vehicle delay in the peak hour for entire intersection in seconds.

* All-Way Stop Intersection

** Operating as 2-way stop-controlled 10/06, with a traffic signal being installed

+ Stop-controlled intersection that does not meet performance standards. Consider alternative control measures.

Intersection Queues

Field reviews of traffic queues were taken at intersections that did not meet performance standards. These observations were made on a weekday during the PM peak hour in August 2006 in order to match the conditions and volume levels used in the intersection analysis. Extensive traffic queues were observed along US 97 in the southbound direction. A southbound queue at Odem Medo was observed to extend from the intersection north to the potential future connection of Quartz Avenue (approximately ½ mile total length). A queue was also present in the southbound direction at Veterans Way which acted to meter the vehicles before arriving at the Odem Medo queue. Construction in the downtown area did not appear to affect the number of available travel lanes. However, the saturation flow rates for US 97 may have been reduced, affecting the potential for queues at downstream signalized intersections. Other locations which failed to meet performance standards were not found to cause adverse queuing based on field reviews.

Alternative Traffic Control

A preliminary MUTCD[9] signal warrant analysis was performed for the ten stop-controlled study intersections that do not currently meet performance standards. South Canal Boulevard/Veterans Way was the only intersection that met preliminary warrants. It should be noted that this intersection is currently being reconfigured and a traffic signal is being installed. The other twelve locations that fail to meet performance standards should be considered for alternative control measures.

Traffic Safety

Crash rates along major corridors (Hwy 97 and Hwy 126) were compiled from the 2005 State Crash Rate Tables. Tables 3-4 and 3-5 list the crash rates for segments along US 97 and OR 126 and provide comparisons to statewide averages for similar facility types from 2003 to 2005. Approximately half of the locations exceed the statewide average and are noted with bold text in the tables. The Safety Priority Index System (SPIS) identifies potential safety problems based on the frequency and severity of crashes on state facilities over a three year period. Table 3-6 lists locations that ranked in the top 10% of Region 4 SPIS for 2006 and provides potential remedies.

City of Redmond motor vehicle collision data for 2003-2005 was obtained from ODOT and was used to determine the crash types, frequencies and rates at study intersections as listed in Tables 3-7 and 3-8. Generally a rate that exceeds 1 crash per million entering vehicles indicates a potential safety issue that requires further analysis. The intersection of 9th Street/Highland Avenue exceeds this rate and was analyzed to determine if any patterns in crashes were present to indicate a safety problem. Four of the twelve collisions at 9th Street/Highland Avenue during 2003-2005 were angle crashes between vehicles making a northbound left turn and vehicles travelling southbound. The remaining eight collisions were varied and did not present any additional patterns. The addition of the Hwy 126 couplet and the 9th/11th Street couplet alters the traffic flow through these intersections and removes the combination of conflicting movements (northbound left turn and southbound through), which caused four collisions during the three years.

[9] Manual on Uniform Traffic Control Devices 2003 Ed., Federal Highway Administration, November 2004.

Table 3-4: US 97 3-year Segment Crash Rate Comparison

Section Limits (Milepoints)	Section Description	Crashes per Million Vehicle Miles 2005	2004	2003
	Statewide Suburban Area Average Rate	1.44	1.22	1.34
118.52 - 119.02	Redmond Suburban Area - Begin Urban Area	0.29	0.59	**1.47**
119.02 - 119.98	Redmond Urban Area - Redmond N. City Limits	0.78	0.35	NA
123.77 - 124.41	Redmond South City Limits - End Urban Area	0.30	0.46	0.46
	Statewide Urban City Average Rate	2.25	2.04	3.15
119.98 - 120.42	Redmond N. City Limits - Begin Couplet	2.20	1.26	**3.28**
120.42 - 121.29	Begin Couplet - Evergreen Ave. (SB)	**2.53**	**3.91**	**6.76**
121.29 - 121.50	Evergreen Ave. - OR 126 (SB)	**2.40**	**7.41**	**8.26**
121.50 - 121.58	OR 126 - End Couplet (SB)	**3.81**	**9.81**	**7.87**
120.42 - 121.31	Begin Couplet - Evergreen Ave. (NB)	**3.03**	1.88	0.42
121.31 - 121.51	Evergreen Ave. - OR 126 (NB)	**4.93**	**3.04**	2.03
121.51 - 121.58	OR 126 - End Couplet (NB)	**8.39**	1.72	NA
121.58 - 123.16	End Couplet - Wickiup Rd.	2.16	**2.11**	2.64
123.16 - 123.77	Wickiup Rd. - Redmond South City Limits	1.11	0.65	0.33

*Note: **Bold type** indicates the crash rate is greater than the statewide average.*

Source: 2005 State Highway Crash Rate Tables, ODOT - Tranportation Data Section Crash Analysis and Reporting Unit, August 2006.

Table 3-5: OR 126 3-year Highway Segment Crash Rate Comparison

Section Limits (Milepoints)	Section Description	Crashes per Million Vehicle Miles 2005	2004	2003
	Statewide Urban City Average Rate	2.25	2.04	3.15
110.16 - 111.89	Redmond West City Limits – US 97 SBD	**2.50**	**4.37**	**3.23**
111.89 - -0.06	US 97 SBD - US 97 NBD	NA	**7.29**	**14.61**
-0.06 - 0.02	S. Canal Blvd - Glacier Ave	NA	NA	NA
0.02 - 0.49	Glacier Ave. - S. Jackson St	**2.59**	**6.22**	2.67
0.49 - 2.32	S. Jackson St - East City Limits	1.23	0.51	0.76

*Note: **Bold type** indicates the crash rate is greater than the statewide average.*

Source: 2005 State Highway Crash Rate Tables, ODOT - Tranportation Data Section Crash Analysis and Reporting Unit, August 2006.

Table 3-6: ODOT Region 4 Top 10% SPIS Sites - Investigative Report (2006)

Route	Mile Post	Max Crashes	Max Fatalities	Max SPIS	Problem Description	Potential Remedies	Impediments to Implementation
US-97	119.93-120.11	6	0	49.15	57% turning (43% N-S collides with W-N), 2 injury A crashes		
US-97	121.00-121.23	18	0	53.44	40% rear end, 28% turning		
US-97	121.89-122.07 (@ Vet Way, MP 121.98)	36	0	**76.30 ***	71% rear end	Signal channelization (added dedicated left turn for eastbound) and timing improvements (changed to full 8 phase signal by adding protected left turns to the side streets) in 2005.	Signal will need to be evaluated in Redmond Refinement Plan and after Redmond Reroute is constructed.
						The existing dog house will be replaced with a flashing yellow arrow in 2006.	
						If the NE corner lot develops a westbound rt turn lane will be added.	Waiting for Developer to add Rt turn lane and rebuild signal.
						The City of Redmond is working on a Refinement plan for US 97 and will evaluate this signal with the construction of the Reroute.	Signal is being evaluated in the Redmond Refinement Plan and will need to be evaluated after the Redmond Reroute is constructed. High cost of building bypass and obtaining funding. Public support for Bypass.
						This signal is also scheduled to be a test for a red light runner enforcer to be installed in 2006. This will include funding for enforcement.	Pilot Program, what happened after funding for enforcement is gone?
						Install advance head	Right of Way expense and head location due to numerous signs and businesses in this section.
US-97	122.20-122.34	13	0	46.01	50% turning		
US-97	123.35-123.53 (@ Yew Ave, MP 123.44)	7	2	**60.66 ***	33% turning, 2 fatal (1 ran stop sign at btm of ramp, 1 Ped crossing between intersection), 1 Inj A (did not yield r/w for bike)	Signal to be installed at both ramps, with sidewalks and ADA upgrades in 2006 by the City of Redmond	Construction scheduled for 2006
OR-126	109.56-109.65	10	0	48.04	40% turning		
OR-126	111.04-111.16	17	0	54.56	94% rear end		
OR-126	111.65-111.77	14	0	49.33	47% turning		

* In top 5 percentile of SPIS

Source: Five Percent Report Based on 2006 SPIS, ODOT – Highway Safety Improvement Program, http://safety.fhwa.dot.gov/fivepercent/06or.htm, December 2007.

Table 3-7: City Study Intersection Collision Data by Type (2003-2005)

Intersection	Backing	Parking Maneuver	Pedestrian	Angle	Head-On	Side-swipe/ Over-taking	Rear-End	Turning Movement	Fixed Object	Total
10th St/Pershall Way				1						**1**
11th St/Glacier Dr.							2			**2**
11th St/Highland Ave.							6	1	0	**7**
19th St/Antler Ave.				1			2	2		**5**
19th St/Hemlock Ave.										**0**
19th/Hwy 126				1			4			**5**
19th St/Maple Ave.										**0**
27th St/Antler Ave.									1	**1**
27th St/Hwy 126										**0**
27th St/ Obsidian Ave.										**0**
27th St/S. Canal Blvd				7				2		**9**
27th St/Salmon Ave.										**0**
27th St/Wickiup Ave.				1						**1**
9th St/Fred Meyer Access				1						**1**
9th St/Glacier Dr.				6			2	3		**11**
9th St/ Highland Ave.				5			2	5		**12**
9th St/Antler Ave.				1				1		**2**
9th St/Hemlock										**0**
9th St/Maple Ave.	1									**1**
Aiport Rd/19th St										**0**
Airport Rd/ Veterans Way										**0**
Hemholtz Way/Hwy 126				2			1	4		**7**
Hemholtz Way/Maple Ave.										**0**
Hemholtz Way/S. canal Blvd										**0**
Hemholtz Way/Wickiup Ave.										**0**
Hwy 126/Veterans Way									1	**1**
O'Neil Hwy/US 97				2			1	1		**4**

Intersection	Backing	Parking Maneuver	Pedestrian	Angle	Head-On	Side-swipe/ Over-taking	Rear-End	Turning Movement	Fixed Object	Total
Old US 97 (NB)/Antler Ave				2			3	2		**7**
Old US 97 (NB)/Dogwood Ave				3						**3**
Old US 97 (SB)/Antler Ave				2			2			**4**
Old US 97 (SB)/Dogwood Ave				1				1		**2**
Old US 97/Kingwood Ave				1			2	2		**5**
Old US 97/Maple Ave								3		**3**
Quary Rd/US 97								1		**1**
S. Canal Blvd/Obsidian Ave										**0**
S. Canal Blvd/Salmon Ave							7	2		**9**
S. Canal Blvd/Veterans Way										**0**
US 97 (NB)/Yew Ave				1			1	2		**4**
US 97 (SB)/Yew Ave								2		**2**
US 97 Odem Medo				1			10	5		**16**
US97/Veterans Way				1		1	16	5		**23**
Total Collisions (2003-2005)	**1**			**40**		**1**	**61**	**44**	**2**	**149**

Source: ODOT – Transportation Data Section – Crash Analysis and Reporting Unit, Continuous System Crash Listing, City of Redmond 2003-2005

Table 3-8: City Study Intersection Collision Rates

Intersection	Total Collisions (Year 2003-2005)	Collision Rate (Crashes/MEV)
10th St/Pershall Way	1	0.50
11th St/Glacier Dr.	2	0.21
11th St/Highland Ave.	7	0.91
19th St/Antler Ave.	5	0.31
19th St/Hemlock Ave.	0	0.00
19th/Hwy 126	5	0.24
19th St/Maple Ave.	0	0.00
27th St/Antler Ave.	1	0.29
27th St/Hwy 126	0	0.00
27th St/ Obsidian Ave.	0	0.00
27th St/S. Canal Blvd	9	0.84
27th St/Salmon Ave.	0	0.00
27th St/Wickiup Ave.	1	0.12
9th St/Fred Meyer Access	1	0.12
9th St/Glacier Dr.	11	0.98
9th St/ Highland Ave.	12	1.09
9th St/Antler Ave.	2	0.80
9th St/Hemlock	0	0.00
9th St/Maple Ave.	1	0.29
Aiport Rd/19th St	0	0.00
Airport Rd/ Veterans Way	0	0.00
Hemholtz Way/Hwy 126	7	0.58
Hemholtz Way/Maple Ave.	0	0.00
Hemholtz Way/S. canal Blvd	0	0.00
Hemholtz Way/Wickiup Ave.	0	0.00
Hwy 126/Veterans Way	1	0.12
O'Neil Hwy/US 97	4	0.17
Old US 97 (NB)/Antler Ave	7	0.36
Old US 97 (NB)/Dogwood Ave	3	0.14
Old US 97 (SB)/Antler Ave	4	0.23
Old US 97 (SB)/Dogwood Ave	2	0.11
Old US 97/Kingwood Ave	5	0.16

Intersection	Total Collisions (Year 2003-2005)	Collision Rate (Crashes/MEV)
Old US 97/Maple Ave	3	0.09
Quary Rd/US 97	1	0.03
S. Canal Blvd/Obsidian Ave	0	0.00
S. Canal Blvd/Salmon Ave	9	0.62
S. Canal Blvd/Veterans Way	0	0.00
US 97 (NB)/Yew Ave	4	0.34
US 97 (SB)/Yew Ave	2	0.15
US 97.Odem Medo	16	0.39
US97/Veterans Way	23	0.54
Study Intersection Total	**149**	-

Source: ODOT – Transportation Data Section – Crash Analysis and Reporting Unit, Continuous System Crash Listing, City of Redmond 2003-2005

Emergency Routes

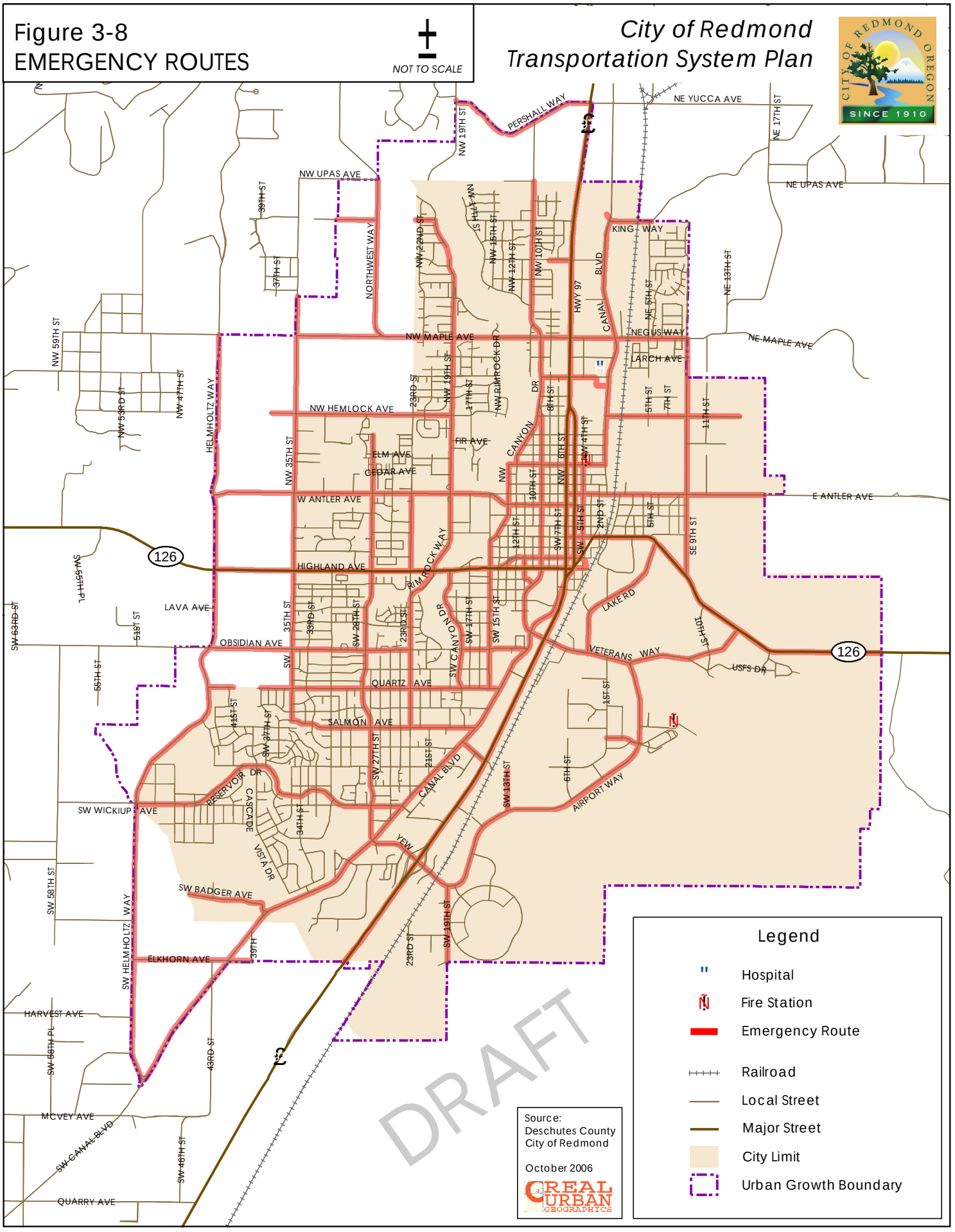
Redmond Fire and Rescue provides emergency services to the community and operates out of four stations. Both Headquarters and the Airport Station are located within the UGB, while Terrebonne Station is located north of Redmond and Cline Falls Station is located to the west. Arterial and collector roadways are primarily used for emergency response. In addition, 4th Street is used as the primary route from Headquarters to OR 126. Other routes may be used when returning to the station after a call but are not used for the initial response. Figure 3-8 shows the location of the two stations within the UGB and the emergency routes used by response personnel.

DKS *Associates*
TRANSPORTATION SOLUTIONS

Figure 3-8
EMERGENCY ROUTES

NOT TO SCALE

City of Redmond
Transportation System Plan



Access Management

Access to US 97 and OR 126 through the study corridor under existing conditions was assessed to identify areas needing improvement. A review of the findings for the highway corridors in the study area follows.

Access Management Spacing Standards

Policy 3A of the *1999 Oregon Highway Plan* establishes access management objectives for state facilities based on assigned classifications and sets standards for spacing of approaches. These standards have also been adopted as part of OAR 734-051, which provides the regulatory basis for implementation. Table 3-9 lists the applicable access management spacing standards for state facilities in the study area. For the purpose of access spacing, US 97 and OR 126 within the UGB are by default designated "Urban Other," while to the south of Yew Avenue, US 97 is designated as an "Urban Expressway" to the UGB and as a "Rural Expressway" from there to Quarry Avenue. It should be noted that these standards are applicable only to approaches on the same side of the roadway and that measurement of approach spacing is to be taken from center to center.

Table 3-9: Access Spacing Standards for Statewide Highways (measured in feet)

Posted Speed (mph)	Rural		Urban	
	Expressway (at-grade only)	Other	Expressway (at-grade only)	Other
> 55	5280	1320	2640	1320
50	5280	1100	2640	1100
40 & 45	5280	990	2640	990
30 & 35	770		720	
> 25	550		520	

US 97

The study area extends from milepoint 118.52 (O'Neil Highway) to milepoint 126.20 (Quarry Avenue), and includes all of the US 97 corridor through the city of Redmond. ODOT's management objectives and spacing standards regarding access to US 97 through the study area vary, as the highway passes through both rural and urban areas, experiences several posted speed changes, and maintains an expressway designation at the northern and southern limits. The management objectives for various segments of US 97 through this area, as adopted in the *1999 Oregon Highway Plan*[10], follow.

Statewide Highways (NHS): Rural Expressways
(MP 118.52 – MP 119.02 & MP 124.37 – MP 126.20)

[10] *1999 Oregon Highway Plan*, Oregon Dept. of Transportation, 1999, p. 104-106.

- Provide for safe and efficient high-speed and high-volume traffic movements with the primary objective of connecting larger urban areas, ports, and major recreation areas with minimal interruptions;
- Discourage private access by eliminating approaches as opportunities occur or alternate access becomes available, purchasing access rights, and developing local road networks;
- Control public road connections to provide appropriate spacing and grade separated crossings where needed;
- Discourage traffic signals;
- Prohibit parking; and
- Construct non-traversable medians through modernization projects.

Statewide Highways (NHS): Urban Expressways
(MP 123.60 – MP 124.37)

- Provide for safe and efficient high-speed and high-volume traffic movements with the primary objective of connecting larger urban areas, ports, and major recreation areas with minimal interruptions;
- Discourage private access by eliminating approaches as opportunities occur or alternate access becomes available, purchasing access rights, and developing local road networks;
- Control public road connections to provide appropriate spacing and grade separated crossings where needed;
- Discourage traffic signals. Where traffic signals area allowed, their impact on through traffic must be minimized by ensuring that efficient progression of traffic is achieved;
- Prohibit parking; and
- Consider median treatments in accordance with criteria in Action 3B.3 of the *1999 Oregon Highway Plan*.

Statewide Highways (NHS): Urban Other
(MP 119.02 – MP 123.60)

- Provide high to moderate speed operations with limited interruptions in traffic flow;
- Direct access to abutting properties is a minor objective;
- Purchase access rights as opportunities arise, with a preference for purchasing rights in full; and
- Provide connections to larger urban areas, ports, and major recreation areas not served by freeways or expressways.

In comparing the existing conditions to the adopted access management spacing standards, the US 97 corridor was divided into sections according to changes in spacing standards triggered by urban growth boundaries, expressway designations, and posted speeds. Tables 3-10 and 3-11 provide the results of this investigation, displaying the number of approaches found in these sections for each side of US 97 and comparing the average approach spacing per section to the applicable access management spacing standard. While this level of analysis can not be used to identify potential improvements to approach spacing, it does reflect the degree to which the spacing standards are being met and provides an indication of the extent of improvements needed. The rightmost column in the table indicates the number of driveway or public streets approaches that would be allowed to fully comply with access spacing standards.

Table 3-10: US 97 Existing Southbound Approach Spacing (MP 118.52 - 126.20)

Highway Segment	Number of Approaches	Segment Length (feet)	Approach Spacing (Feet)		Number of Approaches to Meet Standard
			Actual	Standard	
MP 118.52 (O'Neil Hwy/North UGB) - MP 119.02	6	2640	440	2640	1
MP 119.02 - MP 119.75	8	3854	482	1320	3
MP 119.75 - MP 120.45 (Begin SB Couplet)	24	3696	154	990	4
MP 120.45 (Begin SB Couplet) - MP 121.04 (Antler Ave.) *WEST SIDE*	25	3115	125	720	4
MP 120.45 (Begin SB Couplet) - MP 121.04 (Antler Ave.) *EAST SIDE*	21	3115	148	720	4
MP 121.04 (Antler Ave.) - MP 121.65 (End SB Couplet) *WEST SIDE*	17	3221	189	520	6
MP 121.04 (Antler Ave.) - MP 121.65 (End SB Couplet) *EAST SIDE*	15	3221	215	520	6
MP 121.65 (End SB Couplet) - MP 123.08	31	7550	244	990	7
MP 123.08 - MP 123.60 (Yew Ave.)	6	2746	458	1320	2
MP 123.60 (Yew Ave.) - MP 124.37 (South UGB)	7	4066	581	2640	2
MP 124.37 (South UGB) - MP 126.20 (Quarry Ave.)	8	9662	1208	5280	2

Table 3-11: US 97 Existing Northbound Approach Spacing (MP 118.52 - 126.20)

Highway Segment	Number of Approaches	Segment Length (feet)	Approach Spacing		Number of Approaches to Meet Standard
			Actual	Standard	
MP 118.52 (O'Neil Hwy/North UGB) - MP 119.02	5	2640	528	2640	1
MP 119.02 - MP 119.75	18	3854	214	1320	3
MP 119.75 - MP 120.45 (Begin SB Couplet)	20	3696	185	990	4
MP 120.45 (Begin SB Couplet) - MP 121.04 (Antler Ave.) *WEST SIDE*	26	3115	120	720	4
MP 120.45 (Begin SB Couplet) - MP 121.04 (Antler Ave.) *EAST SIDE*	26	3115	120	720	4
MP 121.04 (Antler Ave.) - MP 121.65 (End SB Couplet) *WEST SIDE*	22	3221	146	520	6
MP 121.04 (Antler Ave.) - MP 121.65 (End SB Couplet) *EAST SIDE*	21	3221	153	520	6
MP 121.65 (End SB Couplet) - MP 123.08	41	7550	184	990	7
MP 123.08 - MP 123.60 (Yew Ave.)	5	2746	549	1320	2
MP 123.60 (Yew Ave.) - MP 124.37 (South UGB)	4	4066	1017	2640	2
MP 124.37 (South UGB) - MP 126.20 (Quarry Ave.)	17	9662	568	5280	2

The data in the preceding tables indicate that the average approach spacing experienced within all sections of US 97 through the study area is much shorter than the adopted standards require, indicating that a significant amount of improvement would be necessary if the standards were to be met. Similarly, many segments currently have 20 to 40 approaches where the maximum allowed number per the access spacing standards is less than 7 approaches. It should be recognized that these figures include public approaches to US 97, which in some sections like the downtown area, would not allow the spacing standards to be met even if all private approaches were eliminated.

OR 126

The study area extends on the McKenzie Highway from milepoint 110.14 (Hemholtz Way) to milepoint 111.94 (US 97), and on the Ochoco Highway from milepoint 0.00 (US 97) to milepoint 2.32 (UGB). These two highway segments are designated as a classified statewide express from milepoint 110.14 to milepoint 110.65 (SW 27th Street) and milepoint 1.37 (Veterans Way) to milepoint 2.32. In addition to several speed zone changes, the stretch of highway is all an NHS route under the urban principal arterial classification. The management objectives for these segments of OR 126 through this area, as adopted in the *1999 Oregon Highway Plan*[11], are described below.

Statewide Highways (NHS): Urban Expressways
(MP 110.14 – MP 110.65; MP 1.37 – MP 2.32)

- Provide for safe and efficient high-speed and high-volume traffic movements with the primary objective of connecting larger urban areas, ports, and major recreation areas with minimal interruptions;
- Discourage private access by eliminating approaches as opportunities occur or alternate access becomes available, purchasing access rights, and developing local road networks;
- Control public road connections to provide appropriate spacing and grade separated crossings where needed;
- Discourage traffic signals. Where traffic signals area allowed, their impact on through traffic must be minimized by ensuring that efficient progression of traffic is achieved;
- Prohibit parking; and
- Consider median treatments in accordance with criteria in Action 3B.3 of the *1999 Oregon Highway Plan.*

Statewide Highways (NHS): Urban Other
(MP 110.65 – MP 111.94; MP 0.00 – MP 1.37)

- Provide high to moderate speed operations with limited interruptions in traffic flow;
- Direct access to abutting properties is a minor objective;
- Purchase access rights as opportunities arise, with a preference for purchasing rights in full; and
- Provide connections to larger urban areas, ports, and major recreation areas not served by freeways or expressways.

The OR 125 corridor that passes through the study area was divided into sections to be analyzed for approach spacing based on changes in expressway designation and posted speeds. Tables 3-12 and 3-13 list the number of approaches in each highway segment as the average approach spacing and applicable standard. While this level of analysis can not be used to identify potential improvements to approach spacing, it does reflect the degree to which the spacing standards are being met and provides an indication of the extent of improvements needed. The table also indicates the number of driveway or public streets approaches that would be allowed to fully comply with access spacing standards.

[11] *1999 Oregon Highway Plan*, Oregon Dept. of Transportation, 1999, p. 104-106.

Table 3-12: OR 126 Eastbound Approach Spacing (MP 110.14 – 111.94; MP 0.00 – 2.32)

Highway Segment	Number of Approaches	Segment Length (feet)	Approach Spacing (Feet)		Number of Approaches to Meet Standard
			Actual	Standard	
MP 110.14 (SW Hemholtz Way) - MP 110.65 (SW 27th Street)	11	2690	240	720	3
MP 110.65 (SW 27th Street) - MP 111.94 (US 97)	23	6810	300	720	9
MP 0.00 (US 97) - MP 0.60 (SE Lake Road)	9	3170	350	720	4
MP 0.60 (SE Lake Road) - MP 0.88 (SE 9th St)	1	1480	1480	990	1
MP 0.88 (SE 9th St) - MP 1.37 (Veterans Way)	2	2590	1300	1320	1
MP 1.37 (Veterans Way) MP 2.32 (East UGB)	2	5020	2510	2640	1

Table 3-13: OR 126 Westbound Approach Spacing (MP 2.32 – 0.00; MP 111.94 – 110.14)

Highway Segment	Number of Approaches	Segment Length (feet)	Approach Spacing (Feet)		Number of Approaches to Meet Standard
			Actual	Standard	
MP 2.32 (East UGB) - MP 1.37 (Veterans Way)	3	5020	2530	2640	2
MP 1.37 (Veterans Way) MP 0.88 (SE 9th St)	2	2590	1300	1320	1
MP 0.88 (SE 9th St) - MP 0.60 (SE Lake Road)	4	1480	370	990	1
MP 0.60 (SE Lake Road) - MP 0.00 (US 97)	16	3170	200	720	4
MP 111.94 (US 97) - MP 110.65 (SW 27th Street)	28	6810	240	720	9
MP 110.65 (SW 27th Street) - MP 110.14 (SW Hemholtz Way)	8	2690	340	720	3

From these tables it can be seen that the average approach spacing does not meet the ODOT standard in any of the sections analyzed. The average spacing is much shorter than the adopted standards require, indicating that a significant amount of improvement would be necessary if the standards were to be met. It should be recognized that these figures include public approaches to OR 126, which in some sections

like the Glacier Avenue/Highland Avenue couplet area, would not allow the spacing standards to be met even if all private approaches were eliminated.

Air

Roberts Field is classified as a Category 1 – Commercial Service Airport and serves air traffic for Redmond and surrounding areas. The airport is operated by the City of Redmond and provides commercial service, air cargo and general aviation use. The airport has four carriers and provides direct flights to such locations as Portland, Seattle, San Francisco and Los Angeles. Plans for expansion of Roberts Field are included in the Airport Master Plan. These plans include extending runways and shifting alignment for surrounding roadways in order to provide adequate runway protection zones (RPZ). The airport is located in the southeast quadrant of the city and is shown in Figure 3-9.

Pipeline

Cascade Natural Gas provides natural gas services in Redmond and the surrounding area. The subsurface gaslines primarily run east-west with northward and southward extensions. A high-pressure line is located in the vicinity of Cascade Avenue. The lines cross major arterials and collectors in numerous locations throughout the study area.

Rail

Rail tracks operated by Burlington Northern Santa Fe Railway follow the alignment of US 97 to the east. Passenger trains do not use the tracks, except in the event of a potential Amtrak detour. Because the tracks are a BNSF mainline, they are maintained to high standards and generally kept in excellent condition to allow for the operating speeds that can be up to 50 miles per hour. There are nine public rail crossings in the study area. Of these nine, seven are gated crossings, one is ungated, and a grade separated crossing is currently being constructed on Maple Avenue. The tracks serve approximately a dozen trains each day, however the amount a particular stretch of track serves is dependant on the proximity to the railyard, located south of Antler Avenue on the west side of the tracks. Figure 3-9 shows the rail tracks, the rail yard, and street crossing locations in the study area.

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Figure 3-9
AIR, WATER, RAIL

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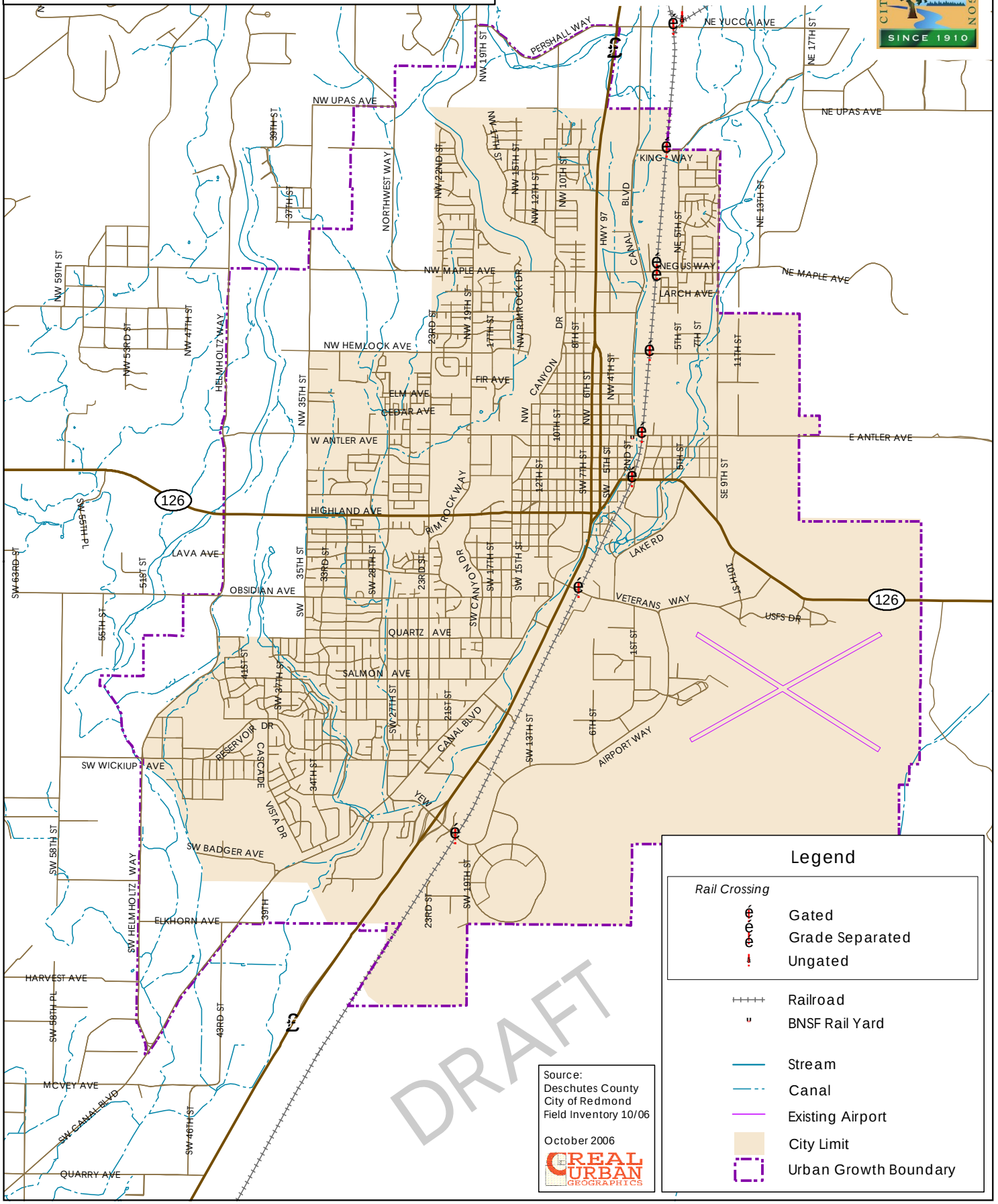
City of Redmond
Transportation System Plan



ITS

Existing Intelligent Transportation Systems (ITS) equipment in the City of Redmond is limited to signal interconnect conduit and two CCTV cameras. Conduit is located along the Highland Avenue/Glacier Avenue couplet, westward on Highway 126 to Rimrock Avenue, as well as 9th Street between Kalama Street Avenue and Highland Avenue. The signal interconnect conduit allows for coordination of the traffic signals which can reduce delay and improve traffic operations. Images from the two CCTV cameras, located at Roberts Field and Highland Avenue/US 97, can be viewed on the internet to provide visual weather and traffic information to drivers. Figure 3-10 shows the location of ITS infrastructure in the City of Redmond.

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Figure 3-10
EXISTING ITS INFRASTRUCTURE

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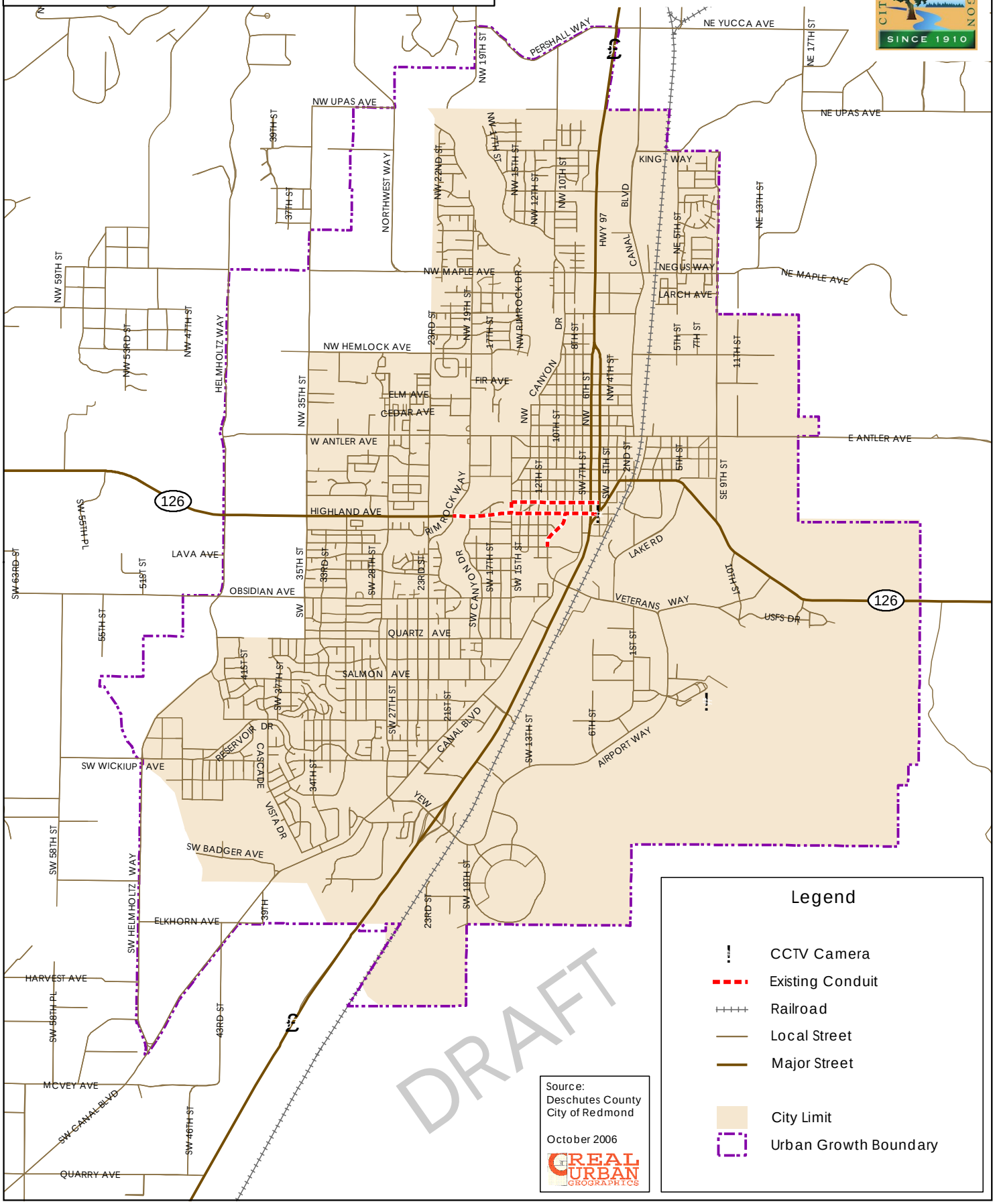
City of Redmond
Transportation System Plan



4. Future Needs

Overview

This chapter summarizes future transportation needs for the City of Redmond. Land use and population growth were projected to the year 2030 to identify future transportation demand and areas of the system that would not be sufficient to support growth. The following sections present the projected land use and growth, and summarize traffic, pedestrian and bicycle mode needs.

Future Travel Demand and Land Use

The Redmond Transportation System Plan (TSP) Update addresses existing system needs and additional facilities that are required to serve future growth to the future forecast year of 2030. The Redmond small-urban area model developed by ODOT's Transportation Planning Analysis Unit (TPAU) was used to determine future traffic volumes in Redmond. This forecast model translates assumed land uses into auto travel and assigns motor vehicles to the roadway network. These traffic volume projections form the basis for identifying potential roadway deficiencies and for evaluating alternative circulation improvements. This section describes the forecasting process including key assumptions and the land use scenario developed from the existing Comprehensive Plan designations and allowed densities.

Projected Land Use Growth

Land use is a key factor in developing a functional transportation system. The amount of land that is to be developed, the type of land uses and how the land uses are mixed together have a direct relationship to expected demands on the transportation system. Understanding the amount of land to be developed, and the type of land use, is critical to taking actions to maintain or enhance transportation system operation.

Projected land uses are developed for the study area and reflect buildout of Redmond's Comprehensive Plan for the year 2030. Complete land use data sets are developed for the following conditions.

- Existing 2000 (base travel forecast for the City)
- Future 2030 Conditions

The following sections summarize the forecasted growth in land uses that influence travel within Redmond.

Growth Within Redmond

The base year travel model is updated periodically to reflect the most current and up to date inputs related to land use for the region. For this study effort the available base model provided by TPAU represents land uses for 2000. This land use database includes the number of dwelling units (housing), retail employees, service employees, and other employee types. Table 4-1 summarizes the aggregated

land use inputs for the 2000 base and future 2030 scenarios within the City of Redmond Urban Growth Boundary (UGB). This land use is broken up within the study area through a serious of smaller areas called Transportation Analysis Zones (TAZs). Each TAZ contains a portion of the households, retail, service and other employees. A detailed summary of the uses for each Transportation Analysis Zone (TAZ) within the Redmond study area is provided in the technical appendix. The TAZ boundaries are shown in Figure 4-1.

Table 4-1: Redmond UGB Area Land Use Summary

Land Use	2000	2030	Increase	Percent Increase
Population	20,762	59,099	38,337	185%
Households	7,801	24,494	16,693	214%
Retail Employees	2,431	6,913	4,482	184%
Service Employees	2,440	6,090	3,650	150%
Other Employees	3,013	9,538	6,525	217%

SOURCE: TPAU

As land uses change in proportion to each other (i.e. a significant increase in employment relative to household growth), there is a shift in the overall operation of the transportation system. Retail land uses generate higher amounts of trips per acre of land than households and other land uses during they PM peak period. The location and design of retail land uses in a community can greatly affect future transportation system operation. Additionally, if an area within the city is homogeneous in land use character (i.e. all employment or residential), the transportation system typically supports significant trips coming to or from the area rather than within the area. Typically, there should be a mix of residential, commercial, and employment type land uses within an close area so that some residents may work and shop locally, reducing the need for residents to travel long distances.

Table 4-1 indicates that significant employment growth (approximately 14,650 jobs) is expected within the City of Redmond in the next 20 years. This growth in employment keeps pace with the growing population to balance the transportation system. However, the growth rates are significant and the transportation infrastructure needed to support this growth is significant. External growth due to other communities and destination resorts is also accounted in future model forecasts. A primary purpose of this TSP update is to determine those needs and help determine transportation projects for all modes that help balance the future needs with the forecasted 2030 land uses.

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Figure 4-1
TRANSPORTATION ANALYSIS ZONES (TAZ)

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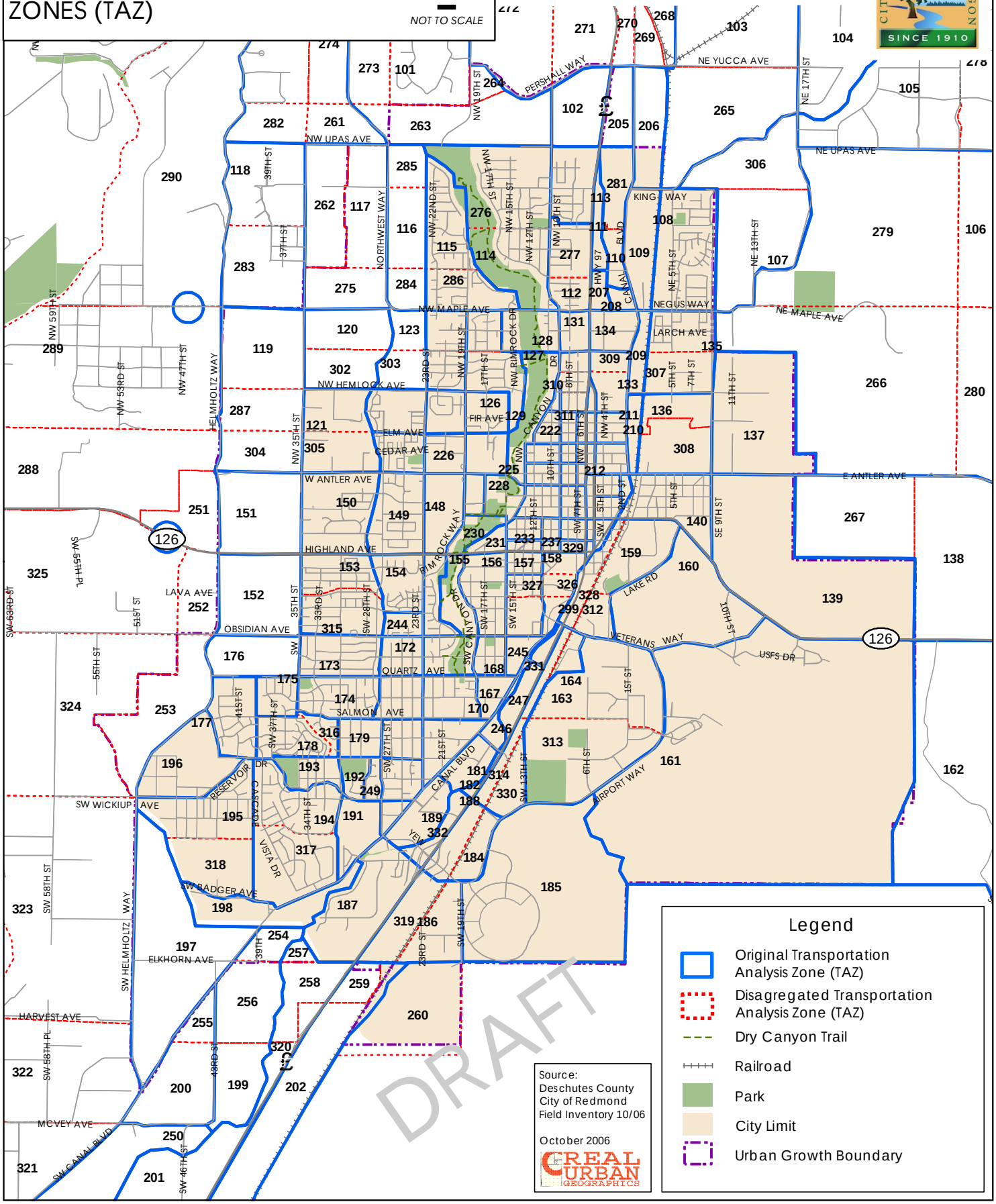
City of Redmond
Transportation System Plan



Redmond Area Transportation Model

A determination of future traffic system needs in Redmond requires the ability to accurately forecast travel demand resulting from estimates of future population and employment for the City. The objective of the transportation planning process is to provide the information necessary to make decisions on where and when improvements should be made to the transportation system to meet future travel demand. TPAU uses a transportation modeling program to process the large amounts of data related to land use and vehicle trips for travel in the Redmond area. The modeling process for the Redmond TSP Update uses the 2000 and 2030 travel demand models during the PM peak period to develop future forecasts within the City of Redmond.

Future travel demand forecasting can be divided into several distinct but integrated components that represent the logical sequence of travel behavior (see Figure 4-2). These components and their general order in the traffic forecasting process are as follows:

- ***Trip Generation*** – This stage of the modeling process converts the land use into vehicle trips.
- ***Trip Distribution*** – This step determines the locations that these trips would go to and come from within the model area.
- ***Mode Choice*** – In models for MPO areas, this step would determine how person trips split into different travel modes (i.e. motor vehicle, bicycle, pedestrian, transit, carpool, etc). For Redmond, the small-urban area model only forecasts the motor vehicle mode.
- ***Traffic Assignment*** – The final step in the modeling process assigns the trips by mode to specific routes in the transportation network that match the trip distribution locations.

The base roadway network in the 2000 traffic model reflects the base year street and roadway system. The future 2030 roadway system in the Redmond model consists of a financially constrained system, which means it includes projects that funding has been currently identified for (e.g. the State Transportation Improvement Program (STIP) and the City of Redmond Capital Improvement Plan (CIP)). Future street extension projects included in the 2030 financially constrained system are:

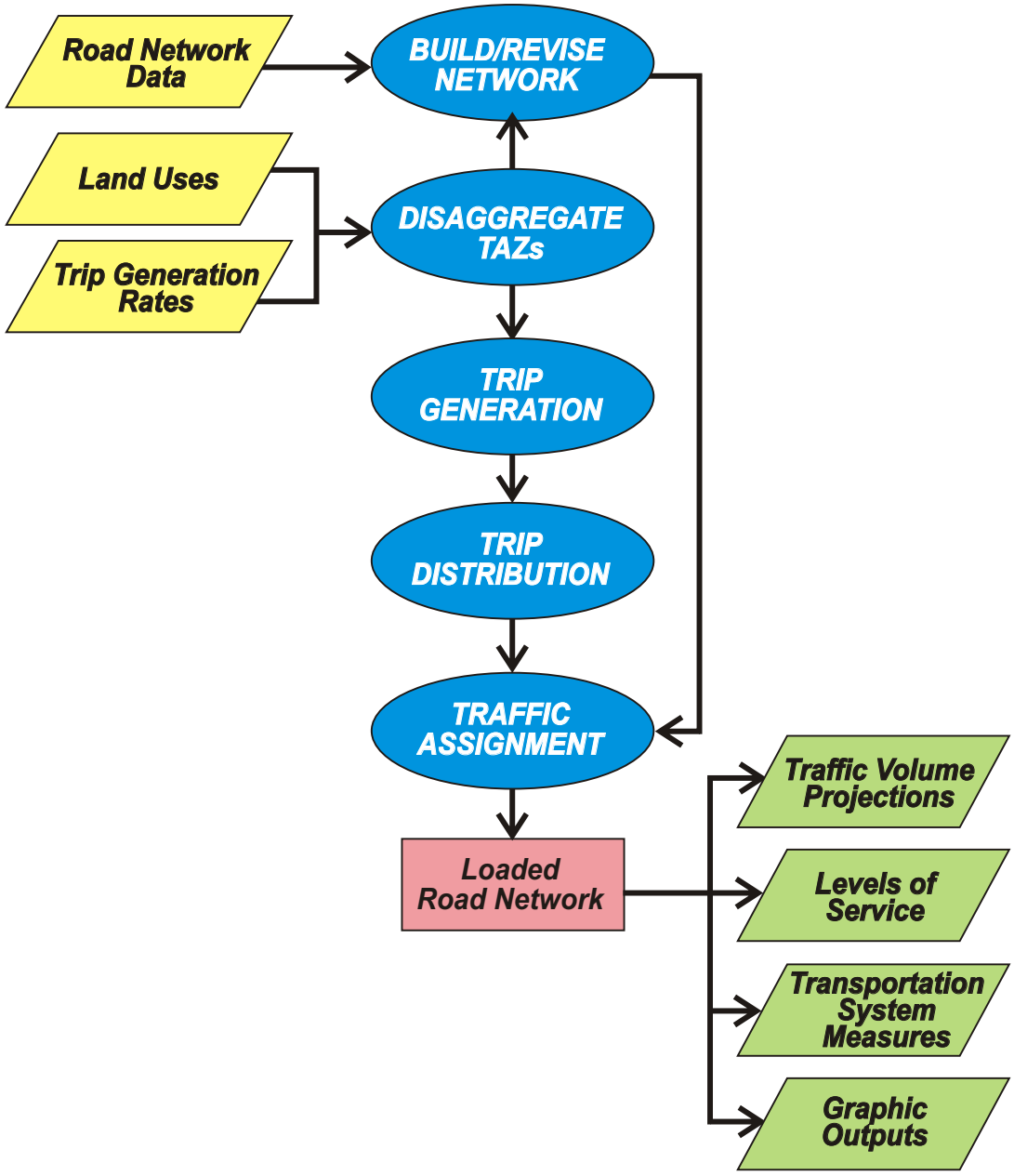
- NW Pershall Lane – Extend existing alignment to Northwest Way
- NW Maple Avenue – NW Helmholtz Way to NW 35th Street
- NW 27th Street – NW Maple Avenue to NW Greenwood Avenue
- NW 27th Street – OR 126 to NW Glacier Avenue
- SE 9th Street – Connection from OR 126 to SE 13th Street
- SW Quartz Avenue – SW Helmholtz Way to SW 35th Street
- SW Quartz Avenue – SW Canal Boulevard to SE 1st Street
- SW Salmon Avenue – Connect SW 19th Street/Salmon Avenue to SW Canal Boulevard/ Odem Medo
- SW Elkhorn Avenue – Extend existing alignment to 19th Street

In addition to street extensions, the 2030 model also assumes turn restrictions that limit movements to right-in-right-out access at several locations including:

- US 97/Oneil Way
- US 97 Reroute/NW Larch Avenue

- US 97 Reroute/NE Hemlock Avenue
- US 97 Reroute/NE Antler Avenue
- US 97/SW Wickiup Avenue
- OR 126/SW 31st Avenue
- OR 126/SW 23rd Avenue

Forecasts of PM peak period traffic flows were produced for every major roadway segment within Redmond. Traffic volumes were projected on all arterials and most collector streets. Some local streets were included in the model, but many are represented by TAZ connectors in the model process.



City of Redmond Transportation System Plan

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FIGURE 4-2: MODEL PROCESS

Trip Generation

The trip generation process translates land use quantities (number of dwelling units, retail employees, service employees and other employees) into vehicle trip ends (number of vehicles entering or leaving a TAZ) using trip generation rates established during the model verification process. The TPAU trip generation process is elaborate, entailing detailed trip characteristics for various types of housing, retail, service, and other employment, and special activities. Typically, most traffic impact studies seen by local agencies rely on the Institute of Transportation Engineers (ITE) research for analysis.[12] The model process is tailored to variations in travel characteristics and activities in the region, including estimation of the likelihood for trip potential to be achieved for a particular land area. For reference, Table 4-2 provides a summary of the approximate average evening peak hour trip rates achieved in the Redmond model. These are averaged over a broad area and, thus, are different than driveway counts represented by ITE for similar land uses. This data provides a reference for the trip generation process used in the model.

Table 4-2: Approximated PM Peak Period Trip Rates Achieved in the Redmond Model

	Average Trip Rate/Unit		
Unit	**In**	**Out**	**Total**
Household (HH)	0.38	0.26	0.64
Retail Employee (RET)	0.35	0.52	0.87
Service Employee (SER)	0.29	0.47	0.76
Other Employee (OTH)	0.09	0.27	0.36

SOURCE: Redmond 2030 Travel Demand Model (TPAU)

Table 4-3 summarizes the total modeled 2000 and 2030 motor vehicle trips for the City of Redmond. Vehicle trips in Redmond are expected to grow by approximately 114 percent between 2000 and 2030 if the land develops according to the 2030 land use assumptions. Assuming a 30-year horizon to the 2030 scenario, this represents an annualized growth rate of approximately 2.4 percent per year.

Table 4-3: Redmond Vehicle Trip Generation (PM Peak Hour)

	2000 Trips	2030 Trips	Percent Increase
Redmond UGB Area	9,000	18,360	104%

SOURCE: Redmond Travel Demand Model (TPAU)

Note: Adjusting for the difference between ITE household trip rates and average model household trip rates, as well as factoring internal trips to determine trip ends within the city, the total growth in trip ends would be approximately 21,200.

Trip Distribution

This step estimates how many trips travel from one area in the model to any other area. Distribution is based on the number of trip ends generated in each TAZ zone pair, and on factors that relate the likelihood of travel between any two TAZs to the travel time between the zones.

[12] *Trip Generation Manual*, 7th Edition, Institute of Transportation Engineers, 2003.

In projecting long-range future traffic volumes, it is important to consider potential changes in regional travel patterns. Although the locations and amount of traffic generation in Redmond are essentially a function of future land use in the city, the distribution of trips is influenced by expected congestion on roadways and regional growth, particularly in neighboring areas such as Bend and unincorporated Deschutes County. The model and trip distribution can also be used to help define the number of internal, external and through trips for the City of Redmond. These types of trips are as follows:

- **Internal trips** are trips that start and end within the City of Redmond UGB;
- **External trips** are trips that either start in Redmond and end outside the city, or start outside the city and end within the city; and
- **Through trips** are trips that pass through Redmond and have neither an origin nor a destination in Redmond.

Table 4-4 quantifies the internal, external, and through trips for all roadways within the City of Redmond, as forecast by the travel demand model for 2000 and 2030. Comparing the percentage of trips for the model year 2030 versus 2000 shows there is an increase in the percentage of internal trips and a decrease in the percentage of external trips during the PM peak period. This could be an indication that the balanced growth in land use reduces the number of Redmond residents that commute outside of the city for work or shopping.

Table 4-4: Redmond Vehicle Trip Distribution (PM Peak Hour)

Trip Type	2000	2030	Change
Internal (I – I)	47%	54%	+ 7%
External (X– I or I - X)	41%	34%	- 7%
Through (X - X)	12%	12%	0

SOURCE: Redmond Travel Demand Model (TPAU)

Traffic Assignment

In this process, trips from one zone to another are assigned to specific travel routes in the network, and resulting trip volumes are accumulated on links of the network until all trips are assigned.

Network travel times are updated to reflect the congestion effects of the traffic assigned through an equilibrium process. Congested travel times are estimated using what are called "volume-delay functions" in VISUM. There are different forms of volume/delay functions, all of which attempt to simulate the impact of congestion on travel times (greater delay) as traffic volume increases. The volume-delay functions take into account the specific characteristics of each roadway link, such as capacity, speed and facility type. This allows the model to reflect conditions somewhat similar to driver behavior.

Model Application to Redmond

PM peak hour volumes were extracted from the model for both the base year 2000 and forecast year 2030 scenarios. A "post processing" technique following NCHRP 255 Methodology[13] is utilized to

[13] *Highway Traffic Data for Urbanized Area Project Planning and Design - National Cooperative Highway Research Program Report 255*, Transportation Research Board, Washington D.C., 1982.

refine model travel forecasts to the volume forecasts utilized for 2030 intersection analysis. Post processing is a methodology that employees using existing count data, base year model data and future year model data to help determine future volumes by adding the increment of growth in volumes between the future and base year models to the existing count data. This methodology minimizes the effects of any model error by adding the increment of growth projected based on changes in land use to the base year counts.

Motor Vehicle Conditions and Needs

Streets and study intersections were analyzed with the projected 2030 Base traffic volumes to provide a basis to compare future improvement alternatives. The traffic volumes for this scenario were developed as described in the previous sections. The transportation network for this scenario includes projects that are expected to be constructed by 2030 to increase connectivity throughout the City of Redmond (especially in the northwest area). The US 97 Reroute around the downtown area is also assumed.

While the additional planned roadways relieve streets that are congested under existing conditions, they do not provide adequate capacity for the future growth and transportation needs of the City. Important transportation corridors such as US 97, OR 126, Helmholtz Way, South Canal Boulevard and Maple Avenue would be near or over capacity during the traffic peak. Approximate 2030 raw model volumes[14] and volume-to-capacity ratios for Redmond are shown in Figure 4-3. Study intersections operations were analyzed to determine the critical areas of the transportation network to be areas of focus in the alternatives analysis.

Traffic Operations

Intersection Operating Conditions

The 2030 Base intersection volumes for the PM peak hour were used to determine the study intersection operating conditions based on the *2000 Highway Capacity Manual*[15] methodology for signalized and unsignalized intersections. Level of service (LOS) descriptions and HCM methodology are included in the Existing Conditions chapter. Traffic volumes and level of service calculation sheets can be found in the technical appendix. Intersections within the existing alignment of US 97 that would be bypassed with the new US 97 Reroute were assumed to be transferred to City of Redmond control.

Nearly half of the 72 study intersections would not meet performance standards under the 2030 Base transportation network. Primary areas where intersections do not meet performance standards include:

- The southern portion of US 97 between Quarry Avenue and the US 97 Reroute;
- OR 126, especially with high cross-street traffic west of US 97;
- South Canal Boulevard; and
- 27th Avenue.

In addition, intersections along Helmholtz Way are also nearing capacity. Table 4-5 summarizes the 2030 Base intersection operation at study intersections.

[14] Note that volumes shown are raw model volumes and are not post-processed for detailed analysis as described in the previous section.

[15] *2000 Highway Capacity Manual*, Transportation Research Board, 2000.

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Figure 4-3
2030 PM Peak Hour Model Volume and Volume/Capacity

City of Redmond Transportation System Plan

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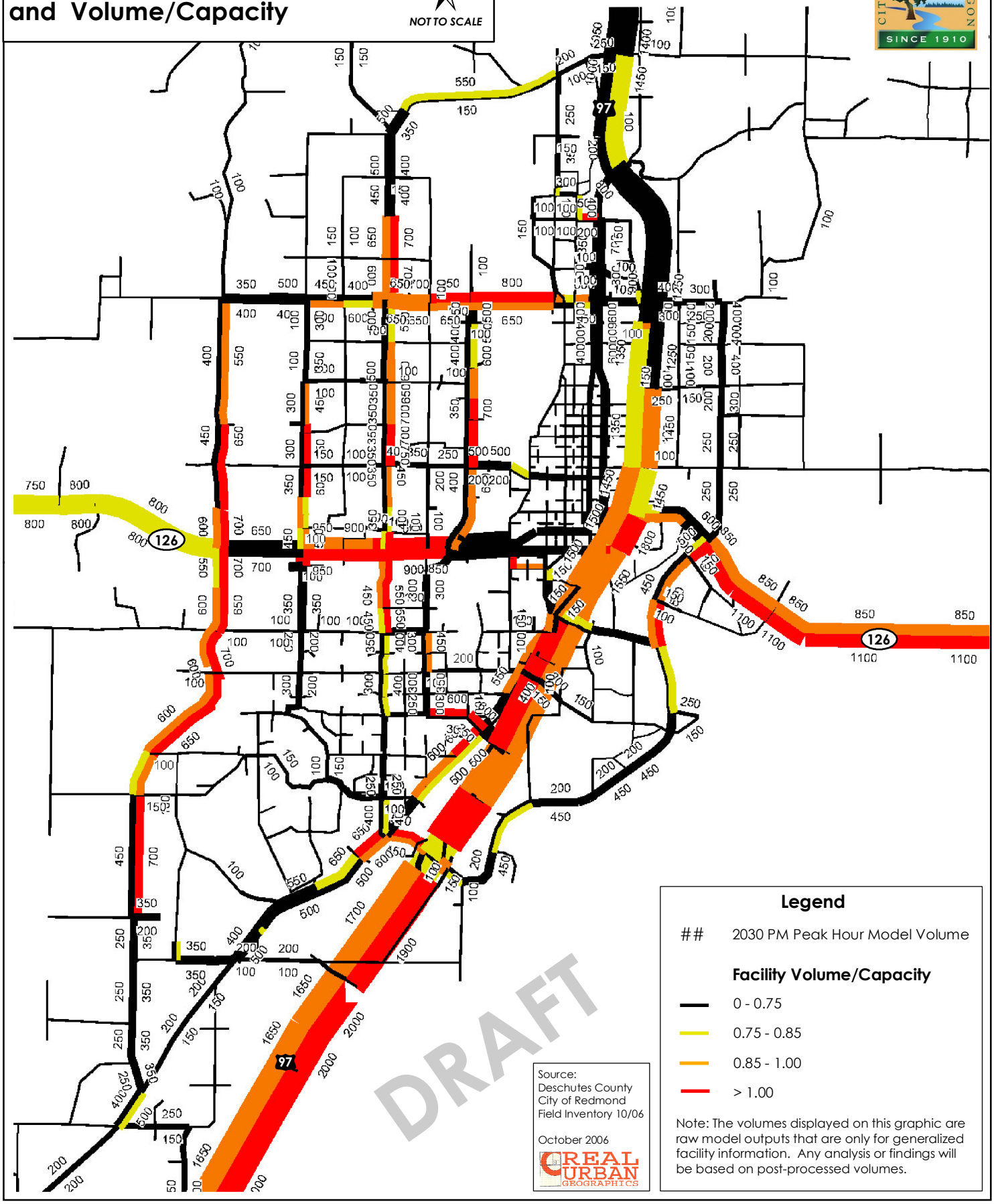

Legend

2030 PM Peak Hour Model Volume

Facility Volume/Capacity

- 0 - 0.75
- 0.75 - 0.85
- 0.85 - 1.00
- > 1.00

Note: The volumes displayed on this graphic are raw model outputs that are only for generalized facility information. Any analysis or findings will be based on post-processed volumes.

Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

REAL URBAN GEOGRAPHICS

Table 4-5: 2030 No Build Design Hour Intersection Level of Service

Intersection	LOS	Average Delay (s)	Volume / Capacity	Performance Standard	Standard Met?
Signalized Intersections – ODOT					
15th Ave/Highland (OR 126)	D	38.4	0.97	0.70	**NO**
Rimrock Way/Highland Ave (OR 126)	C	25.3	0.88	0.70	**NO**
11th St/Glacier Ave (OR 126)	B	11.4	0.33	0.70	YES
11th St/Highland Ave (OR 126)	B	14.9	0.40	0.70	YES
9th St/Glacier Ave/(OR 126)	B	12.8	0.37	0.70	YES
9th St/Highland Ave (OR 126)	B	10.0	0.30	0.70	YES
6th St/Glacier Ave (OR 126)	A	9.5	0.45	0.70	YES
6th St/Highland Ave (OR 126)	C	25.6	0.33	0.70	YES
5th St/Glacier Ave (OR 126)	B	11.0	0.49	0.70	YES
5th St/Highland Ave (OR 126)	E	59.0	0.98	0.70	**NO**
US 97/Veterans Way	E	74.7	>1.0	0.70	**NO**
US 97/Odem Medo	F	>80.0	>1.0	0.70	**NO**
US 97/Quartz	B	10.0	0.72	0.70	**NO**
US 97 Reroute/Highland Ave	C	34.4	0.90	0.70	**NO**
US 97 Reroute/Evergreen Ave	D	46.3	0.98	0.70	**NO**
Signalized Intersections – City of Redmond					
27th St/Maple Ave	C	24.0	0.73	D	YES
19th St/Antler Ave	A	7.0	0.56	D	YES
Old US 97/Maple Ave	D	38.3	0.90	D	YES
6th St (Old US 97 SB)/Black Butte Ave	B	15.1	0.51	D	YES
6th St (Old US 97 SB)/Evergreen Ave	B	16.4	0.66	D	YES
5th St (Old US 97 NB)/Evergreen Ave	C	25.1	0.79	D	YES
9th St/Fred Meyer Access	A	5.2	0.27	D	YES
S Canal Blvd/Veterans Way	D	43.3	1.0	D	YES
Unsignalized Intersections – ODOT					
Helmholtz Way/Highland (OR 126)	A/F	-	0.21/>1.0	0.70	**NO**
31st Ave/Highland (OR 126)	A/C	-	0.57/0.29	0.70	YES
27th Ave/Highland (OR 126)	B/F	-	0.56/>1.0	0.70	**NO**
23rd St/Highland Ave (OR 126)	C/D	-	0.57/0.47	0.70	YES
US 97/O'Neil Hwy	A/C	-	0.46/0.34	0.80	YES
US 97 (SB)/Yew Ave	B/F	-	0.33/>1.0	0.85	**NO**
US 97 (NB)/Yew Ave	A/F	-	0.34/>1.0	0.85	**NO**
US 97 /Quarry Road	F/F	-	>1.0/>1.0	0.70	**NO**
E 9th Ave/OR 126	A/F	-	0.30/>1.0	0.70	**NO**
Veterans Way/OR 126	B/D	-	0.63/0.32	0.70	YES
Lake Rd/OR 126	A/F	-	0.45/1.0	0.70	**NO**
US 97 Reroute/Antler Ave	A/C	-	0.67/0.42	0.70	YES
US 97 Reroute/Hemlock Ave	A/C	-	0.62/0.12	0.70	YES
US 97 Reroute SB Ramps/Old US 97	A/B	-	0.17/0.26	0.85	YES
US 97 Reroute NB Ramps/Old US 97	A/B	-	0.20/0.10	0.85	YES
Unsignalized Intersections – Deschutes County					
10th St/Pershall Way	A/C	-	0.11/0.66	D	YES
Unsignalized Intersections – City of Redmond					
Helmholtz Way/Maple Ave	A/D		0.03/0.57	D	YES
Helmholtz Way/Antler Ave	A/D		0.05/0.30	D	YES
Helmholtz Way/Obsidian Ave	A/D		0.01/0.20	D	YES
Helmholtz Way/Wickiup Ave	A/E		0.06/0.45	D	**NO**
Helmholtz Way/S Canal Blvd	A/B		0.29/0.30	D	YES

Intersection	LOS	Average Delay (s)	Volume / Capacity	Performance Standard	Standard Met?
27th St/Antler Ave*	F	>50.0	>1.0	D	NO
27th St/Obsidian Ave*	C	20.1	0.84	D	YES
27th St/Salmon Ave*	D	30.7	0.94	D	YES
27th St/Wickiup Ave*	E	37.8	1.0	D	NO
27th St/S Canal Blvd	A/F		0.10/>1.0	D	NO
19th St/Maple Ave	A/F		0.35/>1.0	D	NO
19th St/Hemlock Ave	A/C		0.02/0.25	D	YES
19th St/Yew Ave	A/C		0.40/0.33	D	YES
9th St/Maple Ave	A/F		0.08/>1.0	D	NO
Old US 97/Quince	A/F		0.14/0.93	D	NO
Old US 97/Kingwood	A/E		0.21/0.57	D	NO
6th St (Old US 97 SB)/Dogwood Ave	A/C		0.22/0.37	D	YES
6th St (Old US 97 SB)/Antler Ave	A/C		0.27/0.19	D	YES
5th St (Old US 97 NB)/Dogwood Ave	A/E		0.34/0.71	D	NO
5th St (Old US 97 NB)/Antler Ave	A/C		0.27/0.27	D	YES
5th St (Old US 97 NB)/Black Butte Ave	A/F		0.24/0.74	D	NO
S Canal Blvd/Obsidian Ave*	C	24.0	0.84	D	YES
S Canal Blvd/Quartz Ave	A/F		0.12/>1.0	D	NO
S Canal Blvd/Salmon Ave	A/E		0.33/0.46	D	NO
S Canal Blvd/Odem Medo Ave	A/F		0.13/>1.0	D	NO
Airport Way/Veterans Way	A/F		0.44/>1.0	D	NO
E 9th St/Hemlock Ave	A/B		0.06/0.18	D	YES
E 9th St/Antler Ave	A/B		0.01/0.08	D	YES
35th St/Maple Ave	A/A	-	0.17/0.06	D	YES
27th St/Upas Ave	A/E	-	0.03/0.91	D	NO
27th St/Hemlock Ave*	E	45.6	0.84	D	NO
Old US 97/Oak Ave	A/F	-	0.21/>1.0	D	NO
Lake Rd/Veterans Way	A/E	-	0.42/0.66	D	NO

Notes: Unsignalized Intersection Operations:

A/A = Major street turn LOS / Minor street turn LOS

#/# = Major street turn v/c / Minor street turn v/c

Signalized and All-Way Stop Intersections:

Delay = Average vehicle delay in the peak hour for entire intersection in seconds.

* All-Way Stop Intersection

Pedestrian Needs

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand throughout Redmond. Pedestrian travel in and around the study area needs to provide a safe, efficient and interconnected system that can afford users the ability to consider walking as a viable mode of travel for trips that are one mile in length or less. The following needs have been identified for pedestrian access and circulation within the City of Redmond:

Gaps in the Pedestrian Network

Arterial and collector streets in Redmond provide a limited sidewalk inventory (see Figure 4-4). Sidewalks are provided in the downtown grid and many newer residential neighborhoods, but there are limited connections and only intermittent sidewalks connecting the rest of the City. Additionally, the pedestrian system also has significant existing barriers (e.g. Dry Canyon and the railroad) and future barriers (the US 97 Reroute) that contribute to poor connectivity throughout the city.

An important existing pedestrian need in Redmond is providing sidewalks on all arterial, collector and local roadways and providing a connection from residential areas to schools, parks and shopping centers. This includes the need for safe, well lighted arterial, collector, and local streets with suitable pedestrian amenities and crossing facilities to reduce the barriers for pedestrian travel. Pedestrian facility needs in Redmond must consider the three most prevalent trip types:

- **Residential based trips** – home to school, home to home, home to retail, home to park, home to transit, home to entertainment
- **Service based trips** – multi-stop retail trips, work to restaurant, work to services, work/shop to transit
- **Recreational based trips** – home to park, exercise trips, casual walking trips

Residential trips need a set of interconnected sidewalks radiating out from homes to destinations within one-half to one mile. Beyond these distances, walking trips of this type become substantially less common (over 20 minutes). Service based trips require direct, conflict-free connectivity between uses (for example, a shopping mall with its central spine walkway that connects multiple destinations). Service based trips need a clear definition of connectivity. This requires mixed use developments to locate front doors which relate directly to the public right-of-way and provide walking links between uses within one-half mile. Recreational walking trips have different needs. Off-street trails, well landscaped sidewalks and relationships to unique environment (creeks, trees, farmland) are important.

The most common need is to provide a safe and interconnected system that affords the opportunity to consider the walking mode of travel, especially for trips less than one mile in length

Pedestrian Crossing Enhancements

Under future year conditions, many of the arterials through Redmond will experience significant increases in motor vehicle traffic volume (and possibly road widening) that will reduce the ability for pedestrians to safely cross. Motor-vehicle volume and lane configurations at unsignalized intersections

were examined and compared to the criteria[16] for considering marked crosswalks and other pedestrian enhancements. Generally, arterials speeds above 30 mph and volumes above 9,000 vehicles per day are locations were enhanced pedestrian crossings should be considered at unsignalized intersections. In addition, enhanced crossing should be considered at mid-block locations that are more than 500 feet from an intersection. Several corridors in Redmond meet these general criteria and should be examined to potential pedestrian crossing enhancements, including:

- US 97 from the Reroute to the south City limits
- ORE 126 from 15th Street to the west City limits
- ORE 126 from US 97 Reroute to east City limits
- Maple Avenue from 6th Street to 27th Street
- 27th Street from Maple Avenue to Obsidian Drive
- Helmholtz Way from Maple Avenue to Wickiup Avenue
- South Canal Boulevard from Green Boulevard to Veterans Way
- Rimrock Way-19th Street from ORE 126 to Maple Avenue

Potential pedestrian enhancements include the construction of curb extensions to improve the safety at intersections by reducing the crossing distance, pedestrian level lighting, enhance striping and signing, and median refuge islands. Curb extensions can also implemented to enhance the urban design and aesthetic value through the downtown area.

[16] *Traffic Control Devices Handbook*, Institute of Transportation Engineers, 2001; Chapter 13, Table 13-2.

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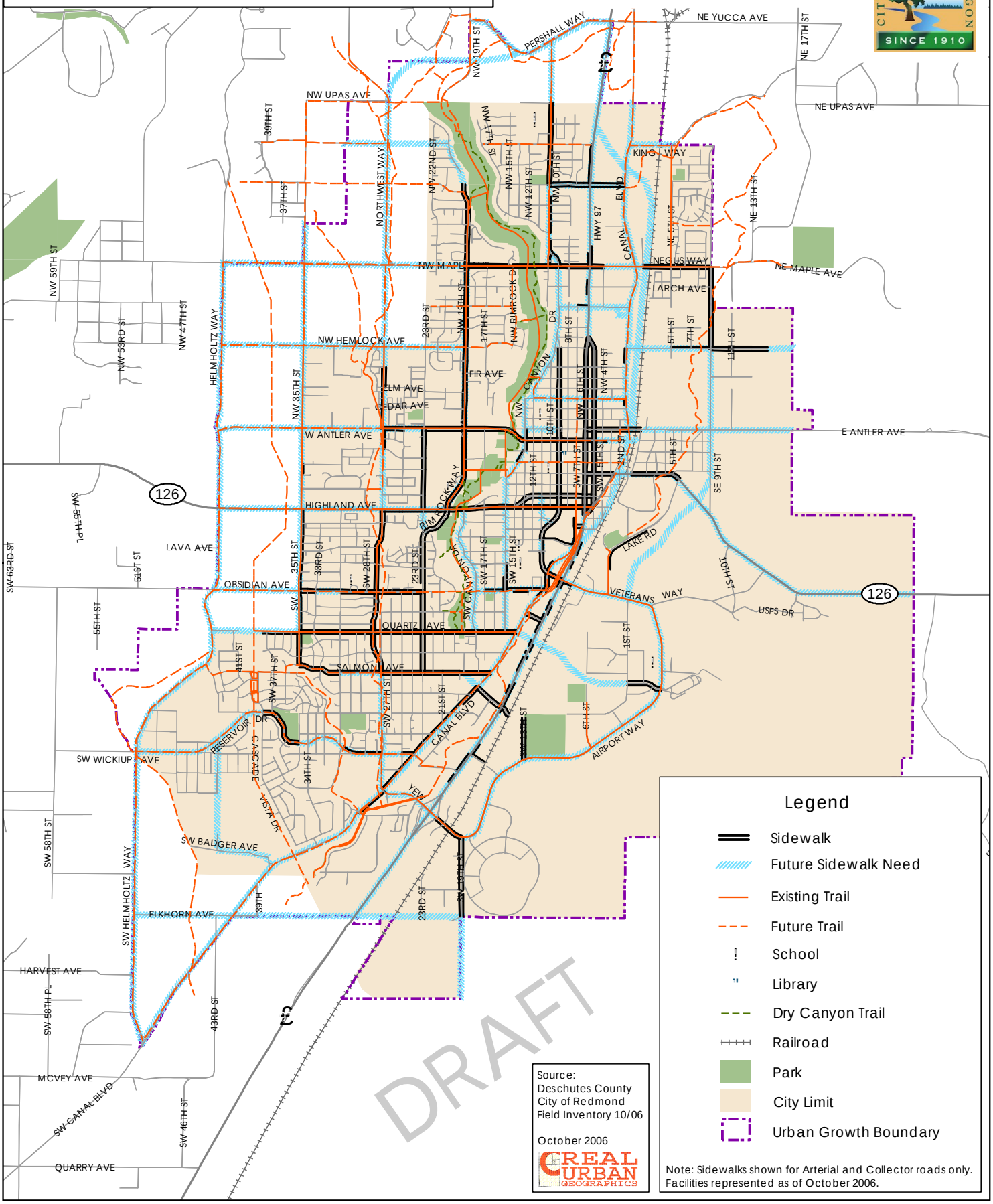
Figure 4-4
PEDESTRIAN NEEDS

NOT TO SCALE

City of Redmond
Transportation System Plan



Legend

- Sidewalk
- Future Sidewalk Need
- Existing Trail
- Future Trail
- School
- Library
- Dry Canyon Trail
- Railroad
- Park
- City Limit
- Urban Growth Boundary

Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

CREAL URBAN GEOGRAPHICS

Note: Sidewalks shown for Arterial and Collector roads only.
Facilities represented as of October 2006.

Bicycle Needs

The locations of existing bikeways and activity centers such as parks, schools, and the city library were identified in the Existing Conditions chapter. Bicycle system needs were identified based on this inventory.

Issues to be Addressed

State policy from the Transportation Planning Rule[17] indicates that all arterial and collector roadways either have bikeways when constructed or improved, or that an adjacent parallel facility is provided. Figure 4-5 identifies bicycle facilities that were previously inventoried as well as areas that will be collectors or arterials that do not contain bicycle facilities. While bicycle facilities exist along major roadways (though not through the downtown couplet), dedicated local access to these facilities is limited. Increasing connectivity would improve access from residential neighborhoods to city parks and other recreational trails, while enhancing and encouraging bicycle use in the community.

In addition to reducing general gaps in bicycle facility on connectors and arterials, other specific deficiencies include:

- Bicyclists in the downtown area are forced to share the roadway with vehicles or the sidewalk with pedestrians due to the lack of designated bicycle lanes;
- There are a lack of dedicated bicycle lanes along major roadways in Redmond;
- Many roadways are potentially wide enough to support bicycle use but striping for such use is not provided;
- There is limited access to the Dry Canyon Trail;
- There are limited safe crossing opportunities for OR 126; and
- Improved connection to key activity centers such as schools, parks, recreational facilities, and retail areas.

[17] OAR 660-012-0045 (3) (B)

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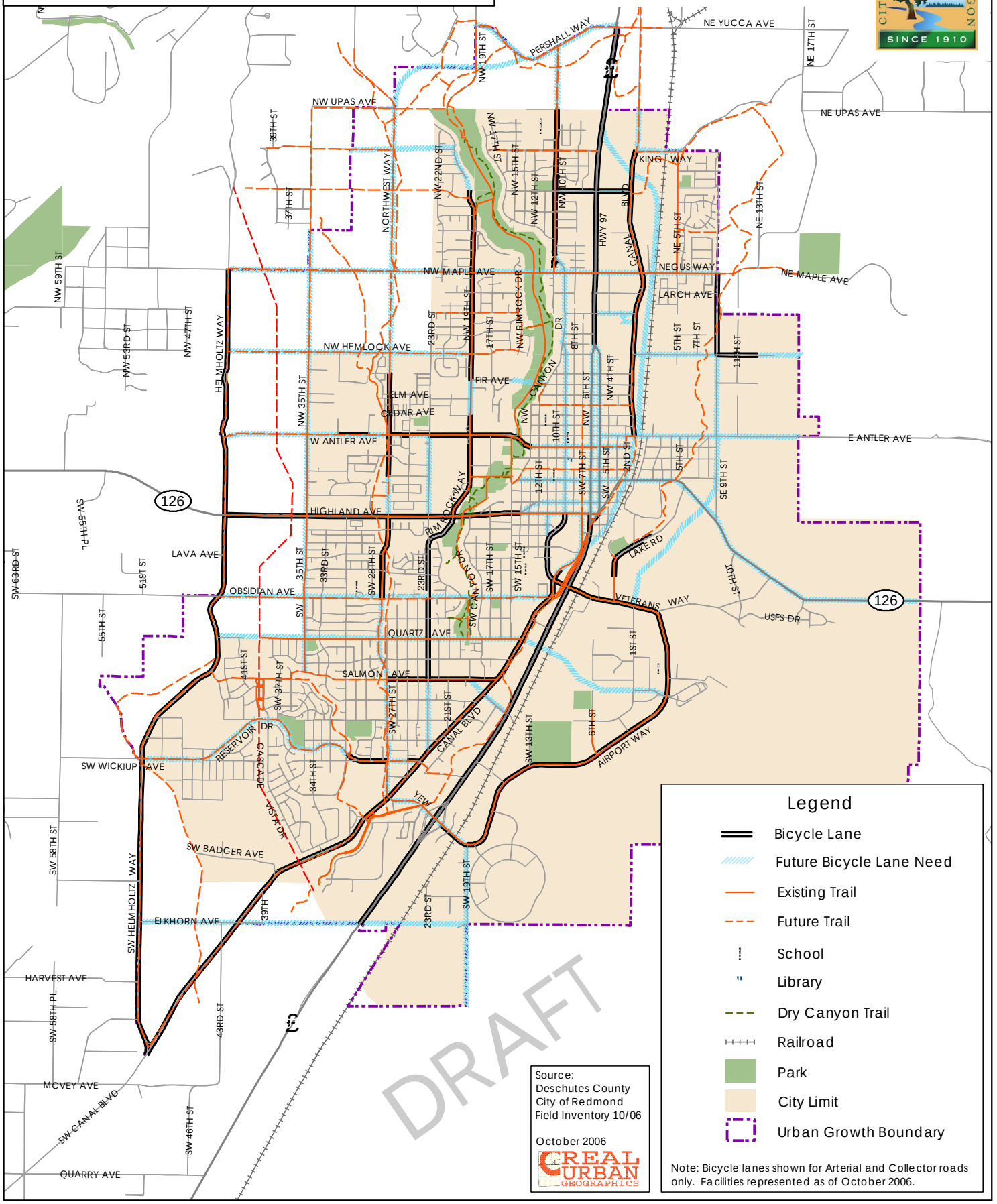
Figure 4-5
BICYCLE NEEDS

NOT TO SCALE

City of Redmond
Transportation System Plan



Transit Needs

The population estimates for the City of Redmond reach approximately 59,000 residents by the year 2030. As a City of over 50,000 residents, a transit system (likely including a fixed-route component) will become a requirement for adequately balancing transportation infrastructure with user needs. To begin planning for this system, the City of Redmond has received a grant from ODOT to undertake a Transit Feasibility Study, which will assess the viability of transit service in Redmond and make recommendations for locations of transit routes, the frequency of service, and user amenities that should be considered at transit stop locations. Prior to the completion of this study, this TSP should consider the needs for future transit service and identify placeholder strategies that could be implemented to address them.

To determine the potential for fixed route transit service within Redmond, a land use density analysis was conducted to identify areas of the City that could generate enough trips to support transit service. The minimum land use density[18] required to support a fixed route transit bus service with 1-hour schedule between arrivals is about four (4) housing units per acre or three (3) employees per acre. Figure 4-6 shows those areas in Redmond that meet this transit supportive density threshold with both the base year 2000 and future year 2030 land use assumptions. The base year 2000 areas that meet the density levels are approximately 7% of the City of Redmond UGB area. The future year 2030 transit supportive areas are approximately 45% of the City of Redmond UGB area. The significant growth in transit supportive areas with the 2030 land use forecasts support the need for transit service and identify areas primarily west of US 97 that should be considered for transit routes.

Issues to be Addressed

Issues that should be addressed in the transit plan include:

- Identify strategies for transit service that could support a local fixed route system
- Identify strategies to provide a transit service connection to surrounding communities

[18] Thresholds for minimum land use density to support fixed-route transit service are based on definitions in the 2000 *Highway Capacity Manual*, Chapter 27 for Transit service analysis methodologies.

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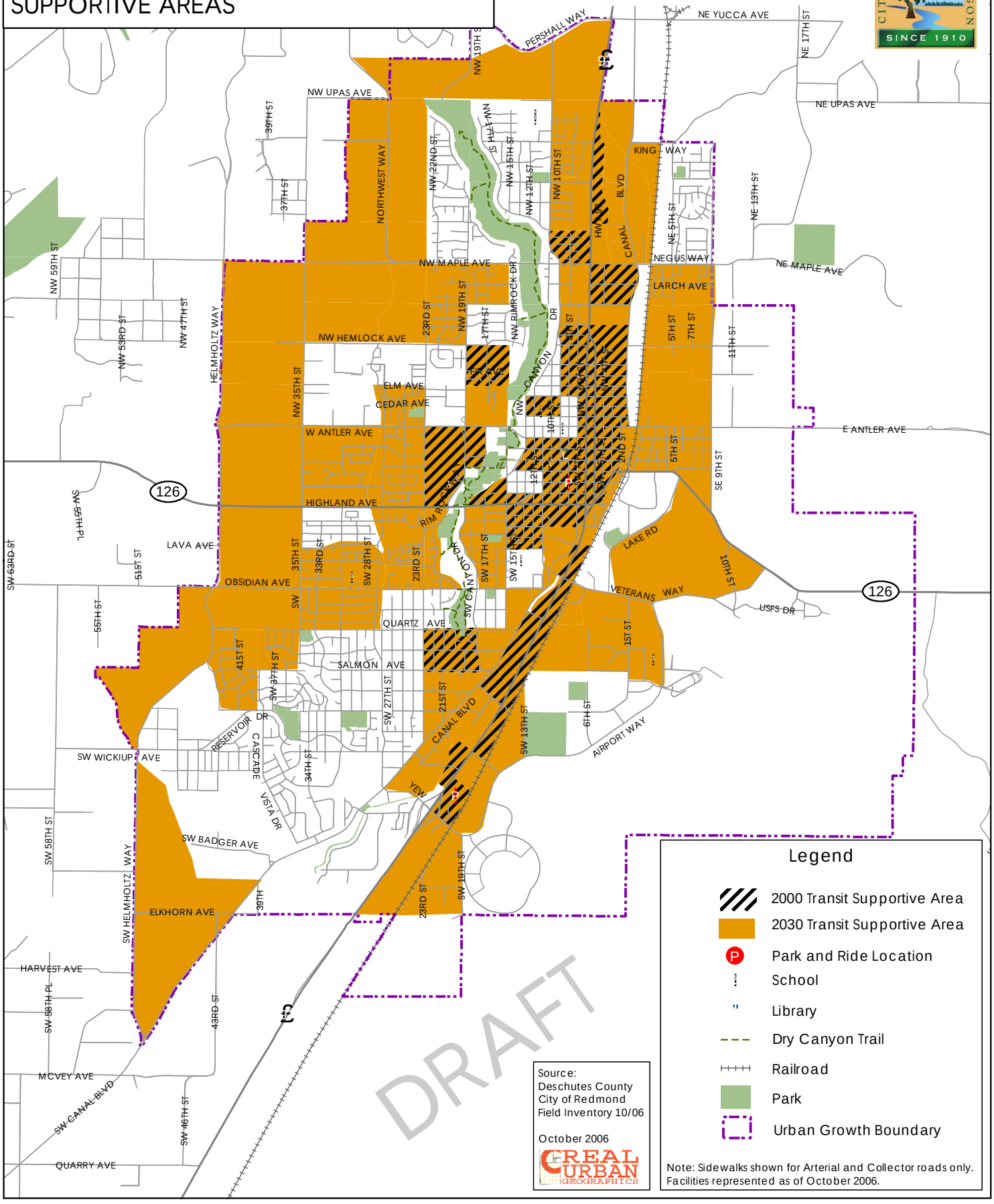
Figure 4-6
POTENTIAL TRANSIT SUPPORTIVE AREAS

NOT TO SCALE

City of Redmond Transportation System Plan



Rail Crossing Needs

The existing conditions inventory identified nine existing at-grade rail crossing in the study area. This will be reduced by the construction of the US 97 North Reroute, which will grade separate the crossing at Negus Way. The planned roadway system in the City will construct roadways across the rail line at Quartz Avenue and at Elkhorn Avenue. The crossing at Quartz Avenue will be at-grade since grade separation is not feasible due to the proximity of US 97. The crossing at Elkhorn Avenue should be grade-separated for safety and to maintain freight and auto mobility.

Air Needs

The Redmond Airport conducts their own master planning process to identify future needs and capital improvements. The growth of the Redmond Airport is including in the land use forecasts and vehicle trips estimates used for this study. The one key airport issue that will be addressed in the Redmond TSP is the realignment of Veterans Way to accommodate the planned runway extension.

5. Motor Vehicle Alternatives Analysis

Overview

This chapter summarizes alternatives to address the deficiencies identified in the Future Needs chapter. Numerous transportation improvements including facility upgrade, widening and extension were considered to address capacity needs. The following sections present the motor vehicle alternatives that were derived from the various network improvement projects that were considered.

Alternative Development

Various network improvements were grouped into three alternatives to address the Redmond transportation system deficiencies identified in the Future Needs analysis. The following section describes the process that was used to develop the alternatives.

Future Capacity Deficiencies

As presented in Chapter 4, capacity analysis of the 2030 Base transportation network indicated that nearly half of the 72 study intersections would not meet performance standards. General areas of deficiency that were identified include:

- The southern portion of US 97 between SW Quarry Avenue and the US 97 Reroute;
- OR 126, especially with high cross-street traffic west of US 97;
- South Canal Boulevard; and
- 27th Avenue.
- In addition, intersections along Helmholtz Way would also be approaching capacity.

Preliminary Alternative Analysis

A number of potential network improvements were developed to address the future capacity needs. These preliminary improvements were tested by informally using the travel demand model to determine the approximate relative impact on the transportation system. Improvements that increased capacity and attracted traffic from congested roadways were included in the final improvement alternatives. The following are improvements that were considered and the general effect that each would have on the transportation network during the PM peak (design hour). Some improvements may offer additional daily or seasonal benefits that are not reflected in the PM peak hour analysis.

US 97 Reroute, Phase II

This project would extend the US 97 Reroute southward to an interchange at Quarry Avenue, allowing through traffic to bypass the existing southern portion of US 97 in Redmond between Veteran's Way and Yew Avenue. Access to the US 97 Reroute would be limited to interchanges at Quarry Avenue, Evergreen Avenue (or vicinity) and the north interchange. The right-in-right-out access assumed at Antler Avenue and Hemlock Avenue under other scenarios (containing only the northern portion of the Reroute) would not be permitted. The Reroute was found to attract approximately 1,000 to 3,000 trips during the PM peak hour.

Airport Way Interchange

The southern extension to the US 97 Reroute was analyzed without access between Evergreen Avenue and Quarry Avenue. However, intermediate access at Airport Way would allow more direct access to the airport and Deschutes County Fairgrounds. The model indicated that the interchange would be utilized by approximately 250 to 500 vehicles during the PM peak hour and have limited effects on the daily transportation network. However, the greatest benefit of the interchange would be for special events at the fairgrounds.

Helmholtz Way Upgrade

Upgrading Helmholtz Way to a 5-lane arterial was investigated to provide relief to US 97 as an alternate north-south route in Redmond. This facility would provide access to the west portion of the city and would allow traffic to avoid using OR 126 to access US 97. The function of the facility would be somewhat limited by access constraints to US 97 via O'neil Way. However, the facility would attract approximately 250 to 1,000 vehicles during the peak hour from other facilities such as 19th Street and 27th Street.

Through access spacing management, the majority of the corridor could provide sufficient capacity as a 3-lane arterial. Capacity constraints would occur at major intersections (primarily at Helmholtz Way/OR 126). Providing a 5-lane section from Antler Avenue to SW Obsidian Avenue would allow a sufficient distance to promote balanced lane utilization at the intermediate intersections so that performance standards could be achieved.

SW 19th Street Extension

Extending SW 19th Street southward to connect with Deschutes Market Road would provide an additional route to Bend and may be utilized by regional traffic to avoid potential congestion on US 97. It was determined that approximately 100 to 400 vehicles travelling between Bend and Redmond may use this facility during the PM peak hour.

NW/SW 27th Street Widening

The 27th Street corridor was identified as needing additional capacity in the 2030 No Build analysis. Widening the facility to three lanes would provide additional capacity at intersections and would allow refuge for vehicles making left turn maneuvers.

SW Elkhorn Avenue Crossing

The grade-separated crossing of Elkhorn Avenue over US 97 could provide an alternative route across the highway in addition to Yew Avenue. However, the effects of the crossing in the travel model were found to be minimal. The model indicated that less than 100 trips during the peak hour would utilize the crossing and travel along Airport Way rather than using US 97. This improvement is included in the 2030 Base model.

NW Upas Avenue Crossing

Providing a grade-separated crossing of US 97 at Upas Avenue would allow traffic to travel between each side of US 97 in the event that O'Neil Avenue is access restricted. This crossing would particularly be of use to potential development area along US 97. The effect of the Upas crossing was found to shift approximately 50 to 100 vehicles from US 97 to the US 97 Reroute (which would provide access to the crossing via Canal Boulevard).

SW Quartz Avenue Connection

This project would extend Quartz Avenue from the current intersection location at South Canal Boulevard eastward across US 97 to Airport Way. Such a connection would provide a additional access between Airport Way and South Canal Boulevard that would not require traversing Veterans Way. Such a connection may be utilized by approximately 100 to 400 vehicles during the peak hour to alleviate traffic on Veterans Way. This improvement is included in the 2030 Base model.

O'Neil Junction Access

Several access options were tested at the intersection of O'Neil Way and US 97 to determine the effect on network traffic patterns and specifically the effect on traffic using the Helmholtz Way corridor. The access configurations that were tested include right-in-right-out, grade-separated, full interchange, and partial interchange access. East-west connectivity across Dry Canyon is limited and the full interchange would reduce traffic using Maple Avenue, Antler Avenue and OR 126 by approximately 200 to 400 vehicles during the peak hour. A grade-separated crossing would allow vehicles to cross US 97 and would reduce traffic using Maple Avenue and US 97 by approximately 100 to 300 vehicles during the peak hour. Partial interchange access (southbound access from US 97 and northbound access to US 97) would eliminate the increase of traffic using Canal Boulevard north of O'Neil Way that the model indicated could result with the grade-separated configuration.

OR 126 Widening [West of US 97]

The OR 126 corridor was identified as one of the key locations in the transportation network that requires additional capacity. The facility is currently 5-lanes from 15th Avenue to Rimrock Drive, 3-lanes from Rimrock Drive to 27th Street, and 2-lanes west of 27th Street. Consideration was given to widening OR 126 first to 3-lanes and then to 5-lanes westward to Helmholtz Drive.

NE 9th Avenue Upgrade

Upgrading NE 9th Avenue may provide an additional option for trips between the east and north of Redmond. However, the travel demand model indicated that there would be limited benefit for this improvement and that less than 100 peak hour trips would be shifted from Maple Avenue and US 97.

South Canal Boulevard Improvements

Due to the constraints of the canal and adjacent development, widening South Canal Boulevard may be difficult. The most likely scenario to increase roadway capacity would be improved access management. Retaining the current cross-section of the facility and increasing the capacity was found to not produce a significant shift in traffic from US 97 due to the limited connectivity between the two roads. However, widening to a 3-lane facility would increase capacity at intersections (where no left turn lanes exist) and provide refuge for vehicles making a left-turn maneuver at midblock locations.

Motor Vehicle Alternatives

Groups of improvements that were found to best address the transportation needs in the preliminary analysis were combined to form three future alternatives. The following section describes the three alternatives and analyzes the performance of each.

Alternative Descriptions

The following subsection describes each alternative and the preliminary system improvements that were included. The list of included preliminary system improvements grows in a cumulative fashion by capacity and cost with each latter alternative. That is, Alternative 2 includes all improvements considered for Alternative 1 in addition to a few more improvements. Likewise, Alternative 3 adds to the total package of facility improvements used for Alternative 2. Figure 5-1 shows the system improvements that were included with each alternative. The previous section contains detailed descriptions of the preliminary system improvements.

Alternative 1

The first alternative represents improvement projects that are considered to have the highest priority and be the most feasible to construct. Alternative 1 contains the following general improvements:

1) SW 19th Street Extension to Deschutes Market Road
2) NW Upas Avenue overcrossing
3) OR 126 widening (5 lanes from SW Rimrock Way to SW 35th Street)
4) OR 126 widening (3 lanes from SW 35th Street to SW Helmholtz Way)
5) NW/SW 27th Street widening (3 lanes from NW Maple Avenue to Obsidian Avenue)
6) Helmholtz Way widening (5-lane connection from Pershall Way to Quarry Avenue)
7) Right-in-right-out access at O'Neil/US 97

Alternative 2

In addition to the general improvements of Alternative 1, Alternative 2 also includes the following:

8) Reroute Phase II - South Extension (does not include Airport Way access)
9) SW 19th Street connections to US 97 at SW Quarry Road
10) Grade-separated (no access) at O'Neil/US 97

Alternative 3

Alternative 3 included all the improvements from Alternatives 1 and 2, as well as:

11) Add Airport Way full interchange to south portion of US 97 Reroute
12) Grade-separated at O'Neill/US 97 with limited access consisting of:
    a) Southbound on-ramp

b) Northbound right-turn off-ramp

13) OR 126 widening (5 lanes from SW 35th Street to SW Helmholtz Way)

Figure 5-2, Figure 5-3, and Figure 5-4 show the volume/capacity ratios for facilities in Alternative 1, 2, and 3, respectively.

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Figure 5-1
FUTURE ALTERNATIVE INCLUDED IMPROVEMENTS

N
NOT TO SCALE

City of Redmond Transportation System Plan

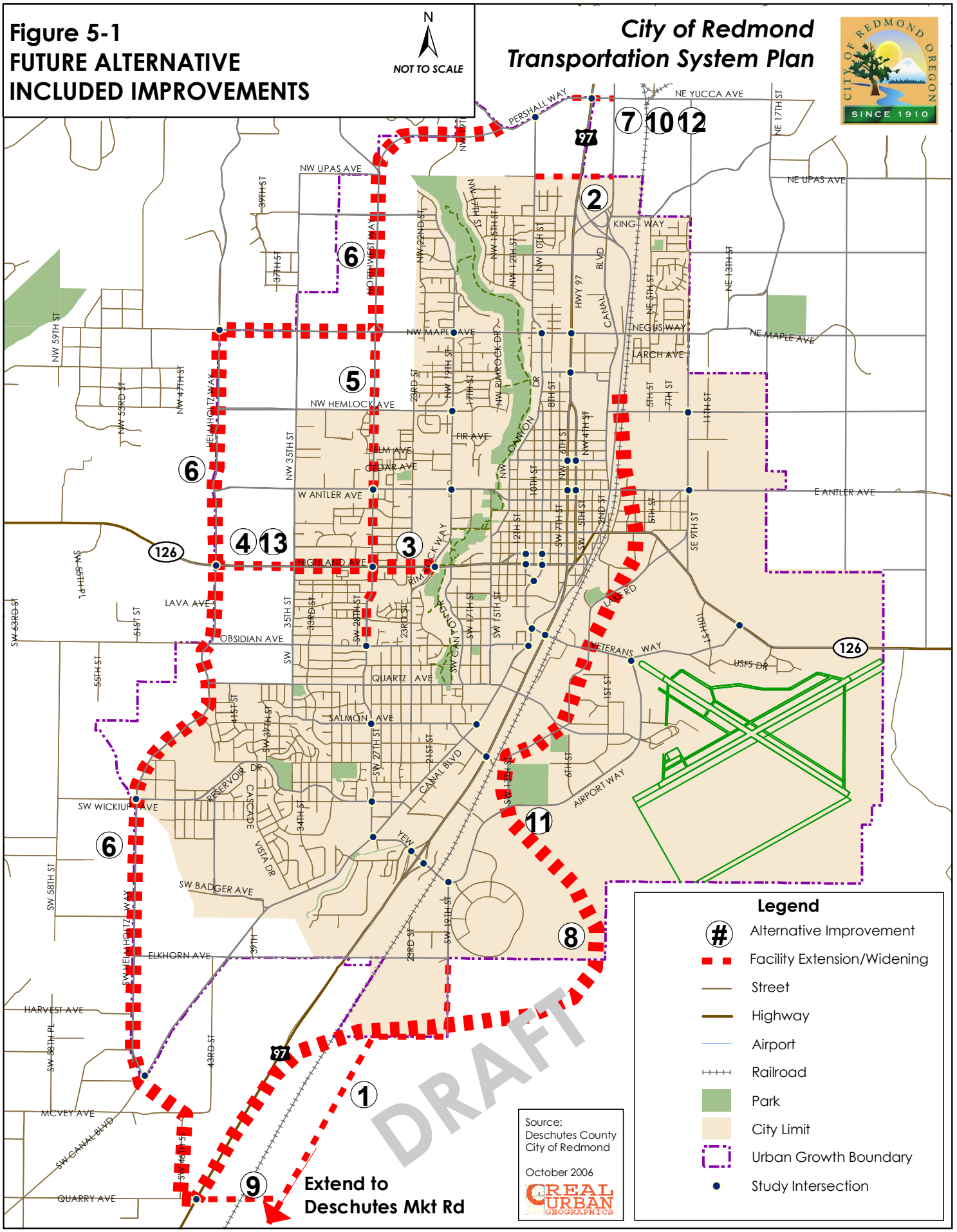

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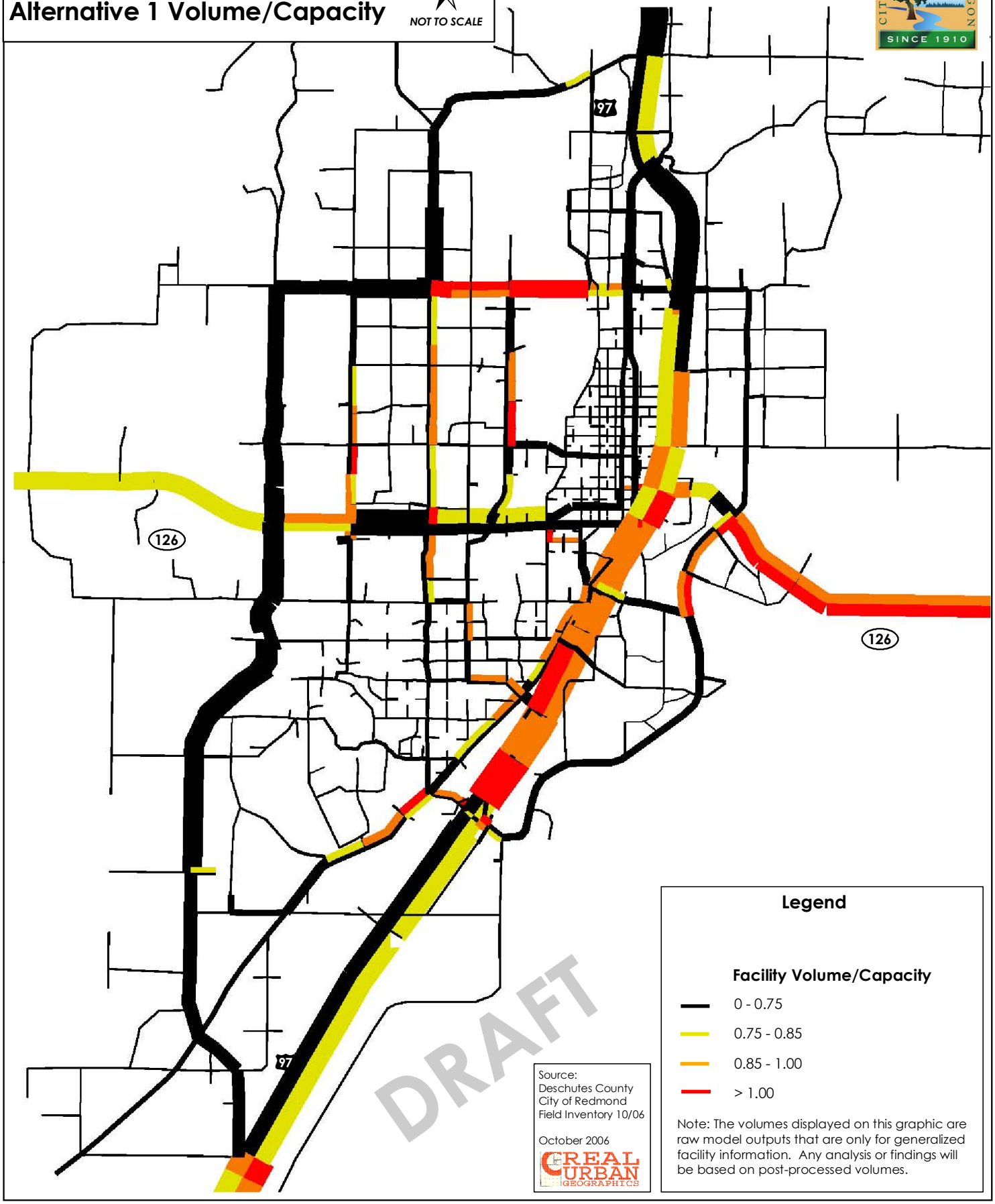
Figure 5-2
2030 PM Peak Hour
Alternative 1 Volume/Capacity

N
NOT TO SCALE

City of Redmond
Transportation System Plan



Legend

Facility Volume/Capacity

- 0 - 0.75
- 0.75 - 0.85
- 0.85 - 1.00
- > 1.00

Note: The volumes displayed on this graphic are raw model outputs that are only for generalized facility information. Any analysis or findings will be based on post-processed volumes.

Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

REAL URBAN GEOGRAPHICS

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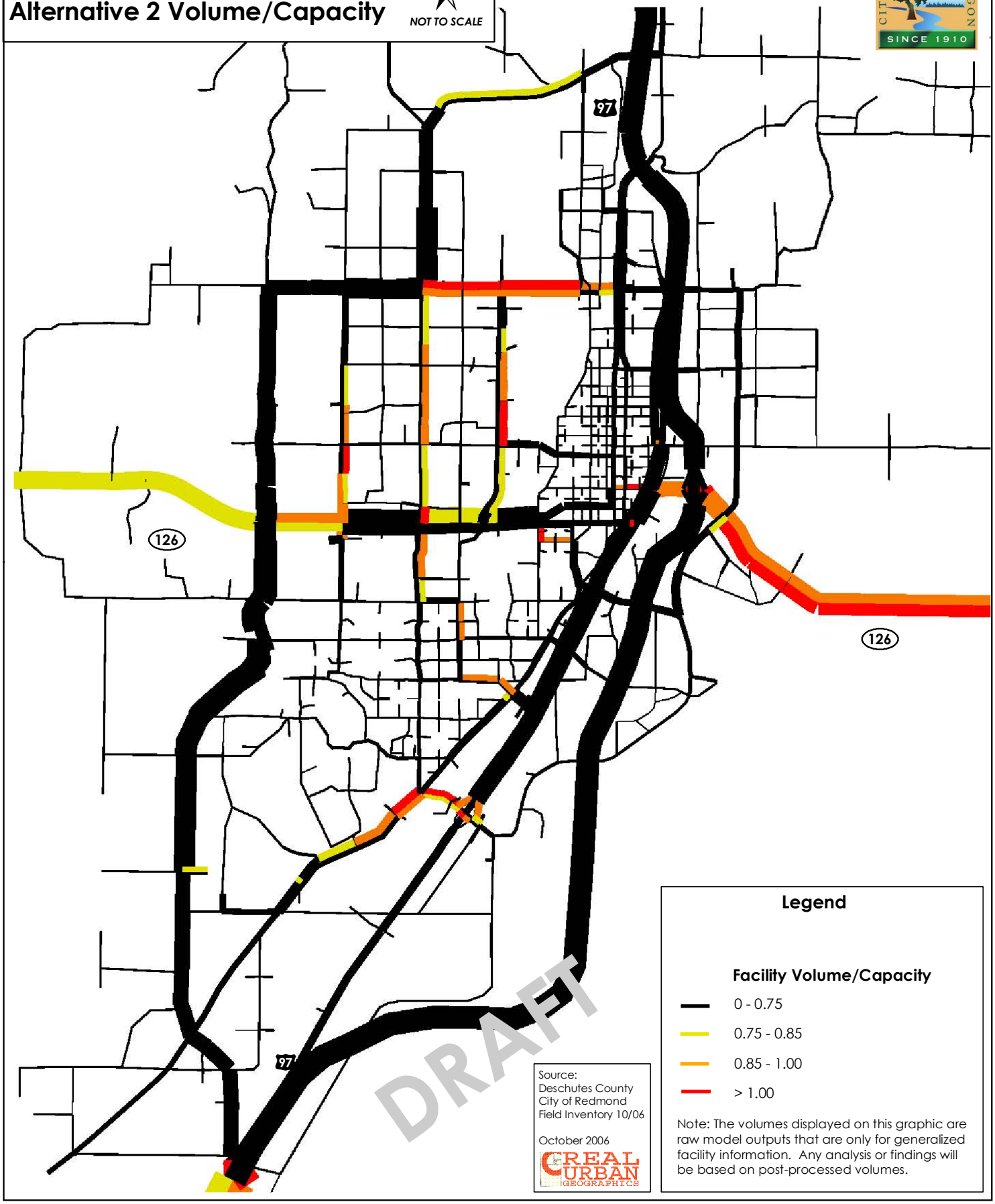
Figure 5-3
2030 PM Peak Hour
Alternative 2 Volume/Capacity

N
NOT TO SCALE

City of Redmond
Transportation System Plan



Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

REAL URBAN GEOGRAPHICS

Legend

Facility Volume/Capacity

- 0 - 0.75
- 0.75 - 0.85
- 0.85 - 1.00
- > 1.00

Note: The volumes displayed on this graphic are raw model outputs that are only for generalized facility information. Any analysis or findings will be based on post-processed volumes.

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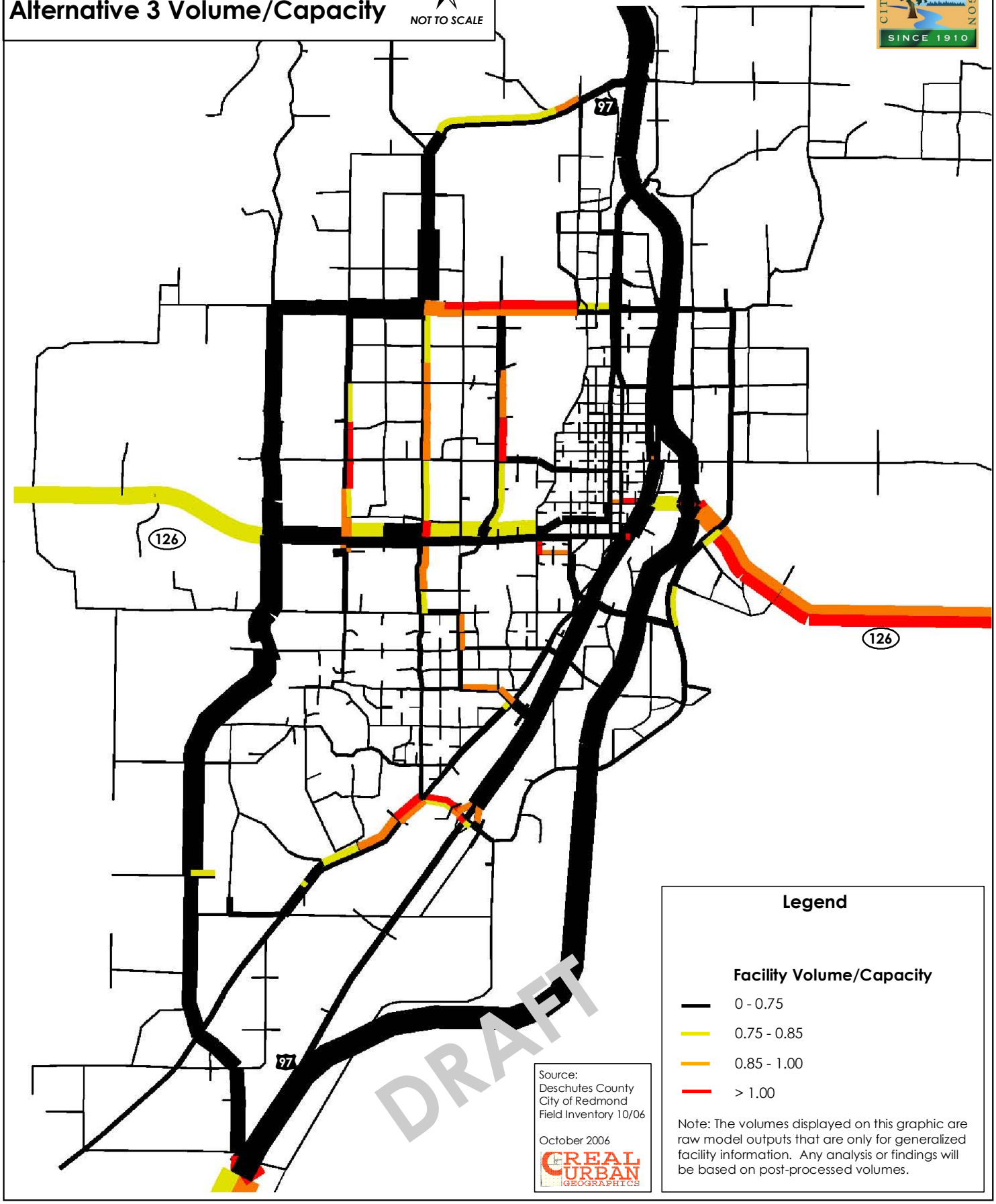
TRANSPORTATION SOLUTIONS

Figure 5-4
2030 PM Peak Hour
Alternative 3 Volume/Capacity

N
NOT TO SCALE

City of Redmond
Transportation System Plan



Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

REAL URBAN GEOGRAPHICS

Legend

Facility Volume/Capacity

- 0 - 0.75
- 0.75 - 0.85
- 0.85 - 1.00
- > 1.00

Note: The volumes displayed on this graphic are raw model outputs that are only for generalized facility information. Any analysis or findings will be based on post-processed volumes.

Traffic Operations

Intersection Operating Conditions

The alternative volumes for the PM peak hour were used to determine the study intersection operating conditions based on the *2000 Highway Capacity Manual*[19] methodology for signalized and unsignalized intersections. Level of service (LOS) descriptions and HCM methodology are included in the Existing Conditions chapter. Traffic volumes and level of service calculation sheets can be found in the technical appendix. Intersections within the existing alignment of US 97 that would be bypassed with the new US 97 Reroute were assumed to be transferred to City of Redmond control.

Intersection operations for each alternative are summarized in Tables 5-1, 5-2, and 5-3. Applicable performance standards (based on the City of Redmond TSP target of LOS D for intersections under jurisdiction of City of Redmond and v/c ratio of 0.70 based on the Oregon Highway Design Manual for intersections under ODOT control) are listed for each location. Note that shaded values indicate that the performance standard of the intersection is not met. In addition to the general intersection performance with the assumed alternative network, performance is also listed with additional intersection improvements where needed. These refinements generally include additional lane channelization and traffic control measures such as signalization. Intersection refinements included at each location are listed in Table 5-6. Signalized operations are provided for several all-way-stop-controlled intersections that are projected to meet performance standards to indicate performance at these arterial-collector locations in the event that signalization is warranted.

The network improvements assumed in Alternative 1 generally improved operations from the 2030 Base network presented in Chapter 4. However, 25 study intersections would still not meet performance standards and would require additional refinement. The two primary areas requiring additional improvements would be OR 126 and the southern portion of US 97. Two locations (35th/Maple and Helmholtz/Wickiup) have low cross-street volumes and improvements would provide limited benefit. Most intersections along the southern portion of US 97 would not meet performance standards with localized improvements. These locations would require parallel routes be built to divert traffic, such as the US 97 Reroute extension in Alternative 2. Most of the other intersections would meet performance standards with additional improvements.

Adding the additional network improvements for Alternative 2 would generally improve performance over Alternative 1 and allow all but 20 locations to meet operational standards. With additional refinement, only five locations would not meet standards. These locations include several along OR 126 (at Rimrock Way, Helmholtz Way, and E 9th Street) as well as the two low-volume locations mentioned previously. Locations along the existing alignment of US 97 that did not meet performance standards in Alternative 1 would meet standards in Alternative 2.

Study intersection performance for Alternative 3 is similar to Alternative 2. Nineteen of the study intersections would not meet performance standards without additional refinements. However, with additional improvements only four locations would not meet standards. Widening OR 126 to a 5-lane facility at Helmholtz Way (as assumed for Alternative 3) would allow the intersection to meet performance standards.

[19] *2000 Highway Capacity Manual*, Transportation Research Board, 2000.

Table 5-1: 2030 Alternative 1 Network - Design Hour Intersection Level of Service

Intersection	Performance Standard	Alt 1		Alt 1 + Refinements	
		LOS	V/C	LOS	V/C
Signalized Intersections – ODOT					
15th Ave/Highland (OR 126)	0.70	B	0.76	B	0.69
Rimrock Way/Highland Ave (OR 126)	0.70	C	0.96	B	0.74
11th St/Glacier Ave (OR 126)	0.70	B	0.39		
11th St/Highland Ave (OR 126)	0.70	B	0.37		
9th St/Glacier Ave/(OR 126)	0.70	B	0.41		
9th St/Highland Ave (OR 126)	0.70	B	0.35		
6th St/Glacier Ave (OR 126)	0.70	B	0.36		
6th St/Highland Ave (OR 126)	0.70	C	0.34		
5th St/Glacier Ave (OR 126)	0.70	B	0.34		
5th St/Highland Ave (OR 126)	0.70	D	0.54		
US 97/Veterans Way	0.70	F	>1.0	D	0.89
US 97/Odem Medo	0.70	F	>1.0	C	0.87
US 97/Quartz	0.70	C	0.95	B	0.78
US 97 Reroute/Highland Ave	0.70	C	0.91	C	0.89
US 97 Reroute/Evergreen Ave	0.70	E	>1.0	D	0.93
Signalized Intersections – City of Redmond					
19th St/Antler Ave	D	A	0.47		
Business 97/Maple Ave	D	C	0.80		
6th St (Business 97 SB)/Black Butte Ave	D	B	0.51		
6th St (Business 97 SB)/Evergreen Ave	D	B	0.66		
5th St (Business 97 NB)/Evergreen Ave	D	C	0.75		
S Canal Blvd/Veterans Way	D	D	0.91		
Business 97/Quince[20]	D	A	0.26		
Business 97/Oak Ave	D	A	0.41		
Unsignalized Intersections – ODOT					
Helmholtz Way/Highland (OR 126)	0.70	B/F	0.29/>1.0	C	0.82
31st Ave/Highland (OR 126)	0.70	A/B	0.47/0.07		
27th Ave/Highland (OR 126)[21]	0.70	B/F	0.30/>1.0	C	0.70
23rd St/Highland Ave (OR 126)	0.70	C/B	0.14/0.22		
US 97/O'Neil Hwy	0.70	A/C	0.46/0.32		
US 97 (SB)/Yew Ave[22]	0.70	A/F	0.21/>1.0	A	0.43
US 97 (NB)/Yew Ave[23]	0.70	A/F	0.01/0.97	A	0.52
US 97 /Quarry Road	0.70	F/F	>1.0/>1.0	C	1.0
E 9th Ave/OR 126	0.70	B/F	0.52/>1.0	C	0.80
Veterans Way/OR 126	0.70	B/D	0.01/0.29		
Lake Rd/OR 126	0.70	A/F	0.10/>1.0	A/E	0.10/0.70
US 97 Reroute/Antler Ave	0.70	A/D	0.73/0.38		
US 97 Reroute/Hemlock Ave	0.70	A/C	0.71/0.15		
US 97 Reroute SB Ramps/Business 97	0.70	A/B	0.06/0.23		
US 97 Reroute NB Ramps/Business 97	0.70	A/B	0.01/0.21		
Unsignalized Intersections – Deschutes County					
10th St/Pershall Way	D	A/D	0.02/0.72		
Unsignalized Intersections – City of Redmond					

[20] A traffic signal is planned at this location December 2007.
[21] Improved with traffic signal control as planned for installation in 2008.
[22] Improved with traffic signal control as planned for installation in 2008.
[23] Improved with traffic signal control as planned for installation in 2008.

Intersection	Performance Standard	Alt 1		Alt 1 + Refinements	
		LOS	V/C	LOS	V/C
27th St/Maple Ave**	D	A	0.49		
Helmholtz Way/Maple Ave	D	A/B	0.18/0.20		
Helmholtz Way/Antler Ave	D	B/C	0.07/0.24		
Helmholtz Way/Obsidian Ave	D	B/D	0.01/0.25		
Helmholtz Way/Wickiup Ave	D	B/F	0.12/0.60		
Helmholtz Way/S Canal Blvd[24]	D	A/F	0.13/>1.0	A	0.73
27th St/Antler Ave*	D	F	>1.0	A	0.60
27th St/Obsidian Ave*	D	C	0.72	A	0.38
27th St/Salmon Ave*	D	C	0.80	A	0.55
27th St/Wickiup Ave*	D	C	0.78	A	0.49
27th St/S Canal Blvd[25]	D	A/F	0.13/>1.0	A	0.54
NW 19th St/Maple Ave	D	A/F	0.26/>1.0	B	0.77
NW 19th St/Hemlock Ave	D	A/C	0.03/0.20		
SW 19th St/Airport Way[26]**	D	A	0.43		
NW 9th St/Maple Ave	D	A/F	0.07/>1.0	A	0.67
Business 97/Kingwood	D	A/C	0.04/0.34		
6th St (Business 97 SB)/Dogwood Ave	D	A/C	0.01/0.37		
6th St (Business 97 SB)/Antler Ave	D	A/C	0.02/0.19		
5th St (Business 97 NB)/Dogwood Ave	D	A/D	0.02/0.62		
5th St (Business 97 NB)/Antler Ave	D	A/C	0.01/0.24		
5th St (Business 97 NB)/Black Butte[27]	D	A/F	0.16/0.66	A	0.41
S Canal Blvd/Obsidian Ave*	D	C	0.81	A	0.43
S Canal Blvd/Quartz Ave	D	A/F	0.12/>1.0	B	0.75
S Canal Blvd/Salmon Ave[28]	D	A/D	0.08/0.42		
S Canal Blvd/Odem Medo Ave	D	A/F	0.12/>1.0	C	0.86
Airport Way/SE 9th St**	D	A	0.56		
NE 9th St/Hemlock Ave*	D	B	0.55	A	0.51
E 9th St/Antler Ave	D	A/B	0.01/0.08		
NW 35th St/Maple Ave	D	B/F	0.29/0.67		
NW 27th St/Upas Ave	D	A/B	0.11/0.25		
NW 27th St/Hemlock Ave*	D	D	0.92	A	0.44
Lake Rd/Veterans Way[29]	D	A/E	0.09/0.68	A/C	0.09/0.46

Notes: LOS and V/C given for major/minor approach at 2-way stop controlled intersections.
Shaded values indicate that performance standard is exceeded
* All-Way Stop Intersection. Signalized performance listed as refinement (when warranted); **Roundabout

[24] Improved operations include a single-lane roundabout
[25] Improved operations include a single-lane roundabout.
[26] A roundabout is planned at this location.
[27] Plan to signalize intersection in the current CIP. Assumed that parking removed and left turn lane painted.
[28] This intersection may become right-in-right-out or closed with the extension of Salmon Ave to Odem Medo.
[29] This intersection would not exist with the Reroute Phase II (Southern Extension) that is included with Alternative 2 and 3. However, additional improvements would be required in Alternative 1 if the intersection remains.

Table 5-2: 2030 Alternative 2 Network - Design Hour Intersection Level of Service

Intersection	Performance Standard	Alt 2		Alt 2 + Refinements	
		LOS	V/C	LOS	V/C
Signalized Intersections – ODOT					
15th Ave/Highland (OR 126)	0.70	B	0.74	B	0.70
Rimrock Way/Highland Ave (OR 126)	0.70	C	0.83	B	0.72
11th St/Glacier Ave (OR 126)	0.70	B	0.38		
11th St/Highland Ave (OR 126)	0.70	B	0.33		
9th St/Glacier Ave/(OR 126)	0.70	B	0.40		
9th St/Highland Ave (OR 126)	0.70	B	0.31		
6th St/Glacier Ave (OR 126)	0.70	B	0.37		
6th St/Highland Ave (OR 126)	0.70	C	0.32		
5th St/Glacier Ave (OR 126)	0.70	B	0.23		
5th St/Highland Ave (OR 126)	0.70	D	0.37		
Old US 97 Reroute/Evergreen Ave	0.70	B	0.66		
Signalized Intersections – City of Redmond					
19th St/Antler Ave	D	A	0.51		
Old US 97/Maple Ave	D	C	0.82		
6th St (Business 97 SB)/Black Butte Ave	D	B	0.51		
6th St (Business 97 SB)/Evergreen Ave	D	B	0.66		
5th St (Business 97 NB)/Evergreen Ave	D	C	0.64		
S Canal Blvd/Veterans Way	D	C	0.76		
Business 97/Veterans Way	D	C	0.70		
Business 97/Odem Medo	D	E	>1.0	D	0.85
Business 97/Quartz	D	A	0.65		
Business 97/Quince[30]	D	A	0.30		
Business 97/Oak Ave	D	A	0.39		
Old US 97 Reroute/Highland Ave	D	B	0.63		
Unsignalized Intersections – ODOT					
Helmholtz Way/Highland (OR 126)	0.70	B/F	0.32/>1.0	D	0.87
31st Ave/Highland (OR 126)	0.70	A/B	0.47/0.04		
27th Ave/Highland (OR 126)[31]	0.70	B/F	0.30/>1.0	C	0.69
23rd St/Highland Ave (OR 126)	0.70	C/B	0.15/0.24		
US 97/O'Neil Hwy	0.70	--	--		
E 9th Ave/OR 126	0.70	A/F	0.30/>1.0	C	0.81
Veterans Way/OR 126	0.70	B/D	0.01/0.27		
Lake Rd/OR 126	0.70	A/F	0.12/>1.0	B/D	0.12/0.52
US 97 Reroute/Antler Ave***	0.70	--	--		
US 97 Reroute/Hemlock Ave***	0.70	--	--		
US 97 Reroute SB Ramps/Business 97	0.70	A/B	0.07/0.16		
US 97 Reroute NB Ramps/Business 97	0.70	A/B	0.01/0.25		
Unsignalized Intersections – Deschutes County					
10th St/Pershall Way	D	A/F	0.02/0.72	A/D	0.02/0.68
Unsignalized Intersections – City of Redmond					
27th St/Maple Ave**	D	A	0.59		
Helmholtz Way/Maple Ave	D	A/B	0.16/0.22		
Helmholtz Way/Antler Ave	D	B/C	0.07/0.26		
Helmholtz Way/Obsidian Ave	D	B/D	0.01/0.28		
Helmholtz Way/Wickiup Ave	D	B/F	0.14/0.73		

[30] A traffic signal is planned at this location December 2007.

[31] Improved with traffic signal control as planned for installation in 2008.

Intersection	Performance Standard	Alt 2		Alt 2 + Refinements	
		LOS	V/C	LOS	V/C
Helmholtz Way/S Canal Blvd[32]	D	A/F	0.13/>1.0	A	0.86
27th St/Antler Ave*	D	F	>1.0	A	0.59
27th St/Obsidian Ave*	D	C	0.67	A	0.39
27th St/Salmon Ave*	D	C	0.75	A	0.54
27th St/Wickiup Ave*	D	C	0.74	A	0.47
27th St/S Canal Blvd[33]	D	A/F	0.13/>1.0	A	0.55
19th St/Maple Ave	D	A/F	0.23/>1.0	B	0.75
19th St/Hemlock Ave	D	A/C	0.02/0.21		
19th St/Airport Way[34]**	D	A	0.19		
9th St/Maple Ave	D	A/F	0.07/>1.0	A	0.67
Business 97/Kingwood	D	A/C	0.04/0.36		
6th St (Business 97 SB)/Dogwood Ave	D	A/C	0.02/0.39		
6th St (Business 97 SB)/Antler Ave	D	A/C	0.02/0.20		
5th St (Business 97 NB)/Dogwood Ave	D	A/C	0.02/0.48		
5th St (Business 97 NB)/Antler Ave	D	A/C	0.01/0.13		
5th St (Business 97 NB)/Black Butte[35] Ave	D	A/E	0.15/0.47	A	0.33
S Canal Blvd/Obsidian Ave*	D	B	0.43	A	0.29
S Canal Blvd/Quartz Ave	D	A/F	0.10/>1.0	B	0.66
S Canal Blvd/Salmon Ave[36]	D	A/C	0.07/0.28		
S Canal Blvd/Odem Medo Ave	D	A/F	0.11/>1.0	B	0.74
Airport Way/SE 9th St**	D	A	0.37		
E 9th St/Hemlock Ave*	D	B	0.55	A	0.48
E 9th St/Antler Ave	D	A/B	0.01/0.14		
35th St/Maple Ave	D	B/F	0.31/0.54		
27th St/Upas Ave	D	A/B	0.14/0.26		
27th St/Hemlock Ave*	D	D	0.90	A	0.43
Business 97 (SB)/Yew Ave[37]	D	A/E	0.14/0.90	A	0.46
Business 97 (NB)/Yew Ave[38]	D	A/F	0.22/>1.0	A	0.43

Notes: LOS and V/C given for major/minor approach at 2-way stop controlled intersections.
Shaded values indicate that performance standard is exceeded
* All-Way Stop Intersection. Signalized performance listed as refinement (when warranted).
**Roundabout
*** Location is grade-separated in Alternative

[32] Improved operations include a single-lane roundabout.
[33] Improved operations include a single-lane roundabout.
[34] A roundabout is planned at this location.
[35] Plan to signalize intersection in the current CIP. Assumed that parking would be removed to accommodate left turn lane striping and a signal added.
[36] This intersection may become right-in-right-out or closed with the extension of Salmon Ave to Odem Medo.
[37] Improved with traffic signal control as planned for installation in 2008.
[38] Improved with traffic signal control as planned for installation in 2008.

Table 5-3: 2030 Alternative 3 Network- Design Hour Intersection Level of Service

Intersection	Performance Standard	Alt 3		Alt 3 + Refinements	
		LOS	V/C	LOS	V/C
Signalized Intersections – ODOT					
15th Ave/Highland (OR 126)	0.70	B	0.75	B	0.70
Rimrock Way/Highland Ave (OR 126)	0.70	C	0.82	B	0.73
11th St/Glacier Ave (OR 126)	0.70	A	0.38		
11th St/Highland Ave (OR 126)	0.70	B	0.32		
9th St/Glacier Ave/(OR 126)	0.70	B	0.39		
9th St/Highland Ave (OR 126)	0.70	B	0.31		
6th St/Glacier Ave (OR 126)	0.70	B	0.36		
6th St/Highland Ave (OR 126)	0.70	C	0.30		
5th St/Glacier Ave (OR 126)	0.70	B	0.23		
5th St/Highland Ave (OR 126)	0.70	D	0.38		
US 97 Reroute/Evergreen Ave	0.70	B	0.65		
Signalized Intersections – City of Redmond					
19th St/Antler Ave	D	A	0.52		
Business 97/Maple Ave	D	C	0.70		
6th St (Business 97 SB)/Black Butte Ave	D	B	0.51		
6th St (Business 97 SB)/Evergreen Ave	D	B	0.66		
5th St (Business 97 NB)/Evergreen Ave	D	C	0.64		
S Canal Blvd/Veterans Way	D	C	0.69		
Business 97/Veterans Way	D	C	0.74		
Business 97/Odem Medo	D	D	0.92		
Business 97/Quartz	D	A	0.65		
Business 97/Oak Ave	D	A	0.38		
Business 97/Quince[39]	D	A	0.30		
US 97 Reroute/Highland Ave	D	B	0.63		
Unsignalized Intersections – ODOT					
Helmholtz Way/Highland (OR 126)	0.70	B/F	0.35/>1.0	C	0.69
31st Ave/Highland (OR 126)	0.70	A/B	0.48/0.07		
27th Ave/Highland (OR 126)[40]	0.70	B/F	0.30/>1.0	C	0.68
23rd St/Highland Ave (OR 126)	0.70	C/B	0.16/0.21		
US 97/O'Neil Hwy	0.70	--	--		
E 9th Ave/OR 126	0.70	A/F	0.38/>1.0	C	0.84
Veterans Way/OR 126	0.70	B/D	0.01/0.27		
Lake Rd/OR 126	0.70	A/F	0.12/>1.0	B/D	0.12/0.49
US 97 Reroute/Antler Ave***	0.70	--	--		
US 97 Reroute/Hemlock Ave***	0.70	--	--		
US 97 Reroute SB Ramps/ Business 97	0.70	A/B	0.07/0.16		
US 97 Reroute NB Ramps/ Business 97	0.70	A/B	0.01/0.25		
Unsignalized Intersections – Deschutes County					
10th St/Pershall Way	D	A/F	0.03/>1.0	A/D	0.02/0.72
Unsignalized Intersections – City of Redmond					
27th St/Maple Ave	D	A	0.63		
Helmholtz Way/Maple Ave	D	A/B	0.18/0.20		
Helmholtz Way/Antler Ave	D	B/C	0.08/0.27		
Helmholtz Way/Obsidian Ave	D	B/D	0.01/0.29		
Helmholtz Way/Wickiup Ave	D	B/F	0.14/0.74		

[39] A traffic signal is planned at this location December 2007.

[40] Improved with traffic signal control as planned for installation in 2008.

Intersection	Performance Standard	Alt 3		Alt 3 + Refinements	
		LOS	V/C	LOS	V/C
Helmholtz Way/S Canal Blvd[41]	D	A/F	0.13/>1.0	A	0.86
27th St/Antler Ave*	D	F	>1.0	A	0.59
27th St/Obsidian Ave*	D	C	0.67	A	0.38
27th St/Salmon Ave*	D	C	0.75	A	0.54
27th St/Wickiup Ave*	D	C	0.74	A	0.47
27th St/S Canal Blvd[42]	D	A/F	0.12/>1.0	A	0.54
19th St/Maple Ave	D	A/F	0.25/>1.0	B	0.72
19th St/Hemlock Ave	D	A/C	0.03/0.20		
19th St/Airport Way[43]**	D	A	0.18		
9th St/Maple Ave	D	A/F	0.03/>1.0	A	0.67
Business 97/Kingwood	D	A/C	0.04/0.35		
6th St (Business 97 SB)/Dogwood Ave	D	A/C	0.02/0.39		
6th St (Business 97 SB)/Antler Ave	D	A/C	0.02/0.20		
5th St (Business 97 NB)/Dogwood Ave	D	A/C	0.02/0.47		
5th St (Business 97 NB)/Antler Ave	D	A/C	0.01/0.13		
5th St (Business 97 NB)/Black Butte Ave[44]	D	A/E	0.15/0.47	A	0.33
S Canal Blvd/Obsidian Ave*	D	B	0.43	A	0.29
S Canal Blvd/Quartz Ave	D	A/F	0.10/>1.0	B	0.69
S Canal Blvd/Salmon Ave[45]	D	A/C	0.07/0.28		
S Canal Blvd/Odem Medo Ave	D	A/F	0.11/>1.0	B	0.71
Airport Way/SE 9th St**	D	A	0.42		
E 9th St/Hemlock Ave*	D	B	0.52	A	0.46
E 9th St/Antler Ave	D	A/B	0.01/0.09		
35th St/Maple Ave	D	B/F	0.31/0.64		
27th St/Upas Ave	D	A/B	0.11/0.26		
27th St/Hemlock Ave*	D	D	0.90	A	0.43
Business 97 (SB)/Yew Ave[46]	D	A/E	0.13/0.87	A	0.46
Business 97 (NB)/Yew Ave[47]	D	A/F	0.23/>1.0	A	0.49

Notes: LOS and V/C given for major/minor approach at 2-way stop controlled intersections.
Shaded values indicate that performance standard is exceeded
* All-Way Stop Intersection. Signalized performance listed as refinement (when warranted).
** Roundabout
***Location is grade-separated in Alternative

[41] Improved operations include a single-lane roundabout.
[42] Improved operations include a single-lane roundabout.
[43] A roundabout is planned at this location.
[44] Plan to signalize intersection in the current CIP. Assumed that parking would be removed to accommodate left turn lane striping and a signal added.
[45] This intersection may become right-in-right-out or closed with the extension of Salmon Ave to Odem Medo.
[46] Improved with traffic signal control as planned for installation in 2008.
[47] Improved with traffic signal control as planned for installation in 2008.

Alternative Improvement Summary

The general network improvements (shown in Figure 5-1) that were assumed in each alternative are listed in Table 5-4.

Table 5-4: General Facility Improvements

Location	Description	Alternative		
		Alt 1	Alt 2	Alt 3
ODOT Facility General Improvements				
OR 126	Widen to 3 lanes from Helmholtz to 35th Avenue[48]	X	X	
OR 126	Widen to 5 lanes from 35th Avenue to Rimrock Way	X	X	X
OR 126	Widen to 5 lanes from Helmholtz to 35th Avenue			X
US 97 Reroute Extension	Extend Reroute Alt 3B to Quarry interchange (no Airport Way interchange)		X	X
Airport Interchange	Reroute interchange at Airport Way			X
City of Redmond Facility General Improvements				
Westside Arterial (Helmholtz Way)	Widen to 5 lane arterial	X	X	X
27th Avenue	Widen to 3 lanes from Maple Avenue to Obsidian	X	X	X
Upas Avenue	US 97 Overcrossing	X		
SW 19th Street	Extend to Deschutes Market Road as 2-lane collector	X	X	X
Quarry Road	Connect US 97 to SW 19th Street extension		X	X
O'neill Avenue	Grade-separated crossing of US 97		X	
O'neill Avenue	Grade-separated crossing of US 97 with partial access			X

Additional refinements that are needed to meet performance standards for each alternative are listed in Table 5-5 and Table 5-6. The inclusion of these projects is the basis for the improved intersection operations listed in Tables 5-1, 5-2, and 5-3. Projects are grouped by ODOT or City of Redmond facility jurisdiction.

The operational analysis indicated the need for widening OR 126 east of US 97 to a 3-lane facility to

[48] ODOT is constructing a left turn lane on OR 126 at Helmholtz Way in 2008 along with right turn lanes.

increase capacity at intersections and provide refuge for vehicles making a left-turn maneuver at midblock locations. This improvement, listed in Table 5-5, would be needed under each of the improvement scenarios analyzed.

Table 5-5: General Facility Improvement Project

		Alternative		
Location	**Description**	**Alt 1**	**Alt 2**	**Alt 3**
OR 126	Widen to 3 lanes from US 97 Reroute to East UGB	X	X	X

Table 5-6: Additional Intersection Refinements

		Alternative		
Location	**Description**	**Alt 1**	**Alt 2**	**Alt 3**
	ODOT Intersection Improvements			
15th Avenue/ Highland (OR 126)	Restripe (no widening) and modify signal to add northbound/southbound left turn lanes	X	X	X
Rimrock Way/ Highland Ave (OR 126)	Add southbound right turn lane and overlap	X		
	Add a westbound right turn lane (includes fill and retaining wall)	X	X	X
US 97/ Veterans Way	Add a southbound right turn lane	X		
	Add a westbound right turn lane[49]	X		
	Add a second eastbound left turn lane and widen canal structure	X		
US 97/Odem Medo	Add a second northbound left turn lane	X		
	Add a second receiving lane to west leg and drop lane at parking access (275 ft)	X		
	Add an eastbound left turn lane[50]	X		
	Widen structure over canal to support additional lanes[51]	X		
	Add a southbound right turn lane[52]	X	X	
US 97/Quartz St	Add a westbound left turn lane	X		
US 97 Reroute/ Highland Avenue	Add a single eastbound right turn lane	X		
US 97 Reroute/ Evergreen Ave	Add a westbound right turn lane	X		
Helmholtz Way/ Highland (OR 126)	Add a traffic signal	X	X	X
	Add a westbound right turn lane[53]	X		
	Add a northbound right turn lane	X	X	X

[49] Planned for Spring 2008.
[50] Planned for 2008.
[51] Planned for 2008
[52] Planned for 2008.
[53] Planned for 2008 by ODOT.

Location	Description	Alternative Alt 1	Alt 2	Alt 3
27th Ave/ Highland (OR 126)	Add a traffic signal[54]	X	X	X
US 97 (SB)/ Yew Ave	Add a traffic signal[55]	X	X	X
US 97 (NB)/ Yew Ave	Add a traffic signal[56]	X	X	X
E 9th Ave/OR 126	Add a traffic signal	X	X	X
	Add northbound/southbound left turn lanes	X	X	X
	Add a northbound right turn lane	X	X	X
	Add an eastbound right turn lane	X	X	X
	Add a westbound right turn lane		X	X
Lake Rd/OR 126	Add a northbound right turn lane		X	X
City of Redmond Intersection Improvements				
5th St (Business 97 NB)/Black Butte	Remove parking and restripe to add an eastbound left turn lane	X	X	X
27th St/Maple Ave	Add a roundabout with two circulating and two entry and exit lanes at each approach	X	X	X
10th St/Pershall	Add a two-way-left-turn lane on Pershall		X	X
	Add an eastbound right turn lane			X
Helmholtz Way/ S Canal Blvd	Add a single-lane roundabout	X	X	X
27th St/Antler Ave	Add a traffic signal	X	X	X
27th St/ S Canal Blvd	Add a single-lane roundabout	X	X	X
S Canal Blvd/ Quartz Ave	Add a traffic signal	X	X	X
19th St/Maple Ave	Add a traffic signal	X	X	X
9th St/Maple Ave	Add a traffic signal	X	X	X
E 9th St/ Veterans Way	Add a roundabout	X	X	X
S Canal Blvd/ Odem Medo Ave	Add a traffic signal[57]	X	X	X
	Add a westbound left turn lane[58]	X	X	X
Lake Rd/Veterans	Add a southbound right turn lane	X		

In addition to improvements that were triggered due to performance deficiencies in the operations analysis, several locations that are currently all-way-stop-controlled may be signalized in the future as traffic signals are warranted. Traffic signals were not assumed at these locations in the capacity analysis, however signalized operations are listed under the refined operating conditions of Table 5-1, 5-2 and 5-3.

[54] Planned for 2008.
[55] Planned for 2008.
[56] Planned for 2008.
[57] Planned for 2008.
[58] Planned for 2008.

Table 5-7: Potential Traffic Signal Locations at Arterial/Collector Intersections

		Alternative		
Location	**Description**	**Alt 1**	**Alt 2**	**Alt 3**
SW 27th St/Obsidian Ave	Add a traffic signal when warranted	X	X	X
SW 27th St/Salmon Ave	Add a traffic signal when warranted	X	X	X
SW 27th St/Wickiup Ave	Add a traffic signal when warranted	X	X	X
SW Canal Blvd/Obsidian Ave	Add a traffic signal when warranted	X	X	X
NE 9th St/Hemlock Ave	Add a traffic signal when warranted	X	X	X
NW 27th St/Hemlock Ave	Add a traffic signal when warranted	X	X	X

6. Pedestrian Master Plan

Overview

This chapter summarizes the existing and future pedestrian facility needs in the City of Redmond, identify improvement strategies and recommend pedestrian improvement projects for the City. Projects that are reasonably expected to be funded are included in the pedestrian action plan, while additional projects that were considered are included in the master plan.

Pedestrian System Needs

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand in Redmond. Pedestrian travel in and around the study area needs to provide a safe, efficient and interconnected system that allows users the ability to consider walking as a viable mode of travel for trips that are one mile in length or less. The following needs have been identified for pedestrian access and circulation within the City of Redmond:

Gaps in the Pedestrian Network- Arterial and collector streets in Redmond provide a limited sidewalk inventory (see Figure 3-2). Sidewalks are provided in the downtown grid and many newer residential neighborhoods, but there are limited connections and only intermittent sidewalks connecting the rest of the City. Additionally, the pedestrian system also has significant existing barriers (e.g. Dry Canyon and the railroad) and future barriers (the US 97 Reroute) that contribute to poor connectivity throughout the city.

An important existing pedestrian need in Redmond is providing sidewalks on all arterial and collector roadways and providing a connection from residential areas to schools, parks and shopping centers. This includes the need for safe, well-lighted arterials and collector streets with suitable pedestrian amenities and crossing facilities to reduce the barriers for pedestrian travel. Pedestrian facility needs in Redmond must consider the three most prevalent trip types:

- *Residential-based trips* – home to school, home to home, home to retail, home to park, home to transit, home to entertainment
- *Service-based trips* – multi-stop retail trips, work to restaurant, work to services, work/shop to transit
- *Recreational-based trips* – home to park, exercise trips, casual walking trips

Residential trips need a set of interconnected sidewalks radiating out from homes to destinations within one-half to one mile. Beyond these distances, walking trips of this type (over 20 minutes) become substantially less common. Service-based trips require direct, conflict-free connectivity between uses (for example, a shopping mall with its central spine walkway that connects multiple destinations). Service based trips need a clear definition of connectivity. This requires mixed use developments to

locate front doors which relate directly to the public right-of-way and provide walking links between uses within one-half mile. Recreational walking trips have different needs. Off-street trails, well landscaped sidewalks and relationships to unique environment (creeks, trees, farmland) are important.

The most common need is to provide a safe and interconnected system that affords the opportunity to consider the walking mode of travel, especially for trips less than one mile in length.

Development of Multi-use Trails- Multi-use trails can supplement the existing sidewalk system and provide connections where the existing pedestrian system is deficient. Multi-use trails are typically off-street and are wider than a typical sidewalk to facilitate shared use with bicyclists. Further development of the Dry Canyon trail and trails along the extensive canal network of the City provide a good opportunity to connect the pedestrian system of Redmond.

Pedestrian Crossing Enhancements- Under future year conditions, many of the arterials through Redmond will experience significant increases in motor vehicle traffic volume (and possibly road widening) that will reduce the ability for pedestrians to safely cross. Motor-vehicle volume and lane configurations at unsignalized intersections were examined and compared to the criteria[59] for considering marked crosswalks and other pedestrian enhancements. Generally, arterials speeds above 30 mph and volumes above 9,000 vehicles per day are locations where enhanced pedestrian crossings should be considered at unsignalized intersections. In addition, enhanced crossing should be considered at mid-block locations that are more than 500 feet from an intersection. Several corridors in Redmond meet these general criteria and were examined for potential pedestrian crossing enhancements. Corridors that were found to meet the criteria to consider additional pedestrian enhancements include the following:

- *US 97 from the Reroute to the south City limits* – This section of roadway has speeds in excess of 40 miles per hour and is projected to serve over 15,000 vehicles per day in 2030. Supplemental improvements will be needed along this section due to the combination of vehicle speeds and volumes with the roadway width (4 lanes or greater).

- *ORE 126 from SW 15th Street to the west City limits* – This posted speed for this section of roadway varies from 30 mph at 15th Street to 55 mph west of 27th Street. The cross-section of the roadway also varies from 2 to 5 lanes.

- *ORE 126 from US 97 Reroute to east City limits* – Speeds on this 2-lane facility range from 30 miles per hour at Evergreen Ave to 55 miles per hour east of E 9th Street. Average daily traffic for the facility would be 12,000-15,000 vehicles per day. Locations with speeds in excess of 35 miles per hour will require additional improvements.

- NW/SW *Helmholtz Way from NW Maple Avenue to SW Wickiup Avenue* - Volumes for this 2-lane facility range from 12,000-15,000 vehicles per day, with speeds posted at 40 miles per hour or greater.

Additional pedestrian enhancements will be needed along Helmholtz Way, OR 126 (east and west of US 97), and US 97 south of the US 97 Reroute. Potential pedestrian enhancements include the construction of curb extensions to improve the safety at intersections by reducing the crossing distance, pedestrian level lighting, enhance striping and signing, and median refuge islands. These enhancements should be

[59] *Traffic Control Devices Handbook*, Institute of Transportation Engineers, 2001; Chapter 13, Table 13-2.

implemented at a spacing of approximately 500 feet. Curb extensions can also implemented to enhance the urban design and aesthetic value through the downtown area.

Strategies

The existing conditions and future needs analysis identified pedestrian system issues within Redmond that include an incomplete arterial/collector sidewalk system, significant barriers to pedestrian network (e.g. railroad, Dry Canyon and canals) and the need for enhanced crossing locations. These needs correspond with those identified in the 2000 TSP.

Several strategies were developed to address pedestrian system needs and to guide project prioritization. This prioritization process helps to focus community investment on those projects that are most effective at meeting critical needs, while deferring other projects of lesser value. The improvement strategies were ranked by the Technical Advisory Committee (TAC) for use in the TSP[60].

The strategies for pedestrian facilities (listed in order of importance) are:

- Connect key pedestrian corridors to schools, parks, and activity centers
- Improve/construct curb ramps for ADA
- Construct sidewalks to complete the pedestrian system (focus first on arterial and collector roadways)
- Construct arterial crossing enhancements
- Reconstruct all sidewalks to City of Redmond standards (width, safety, attractiveness, ADA compliance)
- Fill in gaps in the network where some sidewalks exist to provide continuity
- Provide pedestrian corridors that connect neighborhoods
- Improve pedestrian corridors that connect to potential transit locations

Pedestrian Master Plan

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand. A list of potential pedestrian projects was compiled to meet the identified needs and achieve goals and polices identified by the Technical Advisory Committee. The list of alternatives (shown in Figure 6-1 and summarized in Table 6-1) represent an overall plan and summarizes the 'wish list' of pedestrian related projects in Redmond.

Each pedestrian project was ranked based on how well it met the improvement strategies that were identified. A high, medium, and low designation was given to each project to indicate a general priority that the projects should be implemented.

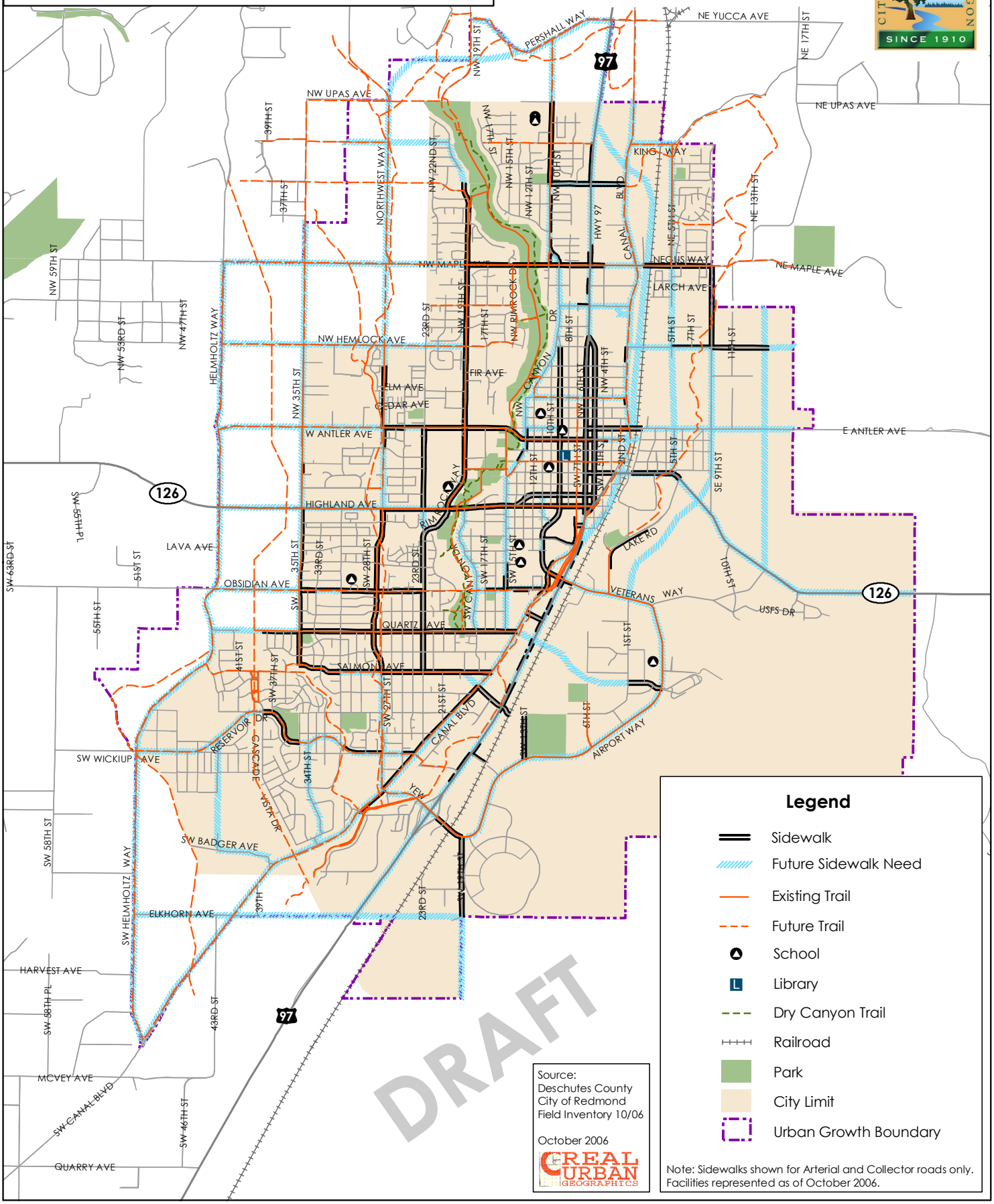
[60] Technical Advisory Committee Meeting, September 26, 2007.

DKS Associates
TRANSPORTATION SOLUTIONS

Figure 6-1
PEDESTRIAN MASTER PLAN

N
NOT TO SCALE

City of Redmond Transportation System Plan



Legend

- Sidewalk
- Future Sidewalk Need
- Existing Trail
- Future Trail
- School
- Library
- Dry Canyon Trail
- Railroad
- Park
- City Limit
- Urban Growth Boundary

Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

CREAL URBAN GEOGRAPHICS

Note: Sidewalks shown for Arterial and Collector roads only. Facilities represented as of October 2006.

Table 6-1: Pedestrian Master Plan Projects and Cost Estimates

Priority	Project Facility	From	To	Cost ($1,000s)
	Sidewalks on New Arterials and Collectors			
High	NW Quince Ave	NW 10th St	NW Canal Blvd	*
High	SW Quartz Ave	SW Helmholtz Way	SW 35th St	*
High	SW/SE Quartz Ave	SW Canal Blvd	SE 1st St	*
Medium	Northwest Way/27th St	NW Maple Ave	NW Greenwood	*
Medium	Northwest Way/27th St	SW Glacier Ave	OR 126	*
Medium	NW Maple Ave	NW Helmholtz Way	NW 35th St	*
Medium	NW Maple Ave	NW 35 th St	NW 27th St	*
Medium	NE 15th St	North UGB	OR 126	*
Low	NW Pershall Way	Northwest Way	US 97	*
Low	OR 126	SW Canal Blvd	East UGB	*
Low	OR 126	SW Helmholtz Way	SW Rimrock Way	*
Low	NW/SW Helmholtz Way	NW Maple Ave	SW Canal Blvd	*
Low	SE 9th St extension	OR 126	SE Veterans Way	*
Low	SW Elkhorn Ave	Existing alignment	SW 19th St	*
	Sidewalks on Existing Arterials and Collectors			
High	NW 9th St	Highland Ave	Maple Ave	$330***
High	W Antler Ave	Helmholtz Way	23rd St	$1,270
High	SW 15th St	OR 126	SW Obsidian Ave	$215***
High	SW Obsidian Ave	SW Helmholtz Way	SW 31st St	$870
High	SW Wickiup Ave	SW 35th St	SW Canal Blvd	$305***
High	NW 10th St	NW Spruce Ave	NW Maple Ave	$135
High	NW Dogwood Ave	NW Canyon Dr	NW Canal Blvd	$315
High	NW Canyon Dr	NW 9th St	OR 126	$495***
High	SW Canyon Dr	OR 126	SW Quartz Ave	$330***
High	W Antler Ave	Canyon Dr	9th St	$240
High	SE/SW Airport Way	SE Veterans Way	SW 19th St	$2,435
High	SW Obsidian Ave	SW 23rd St	SW Canal Blvd	$415
Medium	SW Deschutes Ave	SW Canyon Dr	SW Canal Blvd	$405
Medium	NW Rimrock Dr	NW Maple Ave	NW Jackpine Ave	$315
Medium	NW Quince Ave	west UGB	NW 22th St	$590
Medium	NW Kingwood Ave	NW 9th St	NW Canal Blvd	$480
Medium	NE 5th St	NE King Way	OR 126	$1,475
Medium	NW/SW 35th St	NW Oak Ave	SW Quartz Ave	$2,405
Medium	Northwest Way/27th St	NW Upas Ave	OR 126	$475
Medium	NW/SW 7th St	NW Dogwood Ave	SW Indian Ave	$220
Medium	SW 34th St	SW Wickiup Ave	S Canal Blvd	$610
Medium	NE Hemlock Ave	NW Canal Blvd	NE 9th St	$220
Medium	SW Salmon Ave	SW 31st St	SW 29th St	$65
Medium	SW 27th St	SW Salmon Ave	SW Canal Blvd	$810
Medium	NW 19th St	NW Maple Ave	NW Elm Ave	$610
Medium	SW Canal Blvd	SW Obsidian Ave	SW Helmholtz Way	$3,445
Medium	NW Upas Ave	west UGB	Dry Canyon Trail	$590
Medium	NW Maple Ave	NW Helmholtz Way	NW 19th St	$545
Medium	SW Black Butte	SW 5th St	rail	$35***
Medium	SW Yew Ave	NW Canal Blvd	US 97	$215
Medium	US 97	NW Pershall Wy/O'neil	NW Jackpine Ave	$1,855
Medium	US 97	SW Indian Ave	South UGB	$2,205
Medium	NE 9th St	NE Hemlock Ave	OR 126	$1,135
Low	NW Spruce Ave	west UGB	NW 22nd St	$590
Low	NW Hemlock Ave	NW Helmholtz Way	NW 17th St	$1,795
Low	E Antler Ave	rail	East UGB	$1,260
Low	NW Canal Blvd	NW Upas Ave	NW Birch Ave	$2,035

Priority	Project Facility	From	To	Cost ($1,000s)
Low	Canal Blvd	Highland Ave	Deschutes Ave	$345
Low	NE King Way	NW Canal Blvd	NE 5th St	$240
Low	NE Hemlock Ave	NE 15th	East UGB	$135
Low	SW Wickiup Ave	SW Helmholtz Way	SW Cascade Vista Dr	$945
Low	SW Badger Ave	SW 43rd St	SW Canal Blvd	$420
Low	SW Elkhorn Ave	SW Helmholtz Way	SW 19th St	$830
Low	SW 43rd St	SW Wickiup Ave	SW Badger Ave	$755
Low	NW 10th St	NW Pershall Way	NW Upas Ave	$410
Low	SW 19th St	SW Elkhorn Ave	South UGB	$535
Low	NW Kingwood Ave	NW 23rd St	NW Rimrock Dr	$300
Low	SW Salmon Ave	SW Helmholtz Way	SW 35th St	$200
			Subtotal	***$37,045***
		Off-street Pathways		
Medium	N-S Canal Trail	Existing Trail (S of Antler)	Existing Trail (S of Canal)	$960
Medium	N-S Canal Trail	NE Maple Ave	Firemans's Pond Park	$835
Medium	N-S Canal Trail	SW Salmon Ave	SW Canal Blvd (near Greens Blvd)	$435
Medium	Fir Connection	NW Fir Ave	Dry Canyon Trail	$90***
Low	Dry Canyon Trail	SW Highland Ave	SW Quartz Ave	$320
Low	Dry Canyon Trail	NW Pershall Way	NW Upas Ave	$250
Low	N-S BPA Trail	NW Maple Ave/N UGB	SW Elkhorn Ave	$1,590
Low	N-S Canal Trail	Existing Trail (Obsidian)	Existing Trail (Yew)	$625
Low	N-S Canal Trail	North UGB	Existing Trail (S of Hemlock)	$445
Low	N-S Canal Trail	North UGB	Existing Trail (S of Hemlock)	$835
Low	E-W Canal Trail	NE 5th St	East UGB	$100
Low	E-W Canal Trail	NW Canal Blvd (Quince)	NE 5th St	$225
Low	E-W Canal Trail	US 97	NW Pershall Way	$450
Low	N-S Canal Trail	SW Helmholtz Way	SW Canal Blvd	$1,050
			Subtotal	***$8,210***
		Pedestrian Crossing Enhancements*		
Helmholtz Way Enhancements (35)		NW Maple Ave	SW Wickiup	$350
US 97 Enhancements (27)		US 97 Reroute	South UGB	$270
OR 126 Enhancements (17)		West UGB	SW 15th St	$170
OR 126 Enhancements (17)		SE Lake Rd	East UGB	$170
			Subtotal	***$960***
		Other Pedestrian Projects		
ADA Enhancement Program		Location to be determined following ADA audit to establish existing framework		$50/year

**Project costs are included in motor vehicle plan*

***Spacing of approximately 500 feet*

****Project Cost from 2004 CIP list and factored 8% annually*

Pedestrian Action Plan

A pedestrian action plan project list was created to identify pedestrian projects that are reasonably expected to be funded by the year 2030, which meets the requirements of the updated Transportation Planning Rule[61]. Table 6-2 shows the full action plan identified in the TSP update analysis.

Table 6-2: Pedestrian Action Plan Projects and Cost Estimates

Phase	Project Facility	From	To	Cost ($1,000s)
		Sidewalks on New Arterials and Collectors		
1 (2008-2015)	Northwest Way/27th St	NW Maple Ave	NW Greenwood	*
1 (2008-2015)	Northwest Way/27th St	SW Glacier Ave	OR 126	*
1 (2008-2015)	NW Maple Ave	NW 35th St	NW 27th St	*
1 (2008-2015)	SE 9th St extension	OR 126	SE Veterans Way	*
1/2 (2008-2021)	NW/SW Helmholtz Way	NW Maple Ave	SW Canal Blvd	*
2 (2016-2020)	SW/SE Quartz Ave	SW Canal Blvd	SE 1st St	*
2 (2016-2020)	NW Maple Ave	NW Helmholtz Way	NW 35th St	*
2 (2016-2020)	OR 126	SW Helmholtz Way	SW Rimrock Way	*
3 (2021-2025)	NW Pershall Way	Northwest Way	US 97	*
3 (2021-2025)	SW Quartz Ave	SW Helmholtz Way	SW 35th St	*
4 (2026-2030)	NE 17th St	North UGB	OR 126	*
4 (2026-2030)	SW Elkhorn Ave	Existing alignment	SW 19th St	*
-	OR 126	SW Canal Blvd	SE Veterans Way	*
		Sidewalks on Existing Arterials and Collectors		
1 (2008-2015)	NW 9th St	Highland Ave	Maple Ave	$330***
1 (2008-2015)	W Antler Ave	Helmholtz Way	23rd St	$1,270
1 (2008-2015)	SW 15th St	OR 126	SW Obsidian Ave	$215***
1 (2008-2015)	NW 10th St	NW Spruce Ave	NW Maple Ave	$135
1 (2008-2015)	NW Canyon Dr	NW 9th St	OR 126	$495***
1 (2008-2015)	SW Canyon Dr	OR 126	SW Quartz Ave	$330***
1 (2008-2015)	W Antler Ave	Canyon Dr	9th St	$240
2 (2016-2020)	SW Obsidian Ave	SW Helmholtz Way	SW 31st St	$870
2 (2016-2020)	SW Wickiup Ave	SW 35th St	SW Canal Blvd	$305***
2 (2016-2020)	NW Dogwood Ave	NW Canyon Dr	NW Canal Blvd	$315
2 (2016-2020)	SW Obsidian Ave	SW 23rd St	SW Canal Blvd	$415
3 (2021-2025)	SE/SW Airport Way	SE Veterans Way	SW 19th St	$2,435
			Existing Facilities Subtotal	*$7,355*
		Off-street Pathways		
1 (2008-2015)	Dry Canyon Trail	SW Highland Ave	SW Quartz Ave	****
1 (2008-2015)	N-S BPA Trail	NW Maple Ave/North UGB	SW Elkhorn Ave	****
1 (2008-2015)	N-S Canal Trail	North UGB	Existing Trail (S of Hemlock)	****
1 (2008-2015)	N-S Canal Trail	North UGB	Existing Trail (S of Hemlock)	****
2 (2016-2020)	N-S Canal Trail	Existing Trail (S of Antler)	Existing Trail (S of Canal)	****
2 (2016-2020)	N-S Canal Trail	SW Salmon Ave	SW Canal Blvd (near Greens Blvd)	****
2 (2016-2020)	N-S Canal Trail	Existing Trail (Obsidian)	Existing Trail (Yew)	****
3 (2021-2025)	Dry Canyon Trail	NW Pershall Way	NW Upas Ave	****
3 (2021-2025)	N-S Canal Trail	NE Maple Ave	Firemans's Pond Park	****

[61] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April 2005.

Phase	Project Facility	From	To	Cost ($1,000s)
3 (2021-2025)	E-W Canal Trail	NW Canal Blvd (Quince)	NE 5th St	****
4 (2026-2030)	E-W Canal Trail	NE 5th St	East UGB	****
4 (2026-2030)	N-S Canal Trail	SW Helmholtz Way	SW Canal Blvd	****
Pedestrian Crossing Enhancements				
Helmholtz Way Enhancements (35)		NW Maple Ave	SW Wickiup	$350
US 97 Enhancements (27)		US 97 Reroute	South UGB	$270
OR 126 Enhancements (17)		West UGB	SW 15th St	$170
OR 126 Enhancements (17)		SE Lake Rd	East UGB	$170
			Crossing Enhancements Subtotal	*$960*
Other Pedestrian Projects				
ADA Enhancement Program		Location to be determined following ADA audit to establish existing framework		$50/year
			23-YEAR TOTAL PEDESTRIAN ACTION PLAN COST	**$9,370**

**Project costs are included in motor vehicle action plan*

***Spacing of approximately 500 feet*

****Project Cost from 2004 CIP list and factored 8% annually*

***** Project costs are included in bicycle action plan*

7. Bicycle Master Plan

Overview

The following chapter summarizes the existing and future bicycle facility needs in the City of Redmond, identify improvement strategies, and recommends bikeway projects for the City.

Bicycle System Needs

Bicycle goals and policies for the area aim to provide safe, continuous, and accessible facilities. Striped bike lanes are generally present on US 97 (except through the downtown 5th/6th Street couplet), OR 126 west of US 97, Airport Way, Canal Boulevard, Helmholtz Way, 19th Street, and intermittent locations on other collectors and arterials in the City. The Dry Canyon Trail is a popular facility for pedestrian and bicycle use. Connectivity between these bicycle facilities is limited.

Bicycle trips are different from pedestrian and motor vehicle trips. Common bicycle trips are longer than walking trips and generally shorter than motor vehicle trips. Where walking trips are attractive at lengths of a quarter mile (generally not more than a mile), bicycle trips are attractive up to three miles. Bicycle trips can generally fall into three groups: commuting, activity-based and recreational. Commuter trips are typically home/work/home (sometimes linking to transit) and are made on direct, major connecting roadways and/or local streets. Bicycle lanes provide good accommodations for these trips. Activity-based trips can be home-to-school, home-to-park, home-to-neighborhood commercial or home-to-home. Many of these trips are made on local streets with some connections to arterials and collectors. Their needs are for lower volume/speed traffic streets, safety and connectivity. Recreational trips share many of the needs of both the commuter and activity-based trips, but create greater needs for off-street routes, connections to rural routes and safety. Typically, recreational bike trips will exceed the normal bike trip length.

System continuity and connectivity, and safety are key issues for bicyclists. The lack of safe facilities and gaps in the system cause the most significant problems for bicyclists traveling to and from downtown Redmond. The following needs have been identified for bicycle access and circulation within the City of Redmond.

Local/Regional Connectivity- The existing bicycle network in Redmond includes a combination of striped bicycle lanes and shared facilities. Dedicated bicycle facilities in the downtown area are limited. Local connectivity can be improved with the dedication of bicycle lanes on new and existing facilities as well as the construction of off-street trails.

Interest was also noted for bicycle facilities connecting to neighboring communities. Due to the limited level of interest expressed, projects for such regional facilities are not included on the list of recommended projects. However, the City should consider a joint regional effort to improve bicycle connections to the surrounding communities of Sisters, Madras, Bend, and Prineville.

Bicycle Parking- The existing bicycle parking is limited in downtown Redmond. Providing additional bicycle parking at key destinations was the top bicycle priority based on input from the TAC. To facilitate bicycle trips, bicycle parking should be provided with short-term and long-term spaces around key destinations such as schools, the library, retail areas and other activity centers. Short-term spaces should be located within 50 feet of entrances of buildings, with care taken to not conflict with pedestrian access or circulation. Long-term parking should be provided with bicycle lockers or dedicated parking rooms or cages with signage from the street directing cyclists where to access these facilities. To the extent possible, bike parking should be visible, inviting and integrated with building, street front and landscape design.

Strategies

Bikeway improvements are aimed at closing the gaps in the bicycle network along arterial and collector roadways, in additional to providing multi-modal links to improve livability. Several strategies were identified to address bicycle system needs and to guide project prioritization. This prioritization process helps to focus community investment on those projects that are most effective at meeting critical needs, while deferring other projects of lesser value. The strategies were ranked by the Technical Advisory Committee (TAC) for use in this TSP[62].

The strategies for bicycle facilities (listed in order of importance) are:

- Provide bicycle parking at key destinations
- Provide corridors that are separate from roadways (along canal ROWs, development, landscaping, etc)
- Construct bicycle lanes on all arterials and collectors to meet City of Redmond, Deschutes County or ODOT standards
- Connect key bicycle corridors to schools, parks, employment, and activity centers
- Provide bicycle corridors that connect to major recreational facilities
- Develop a maintenance program to clean bicycle lanes
- Fill in gaps in the network where some bikeways exist (arterials and collectors)
- Provide a regional pathway facility connecting to neighboring communities
- Provide bicycle corridors that commuters might use
- Provide arterial crossing enhancements
- Provide bicycle corridors that connect neighborhoods
- Provide bicycle corridors that access retail areas

Bicycle Master Plan

A list of bicycle projects to meet the identified needs and achieve these outlined strategies was developed and is shown in Figure 7-1 and summarized in Table 7-1. The list is an overall plan and summarizes the 'wish list' of bicycle related projects in Redmond, providing a long-term map for planning bicycle facilities.

Each bicycle project was ranked based on how well it met the improvement strategies that were identified. A high, medium, and low designation was given to each project to indicate a general priority for implementation. Each of these projects will need further refinement to detail right-of-way requirements and costs associated with special design details as projects are pursued.

[62] Technical Advisory Committee Meeting, September 26, 2007.

Table 7-1: Bicycle Master Plan Projects and Cost Estimates

Priority	Project Facility	From	To	Cost ($1,000s)
	Bicycle Lanes on New Arterials and Collectors			
High	NW Quince Ave	NW 10th St	NW Canal Blvd	*
Med	SW Quartz Ave	SW Helmholtz Way	SW 35th St	*
Med	SW Quartz Ave	SW Canal Blvd	SE 1st St	*
Med	SW 27th St	SW Glacier	OR 126	*
Med	NW Maple Ave	NW Helmholtz Way	NW 35th St	*
Med	NW Maple Ave	NW 35 th St	NW 27th St	*
Med	SE 9th St extension	OR 126	SE Veterans Way	*
Low	Northwest Way/27th St	NW Maple Ave	NW Greenwood Ave	*
Low	NW Pershall Way	Northwest Way	US 97	*
Low	OR 126	SW Canal Blvd	East UGB	*
Low	NE 15th St	North UGB	OR 126	*
Low	SW Elkhorn Ave	Existing alignment	SW 19th St	*
	Bicycle Lanes on Existing Arterials and Collectors			
High	W Antler Ave	Helmholtz Way	23rd St	$1,630
High	SW Obsidian Ave	SW 23rd St	SW Canyon Dr	$140
Medium	SW Evergreen Ave	SW Canyon Dr	SW Canal Blvd	$495
Medium	SW 15th St	SW Evergreen Ave	SW Quartz Ave	$775
Medium	NW/SW 9th St	NW Negus Pl	SW Highland Ave	$1,240
Medium	NW/SW 6th St	NW Hemlock Ave	SW Highland Ave	$775
Medium	NW/SW 5th St	NW Hemlock Ave	SW Highland Ave	$775
Medium	SW Obsidian Ave	SW Helmholtz Way	SW Canal Blvd	$1,020***
Medium	SW Quartz Ave	SW 35th Way	SW Canal Blvd	$1,050
Medium	SW Wickiup Ave	SW Helmholtz Way	SW 31st St	$1,170
Medium	SW Canyon Dr	OR 126	SW Quartz Ave	$640
Medium	NW/SW Canyon Dr	NW Ivy Ave	SW Evergreen Ave	$745
Medium	SW Deschutes Ave	SW Canyon Dr	SW Canal Blvd	$495
Medium	NW Dogwood Ave	NW Canyon Dr	NW Canal Blvd	$490
Medium	SE Quartz Ave	SE 1st St	SE Airport Way	$85
Medium	NW Kingwood Ave	NW 23rd St	NW Rimrock Dr	$420
Medium	NE/SE 9th St	NE Hemlock Ave	OR 126	$820
Medium	SW Yew Ave	SW Canal Blvd	SW 19th St	$465
Medium	SW Wickiup Ave	SW 27th St	SW Canal Blvd	$160
Medium	NW 27th St	NW Evergreen Ave	NW Glacier Ave	$120
Medium	NW 19th St	NW Fir Ave	NW Cedar Ave	$130
Medium	NW/NE Maple Ave	NW 27th St	NE 9th St	$1,570
Medium	NW Kingwood Ave	US 97	NW Canal Blvd	$90***
Medium	NE Hemlock Ave	NW Canal Blvd	NE 9th St	$405
Medium	Antler Ave	W 5th St	East UGB	$1,065
Low	SW Glacier Ave	SW 14th St	SW 5th St	$400
Low	SW Highland Ave	SW 14th St	SW 5th St	$345
Low	SW Obsidian Ave	SW 23rd St	SW Canal Blvd	$185***
Low	Spruce Ave	west UGB	19th St	$495
Low	NE King Way	NW Canal Blvd	NE 5th St	$145
Low	NW Hemlock Ave	NW Helmholtz Way	NW Rimrock Dr	$1,435
Low	NE Hemlock Ave	NE 13th	East UGB	$195
Low	SW Black Butte Ave	SW Canyon Dr	SW Canal Blvd	$460
Low	SW Salmon Ave	SW 31st St	SW 27th St	$205
Low	NW Upas Ave	west UGB	Dry Canyon Trail	$355
Low	NW Spruce Ave	NW Canyon Dr	US 97	$540
Low	NW Quince Ave	west UGB	NW 19th St	$600

Priority	Project Facility	From	To	Cost ($1,000s)
Low	SW Salmon Ave	SW Helmholtz Way	SW 35th St	$490
Low	NW/SW 35th St	North UGB	SW Salmon Ave	$2,775
Low	Northwest Way/27th St	NW Pershall Way	NW Maple Ave	$795
Low	SW 27th St	SW Obsidian Ave	SW Canal Blvd	$985
Low	SW 23rd St	W Antler Ave	SW Rimrock Way	$585
Low	SW 23rd St	SW Salmon Ave	SW Canal Blvd	$430
Low	NW 19th St	NW Spruce Ave	NW Quince Ave	$225
Low	SW 7th St	SW Dogwood Ave	SW Indian Ave	$625
Low	SW Odem Medo Rd	SW Salmon Ave	US 97	$145
Low	SW Badger Ave	SW 43rd St	SW Canal Blvd	$300
Low	SW Elkhorn Ave	SW Helmholtz Way	existing alignment	$595
Low	NW Rimrock Dr	NW Maple Ave	NW Hemlock Ave	$400
Low	SW 43rd St	SW Wickiup Ave	SW Badger Ave	$535
Low	NW Canal Blvd	NW Upas Ave	NW Spruce Ave	$355
Low	NW 10th St	NW Pershall Way	NW Upas Ave	$295
			Subtotal	***$31,665***
		Off-street Bicycle Pathways		
High	NS BPA Trail	NW Maple Ave/N UGB	SW Elkhorn Ave	**
High	NS Canal Trail	SW Salmon Ave	SW Canal Blvd (near Greens Blvd)	**
High	NS Canal Trail	Existing Trail (S of Antler)	Existing Trail (S of Canal)	**
High	NS Canal Trail	SW Helmholtz Way	SW Canal Blvd	**
High	NS Canal Trail	North UGB	Existing Trail (S of Hemlock)	**
High	NS Canal Trail	NE Maple Ave	Firemans's Pond Park	**
High	NS Canal Trail	North UGB	Existing Trail (S of Hemlock)	**
High	NS Canal Trail	Existing Trail (Obsidian)	Existing Trail (Yew)	**
High	Dry Canyon Trail	SW Highland Ave	SW Quartz Ave	**
High	Dry Canyon Trail	NW Pershall Way	NW Upas Ave	**
High	EW Canal Trail	NE Canal Blvd (Quince)	NE 5th St	**
High	EW Canal Trail	NE 5th St	East UGB	**
Medium	EW Canal Trail	US 97	NW Pershall Way	**
Medium	Fir Connection	Fir Ave	Dry Canyon Trail	**
		Other Projects		
Bicycle parking		Downtown locations, key destinations, and activity centers		$10

** Project cost is included in the motor vehicle plan*

***Project cost is included in the pedestrian plan.*

****Project cost is from 2004 CIP cost and is factored 8% annually*

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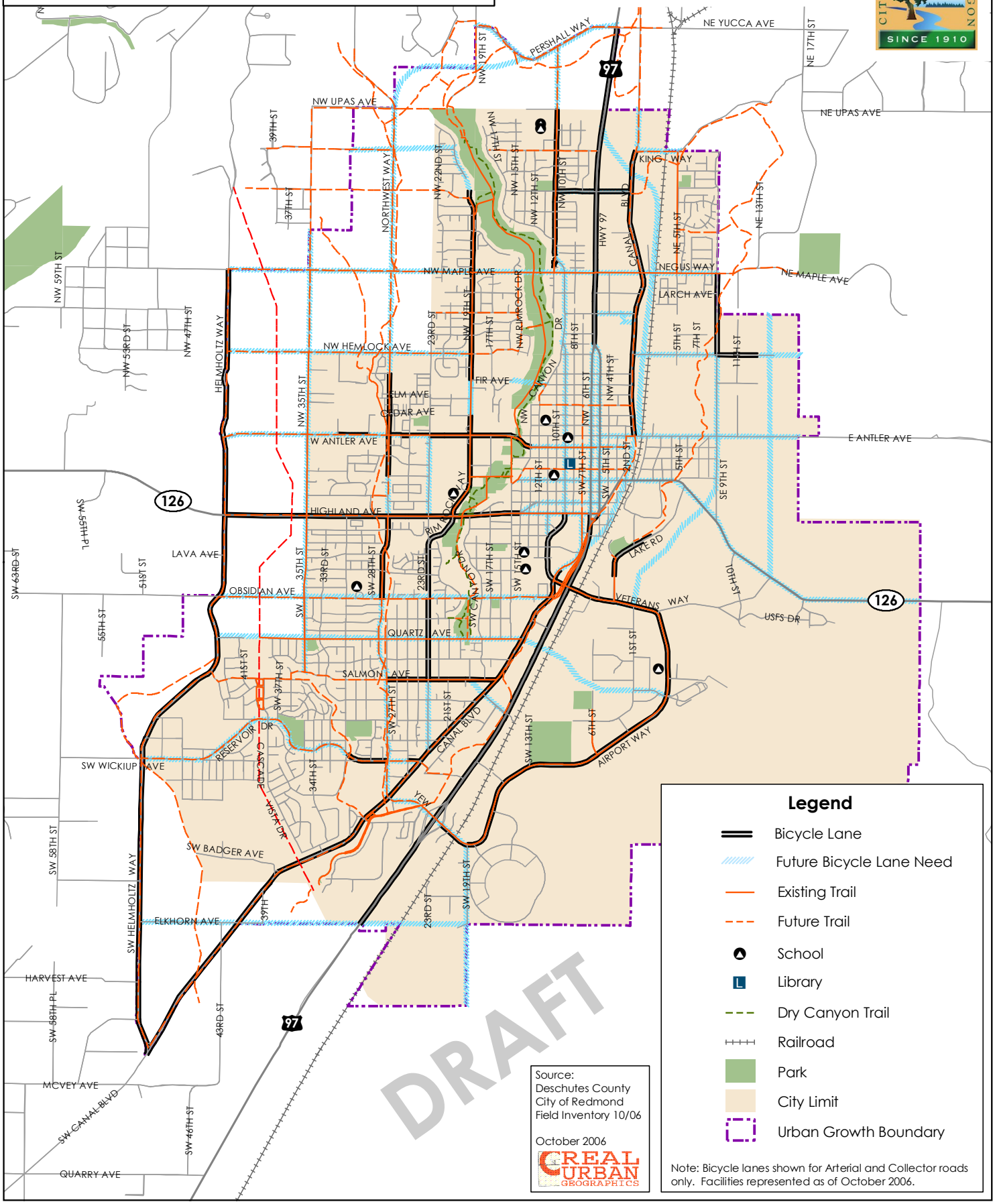
Figure 7-1
BICYCLE MASTER PLAN

N
NOT TO SCALE

City of Redmond Transportation System Plan



DRAFT

Source:
Deschutes County
City of Redmond
Field Inventory 10/06

October 2006

CREAL URBAN GEOGRAPHICS

Legend

- Bicycle Lane
- Future Bicycle Lane Need
- Existing Trail
- Future Trail
- School
- Library
- Dry Canyon Trail
- Railroad
- Park
- City Limit
- Urban Growth Boundary

Note: Bicycle lanes shown for Arterial and Collector roads only. Facilities represented as of October 2006.

Bicycle Action Plan

A bicycle action plan project list was created to identify bicycle projects that are reasonably expected to be funded by the year 2030, meeting the requirements of the updated Transportation Planning Rule[63]. Table 7-2 lists the full action plan identified in the TSP update analysis.

Table 7-2: Bicycle Action Plan Projects and Cost Estimates

Phase	Project Facility	From	To	Cost ($1,000s)
		Bicycle Lanes on New Arterials and Collectors		
1 (2008-2015)	SW 27th St	SW Glacier	OR 126	*
1 (2008-2015)	NW Maple Ave	NW 35th St	NW 27th St	*
1 (2008-2015)	SE 9th St extension	OR 126	SE Veterans Way	*
1 (2008-2015)	Northwest Way/27th St	NW Maple Ave	NW Greenwood Ave	*
2 (2016-2020)	SW Quartz Ave	SW Canal Blvd	SE 1st St	*
2 (2016-2020)	NW Maple Ave	NW Helmholtz Way	NW 35th St	*
3 (2021-2025)	SW Quartz Ave	SW Helmholtz Way	SW 35th St	*
3 (2021-2025)	NW Pershall Way	Northwest Way	US 97	*
4 (2026-2030)	NE 17th St	North UGB	OR 126	*
4 (2026-2030)	SW Elkhorn Ave	Existing alignment	SW 19th St	*
-	OR 126	SW Canal Blvd	Veterans Way	*
		Bicycle Lanes on Existing Arterials and Collectors		
1 (2008-2015)	W Antler Ave	Helmholtz Way	23rd St	$1,630
2 (2016-2020)	SW Obsidian Ave	SW 23rd St	SW Canyon Dr	$140
			Existing Facilities Subtotal	***$1,770***
		Off-street Bicycle Pathways		
1 (2008-2015)	NS BPA Trail	NW Maple Ave/N UGB	SW Elkhorn Ave	$1,590
1 (2008-2015)	Dry Canyon Trail	SW Highland Ave	SW Quartz Ave	$320
1 (2008-2015)	NS Canal Trail	North UGB (Oak)	Existing Trail (S of Hem.)	$445
1 (2008-2015)	NS Canal Trail	North UGB (Upas)	Existing Trail (S of Hem.)	$835
2 (2016-2020)	NS Canal Trail	SW Salmon Ave	SW Canal Blvd (near Greens Blvd)	$435
2 (2016-2020)	NS Canal Trail	Existing Trail (S of Antler)	Existing Trail (S of Canal)	$960
2 (2016-2020)	NS Canal Trail	Existing (@Obsidian)	Existing Trail (Yew)	$625
3 (2021-2025)	NS Canal Trail	NE Maple Ave	Firemans's Pond Park	$835
3 (2021-2025)	Dry Canyon Trail	NW Pershall Way	NW Upas Ave	$250
3 (2021-2025)	EW Canal Trail	NE Canal (@Quince)	NE 5th St	$225
4 (2026-2030)	EW Canal Trail	NE 5th St	East UGB	$100
4 (2026-2030)	NS Canal Trail	SW Helmholtz Way	SW Canal Blvd	$1,050
			Off-Street Facilities Subtotal	***$7,670***
		Other Projects		
1 (2008-2015)	Bicycle parking	Downtown locations, key destinations, and activity centers		$10
			BICYCLE ACTION PLAN TOTAL	***$9,440***

** Project cost is included in the motor vehicle plan*

[63] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April 2005.

8. Transit Master Plan

Overview

This chapter summarizes existing and future transit needs in the City of Redmond, presents improvement strategies and outlines the recommended transit plan.

Transit System Needs

The population estimates for the City of Redmond reach approximately 59,000 residents by the year 2030. As a City of over 50,000 residents, a transit system (likely including a fixed-route component) will become a requirement for adequately balancing transportation infrastructure with user needs. To begin planning for this system, the City of Redmond has received a grant from ODOT to undertake a Transit Feasibility Study, which will assess the viability of transit service in Redmond and make recommendations for locations of transit routes, the frequency of service, and user amenities that should be considered at transit stop locations. Prior to the completion of this study, this TSP should consider the needs for future transit service and identify placeholder strategies that could be implemented to address them.

Several improvement strategies were developed to meet transit needs in Redmond. These strategies were ranked as part of this TSP[64]. The strategies, which rely on coordination with the City of Redmond as well as other regional transit service providers, include (listed in order of importance):

- Provide park-and-ride lots and support van pools/car pools
- Establish a Transportation Management Agency (TMA) to support transit and travel demand management efforts (e.g. carpools)
- Construct transit stop amenities (shelters, schedules, lights, benches, etc)
- Provide commuter service to Bend
- Update roadway design standards to support fixed-route transit service
- Improve the dial-a-ride program (frequency and scheduling)
- Expand regional transit services to surrounding communities
- Provide shuttle service to key destinations
- Explore the feasibility of local fixed-route transit service
- Improve rail facilities to support recreational/commuter rail services

[64] Technical Advisory Committee Meeting, September 26, 2007.

Transit Master Plan

To meet transportation performance standards and serve future growth, the future transportation system needs multi-modal improvements to manage the forecasted travel demand. Placeholder transit master plan projects were ranked based on feedback for transit strategies. A high, medium, and low designation was given to each project to indicate a general priority that the projects should be implemented. Transit master plan projects are summarized in Table 8-1.

Table 8-1: Transit Master Plan

Priority	Project	Description	Cost ($1,000s)
High	Park-and-ride lots	Implement park-and-ride lot to serve transit and carpool users. Specific location to be determined.	$500
High	Transit stop amenities	Construct or plan for future transit stop amenities such as shelters, schedules, lights, and benches	$250
High	Commuter service	Provide commuter service to Bend	$100/Year
Medium	Dial-a-ride services	Enhance dial-a-ride services, including ease of scheduling and hours of operation	$50/Year
Low	Regional transit service	Expand regional transit service to surrounding communities	$100/Year
Low	Shuttle service	Provide a shuttle service to key destinations in and around Redmond	$50/Year
Low	Local fixed route feasibility study	Explore the feasibility of local fixed-route transit service	$75
		Transit Master Plan Total (for 23 years)	**$7,725**

Transit Action Plan

A transit action plan project list was created to identify transit projects that are reasonably expected to be funded by the year 2030, meeting the requirements of the updated Transportation Planning Rule[65]. Table 8-2 lists the full action plan identified in the TSP update analysis.

Table 8-2: Transit Action Plan

Priority	Project	Description	Cost ($1,000s)
High	Park-and-ride lots	Implement park-and-ride lot to serve transit and carpool users. Specific location to be determined.	$500
High	Transit stop amenities	Construct or plan for future transit stop amenities such as shelters, schedules, lights, and benches	$250
High	Commuter service	Provide commuter service to Bend	$100/Year
		Transit Project Total (for 23 years)	**$3,050**

[65] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April 2005.

9. Motor Vehicle Master Plan

Introduction

This chapter outlines the strategies and recommends plans to meet the future needs of the motor vehicle system in Redmond. The Motor Vehicle modal plan is intended to be consistent with other jurisdictional plans including Deschutes County Transportation System Plan and Oregon Department of Transportation's Highway Plan Strategies. The following sections include functional classification, cross-section design and access spacing for facilities, as well as a plan for future roadway extensions, connections, and intersection control and lane channelization and control.

Strategies

Strategies for meeting the automobile facility needs (presented in Chapter 4) include the following:

- Transportation System Management (TSM), including:
    - Neighborhood Traffic Management
    - Access Management
    - Local Circulation Enhancements
- Transportation Demand Management (TDM)
- Roadway Extensions to Improve Circulation
- Traffic Signals on Arterial/Collector Intersections
- Mitigate all Intersections to State and Local performance standards
    - Additional Traffic Signals on Arterial/Collector Intersections
    - Intersection Modifications
    - Mitigate all intersections to meet State and Local performance standards

The following sections outline the type of improvements that would be necessary as part of a long-range Motor Vehicle Master Plan. Phasing of implementation will be necessary since all improvements cannot be done at once. This will require prioritization of projects and periodic updating to reflect current needs. The following sections are a guide to managing growth in Redmond as it occurs over the next 23 years.

Transportation System Management

The implementation of low-cost strategies to address problems and enhance the transportation system is known as transportation system management (TSM). These strategies improve the transportation system through a system-wide focus on maximizing mobility and a consideration for all modes of travel. Measures such as neighborhood traffic management (NTM), access management, local street connectivity, traffic signal spacing, and street design standards are all utilized through implementation of TSM and are described in the following section.

Functional Classification

The functional class of a road aids in defining the primary function and associated design standards for the facility. The hierarchy of the facilities within the network in regards to the type of traffic served (through or local trips), balance of function (providing access and/or capacity), and the level of use (generally measured in vehicles per day) are generally dictated by the functional class.

How Street Functional Classification is Applied

Functional classification has two components: the extent of connectivity and the frequency of the facility type. Maps can be used to determine regional, city, and neighborhood connections. The frequency or need for facilities of certain classifications is not routine or easy to package into a single criterion. While planning textbooks call for arterial spacing of a mile, collector spacing of a quarter to a half-mile, and neighborhood connections at an eighth to a sixteenth of a mile, this does not form the only basis for defining functional classification.

Changes in land use, environmental issues or barriers, topographic constraints, and demand for facilities can change the frequency for routes of certain functional classifications. While spacing standards can be a guide, they must consider other features and potential long term uses in the area (some areas would not experience significant changes in demand, where others will). It is acceptable for the city to re-classify street functional designations to have different naming conventions, however, the general intent and purpose of the facility, whatever the name, should be consistent with regional, state and federal guidelines.

By planning an effective functional classification of Redmond streets, the City can manage public facilities pragmatically and cost effectively. These classifications do not mean that because a route is an arterial it is large and has lots of traffic. Nor do the definitions dictate that a local street should only be small with little traffic. Identification of connectivity does not dictate land use or demand for facilities. The demand for streets is directly related to the land use. The highest level connected streets have the greatest potential for higher traffic volumes, but do not necessarily have to have high volumes as an outcome, depending upon land uses in the area. Typically, a significant reason for high traffic volumes on surface streets at any point can be related to the level of land use intensity within a mile or two. Many arterials with the highest level of connectivity have only 35 to 65 percent "through traffic". Without the connectivity provided by arterials and collectors, the impact of traffic intruding into neighborhoods and local streets goes up substantially.

Definitions

Arterial streets serve to interconnect the City. These streets link major commercial, residential, industrial and institutional areas. Arterial streets are typically spaced about one mile apart to assure accessibility and reduce the incidence of traffic using collectors or local streets for through traffic in lieu of a well placed arterial street. Access control is the key feature of an arterial route. Arterials are typically multiple miles in length.

Major Collector streets provide both access and circulation within and between residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require as extensive control of access (compared to arterials) and penetrate residential neighborhoods, distributing trips from the neighborhood and local street system. Collectors are typically greater than 0.5 to 1.0 miles in length.

Minor Collector streets (also known as neighborhood routes) are usually long relative to local streets and provide connectivity to major collectors or arterials. Because minor collectors have greater connectivity, they generally have more traffic than local streets and are used by residents in the area to get into and out of the neighborhood, but do not serve citywide/large area circulation. They are typically about a quarter to a half-mile in total length. Traffic from cul-de-sacs and other local streets may drain onto minor collectors to gain access to major collectors or arterials. Because traffic needs are greater than a local street, certain measures should be considered to retain the neighborhood character and livability of these streets. Neighborhood traffic management measures are often appropriate (including devices such as speed humps, traffic circles and other devices - refer to later section in this chapter). However, it should **not** be construed that minor collectors automatically get speed humps or any other measures. While these streets have special needs, neighborhood traffic management is only one means of retaining neighborhood character and vitality.

Local Streets have the sole function of providing access to immediate adjacent land. Service to "through traffic movement" on local streets is deliberately discouraged by design.

The proposed functional classification map for the master plan street network in Redmond is shown in Figure 9-1. Any street not designated as an arterial or collector is considered a local street.

Functional Classification Changes in Redmond

The 2000 TSP established a functional classification for Redmond that included arterials (major and minor), and collectors (major and minor). The classifications of several roadways within the City have been revised. The key changes include the addition of the US 97 Reroute as a major arterial, changing the classification of the current US 97 alignment (along 5th/6th Avenues) to minor arterial, and maintaining and updating the collector system to reflect changing land uses.

A revised functional classification map is illustrated in Figure 9-1. The recommended changes to the functional classification defined in the 2000 TSP include:

- Downgrade existing US 97 alignment between north reroute interchange and Quarry interchange to minor arterial (upon construction of the US 97 Reroute, Phase II),
- Downgrade SW Lake Road to local street from OR 126 to SE Veterans Way,
- Downgrade N Canal Boulevard to major collector from Dogwood Avenue to Maple Avenue,
- Downgrade Veterans Way to major collector from OR 126 to Airport Way,
- Downgrade N Canal Boulevard to major collector from north UGB to King Way,
- Downgrade SW 23rd Street to a local street from Highland Avenue to Antler Avenue,
- Upgrade NE 5th Street to minor collector from King Way to OR 126,
- Upgrade NW 9th Street to major collector from Glacier Avenue to Maple Avenue,
- Upgrade SW Quartz Avenue to major collector from SW Helmholtz Way to SW Canal Boulevard,

- Upgrade Airport Way to minor arterial from SW 13th St to Veterans Way,
- Upgrade Salmon Ave to minor collector from Helmholtz Way to SW 35th Street,
- Upgrade SW 34th Street to minor collector from Wickiup Avenue to S Canal Boulevard,
- Addition of US 97 Reroute as a major arterial,
- Extend Helmholtz Way as minor arterial from S Canal Blvd to Quarry Avenue,
- Extend NE 17th Street as a major collector from north UGB to OR 126,
- Extend Upas Avenue as major collector from NW 10th Street to N Canal Boulevard, and
- Addition of SE 9th Street extension as minor arterial.

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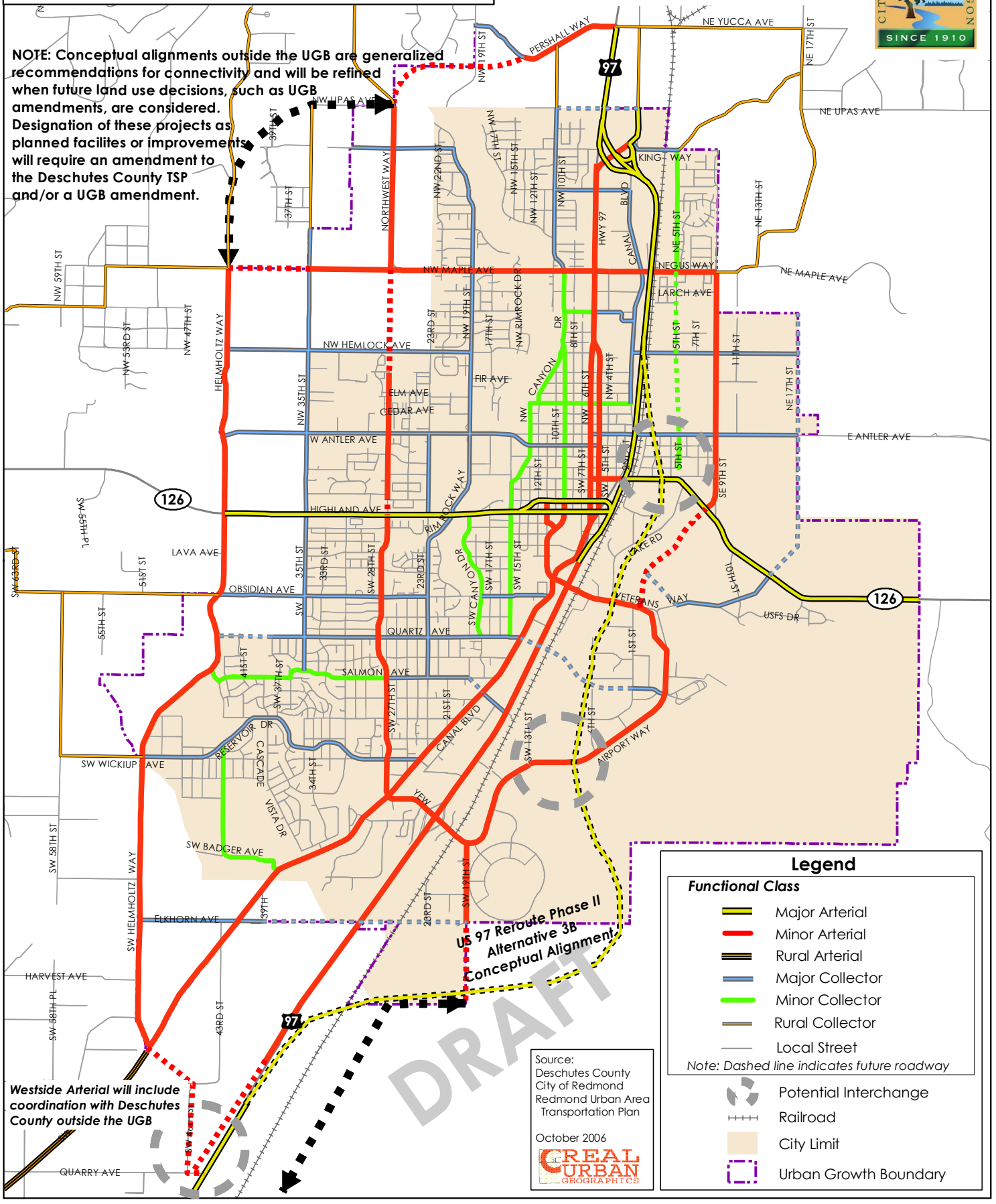
Figure 9-1
PROPOSED FUNCTIONAL CLASS

N
NOT TO SCALE

City of Redmond Transportation System Plan

NOTE: Conceptual alignments outside the UGB are generalized recommendations for connectivity and will be refined when future land use decisions, such as UGB amendments, are considered. Designation of these projects as planned facilites or improvements will require an amendment to the Deschutes County TSP and/or a UGB amendment.



Source:
Deschutes County
City of Redmond
Redmond Urban Area Transportation Plan

October 2006

CREAL URBAN GEOGRAPHICS

Legend

Functional Class

- Major Arterial
- Minor Arterial
- Rural Arterial
- Major Collector
- Minor Collector
- Rural Collector
- Local Street

Note: Dashed line indicates future roadway

- Potential Interchange
- Railroad
- City Limit
- Urban Growth Boundary

Roadway Cross-Section Standards

The street design characteristics in Redmond were updated and developed to meet the function and demand for each facility type. Because the actual design of a roadway can vary from segment to segment due to adjacent land uses and demands, the objective was to define a system that allows standardization of key characteristics to provide consistency, but also to provide criteria for application that provides some flexibility, while meeting standards. Cross-sections of streets under City of Redmond jurisdiction are depicted in Figure 9-2 through Figure 9-4 for minor arterials, collectors (major and minor), and local streets. A summary of each cross-section is also provided in Table 9-1. Private alleys do not have a design standard.

Table 9-1: City of Redmond Roadway Cross-Section Standards

	Width (ft)						
Functional Class	Pavement (standard)	Pavement (minimum)*	Right of Way*	Travel Lanes	Sidewalks	Bike Lanes**	Parking**
Local Residential Grid	36 ft	28/32 ft	60 ft	2***	5 ft.	shared	both sides (unstriped)
Local Industrial	40 ft	38 ft	60 ft	2***	5 ft.	shared	optional (unstriped)
Industrial Collector	40 ft	38 ft	80 ft	2	5 ft.	6 ft.	none
Minor Collector	40 ft	36 ft****	60 ft	2	5 ft.	shared	both sides (8 ft)
Major Collector	36-50 ft	38 ft	80 ft	2	5 ft.	6 ft.	none
Minor Arterial (3-lane)	50 ft	48 ft	100 ft	3	7 ft.	6 ft.	none
Minor Arterial (5-lane)	74 ft	72 ft	100 ft	5	7 ft.	6 ft.	none

Notes:

**The standard paved width for a residential street in the local grid is 36' in 60' ROW. Two reduced cross-sections that can be approved through an annexation agreement only. These are:*

Reduced Local 1: 32' in 50' ROW (with 5' utility easements on each side)

Reduced Local 2: 28' in 40' ROW (with 10' utility easements on each side - used in conjunction with alleys adjacent to single family residential only)

*** In certain cases, bike lanes may be reduced to 5 ft, parking may be reduced to 7 ft, and travel lanes to 11 ft at the discretion of the City Engineer*

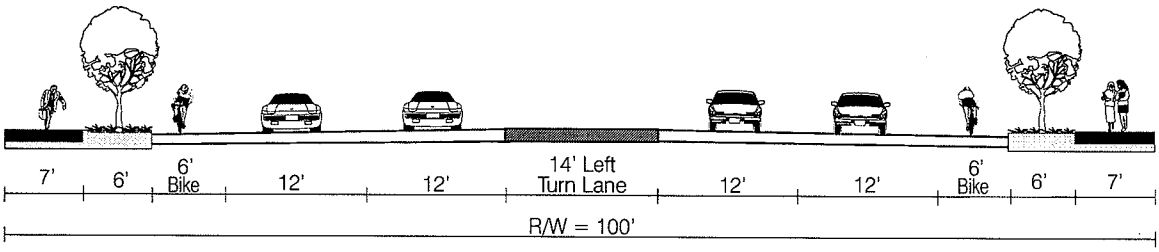
**** unstriped travel lanes*

***** 36 ft in existing built-out areas*

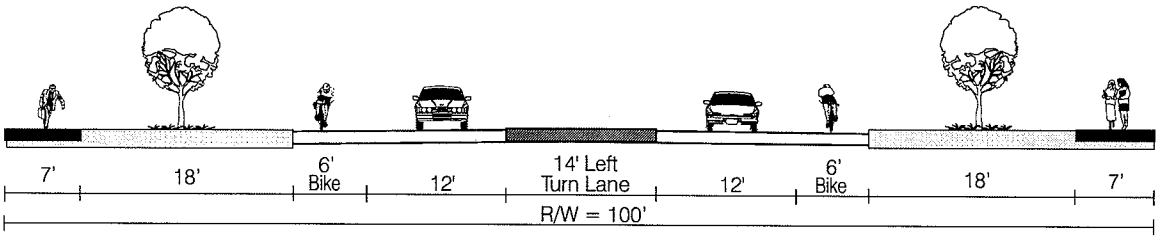
Specific right-of-way needs will need to be monitored continuously through the development review process to reflect current needs and conditions (that is to say that more specific detail may become evident in development review which requires improvements other than these outlined in this 20 year general planning assessment of street needs).

In addition to the city streets, the three state highways (US 97, OR 126 and OR 370) within the community have an additional set of design considerations as defined in the *Oregon Highway Plan* (OHP) and in the *Highway Design Manual*. ODOT's design standards from the current *Highway Design Manual* apply, with any deviation from those standards requiring approval of a design exception.

5 LANE MINOR ARTERIAL



3 LANE MINOR ARTERIAL



Notes:

1. For new or re-constructed roadways.
2. Turn lane warrants should be reviewed using Highway Research Record No. 211, NCHRP Report No. 279 or other updated/superseding reference.
3. ODOT "Highway Design Manual" requirements supercede city standards.
4. Sidewalks are "property tight" as shown for 5 lane arterials, and "property tight" or meandering for 3 lane arterials, unless approved by City Engineer.

LEGEND

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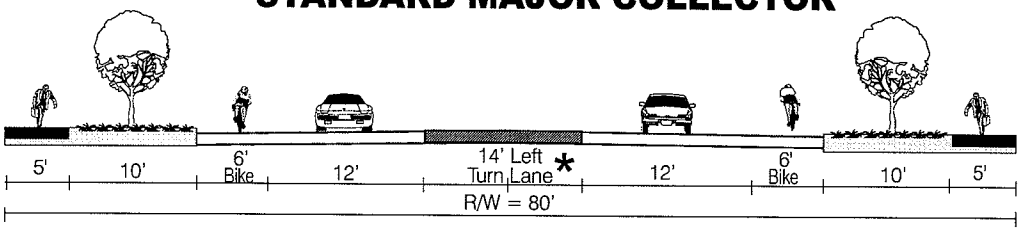
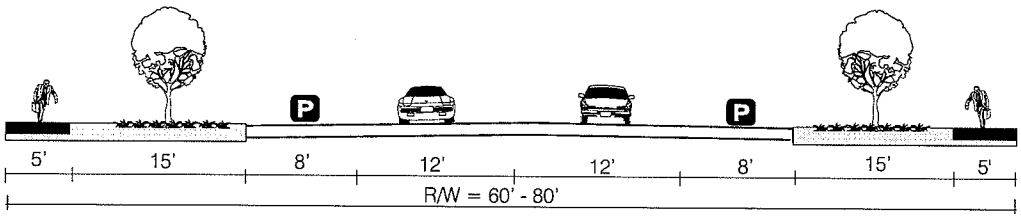
Figure 9-2

ARTERIAL STREETS STANDARD CROSS SECTIONS

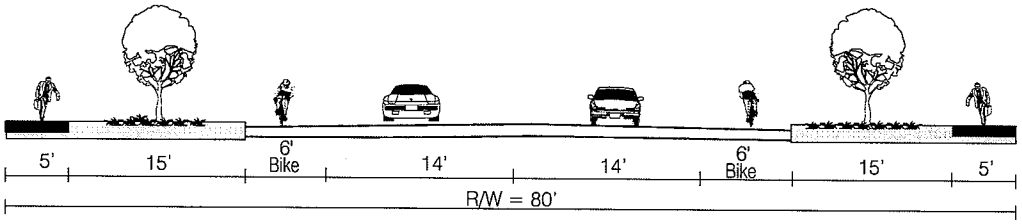
STANDARD MAJOR COLLECTOR



STANDARD MINOR COLLECTOR



STANDARD INDUSTRIAL COLLECTOR



Notes:

1. For new or re-constructed roadways
2. Turn lane warrants should be reviewed using Highway Research Record No. 211, NCHRP Report No. 279 or other updated/superseding reference.
3. Sidewalks are "property tight" as shown, unless approved by City Engineer.

LEGEND

P - On-street Parking Lane (except at intersections)

* - As required by City Engineer

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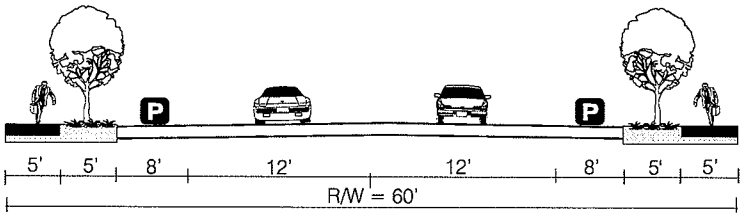
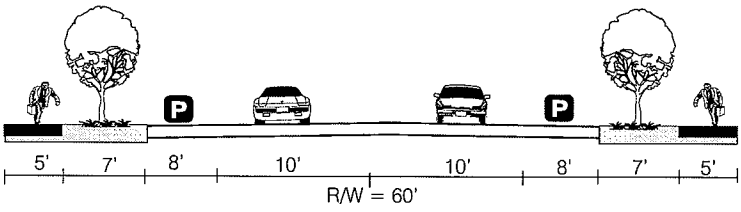
Figure 9-3

COLLECTOR STREETS
STANDARD CROSS SECTIONS

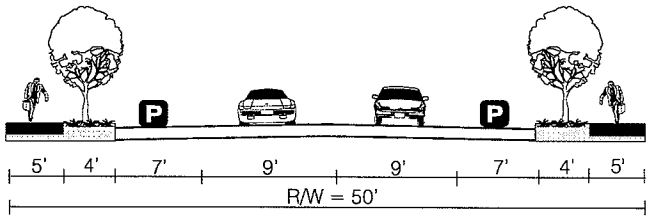
STANDARD LOCAL INDUSTRIAL



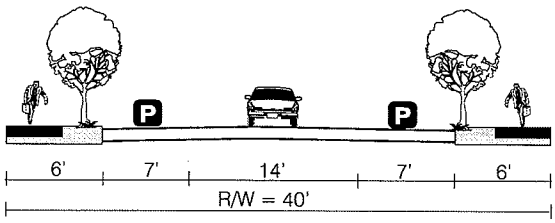
STANDARD LOCAL RESIDENTIAL GRID



REDUCED LOCAL 1* (32' in 50' ROW)



REDUCED LOCAL 2* (28' in 40' ROW)



Notes:

1. For new or re-constructed roadways
2. The standard paved width for a residential street in the local grid is 36' in 60' ROW. Two reduced cross-sections include:
   Reduced Local 1: 32' in 50' ROW (with 5' utility easements on each side)
   Reduced Local 2: 28' in 40' ROW (with 10' utility easements on each side - used in conjunction with alleys adjacent to single family residential only)
   In certain cases, bike lanes may be reduced to 5 ft and parking may be reduced to 7 ft at the discretion of the City Engineer
3. Sidewalks are "property tight" as shown for standard local residential/industrial, but may be included in easement of Reduced Local 1 at the discretion of City Engineer. Sidewalks are to be located in easement of Reduced Local 2.

LEGEND

P - On-street Parking Lane (except at intersections)

* - Approved through annexation agreement only

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Figure 9-4

LOCAL STREETS STANDARD CROSS SECTIONS

Neighborhood Traffic Management (NTM)

Neighborhood Traffic Management (NTM) is a term that has been used to describe traffic control devices typically used in residential neighborhoods to slow traffic or possibly reduce the volume of traffic. NTM is descriptively called traffic calming due to its ability to improve neighborhood livability. Redmond currently has limited neighborhood traffic management elements in place on streets within the study area. The city may consider traffic calming measures and work with the community to find the traffic calming solution that best meets their needs and maintains roadway function.

The City could consider adopting a neighborhood traffic management program. This program would help prioritize implementation and address issues on a systematic basis rather than a reactive basis. Criteria should be established for the appropriate application of NTM in the City. This would address warrants, standards for design, funding, the required public process, use on collectors/arterials (fewer acceptable measures) and how to integrate NTM into all new development design. NTM projects on state facilities are required to meet ODOT standards. Pavement textures, chokers, on-street parking and traffic circles are prohibited on state highways.

In addition to adopting a neighborhood traffic management program, the City should consider modifying the Traffic Impact Study requirements for development applications. This would include a neighborhood impact assessment and mitigation program if the development is anticipated to add significant traffic volumes (or change vehicle speeds) on surrounding local or neighborhood route streets in a residential area. Thresholds used to determine an impact may be similar to the following:

- Local residential street volumes should not exceed 1,200 average daily trips
- Local residential street speeds (85^{th} percentile) should not exceed posted speeds by 10 miles per hour (generally 30-35 mph is impact threshold).
- Impacts should be analyzed if the proposed project would increase volumes on a local residential street by more than 25 vehicles during a peak hour

Table 9-2 lists common NTM applications and suggests which devices may be supported by the Redmond Fire and Rescue. Any NTM project should include coordination with emergency agency staff to ensure public safety is not compromised.

Table 9-2: Traffic Calming Measures by Roadway Functional Classification

Traffic Calming Measure	Roadway Classification		
	Minor Arterial*	Major Collector	Minor Collector/ Local Street
Curb Extensions	Supported	Supported	Calming measures are okay on lesser response routes that have connectivity (more than two accesses) and are accepted and field tested by Redmond Fire and Rescue.
Medians	Supported	Supported	
Pavement Texture	Supported	Supported	
Speed Hump	Not Supported	Not Supported	
Raised Crosswalk	Not Supported	Not Supported	
Speed Cushion (provides emergency pass-through with no vertical deflection)	Not Supported	Not Supported	
Choker	Not Supported	Not Supported	
Traffic Circle (small diameter)	Not Supported	Not Supported	
Diverter (with emergency vehicle pass through)	Not Supported	Supported	
Meandering Alignments	Not Supported	Not Supported	

Note: Traffic calming measures are supported with the qualification that they meet Redmond Fire and Rescue guidelines including minimum street width, emergency vehicle turning radius, and accessibility/connectivity.
*****Due to the unique nature of the downtown overlay district, it may be exempt from these general guidelines at the discretion of the City Engineer.

Access Management

Access Management is a broad set of techniques that balance the need to provide efficient, safe and timely travel with the ability to allow access to the individual destination. Proper implementation of access management techniques will promote reduced congestion, reduced accident rates, less need for highway widening, conservation of energy, and reduced air pollution.

Access management involves the control or limiting of access on arterial and collector facilities to maximize their capacity and preserve their functional integrity. Numerous driveways erode the capacity of arterial and collector roadways and introduce a series of conflict points that present the potential for crashes and interfere with traffic flow. Preservation of capacity is particularly important on higher volume roadways for maintaining traffic flow and mobility. Whereas local and minor collector (neighborhood) streets primarily function to provide direct access, major collector and arterial streets serve greater traffic volume with the objective of facilitating through travel. Redmond, as with every city, needs a balance of streets that provide access with streets that serve mobility.

Several access management strategies were identified to improve access and mobility in Redmond:

- Complete the update of the Access Management Plan for US 97 that exists. This plan will provide a framework for access control to a significant portion of the state roadway system through Redmond.
- Work with land use development applications to consolidate driveways, provide crossover easements, and take access from lower class roads where feasible
- Prohibit new single family residential access on arterials and collectors
- Access to arterial roadways should only be permitted for public roads.

- Establish City access spacing standards to prohibit the construction of access points within the influence area of intersections. The influence area is that area where queues of traffic commonly form on the approach to an intersection (typically between 150 to 300 feet). In a case where a project has less than 150 feet of frontage, the site would need to explore potential shared access, or if that were not practical, place driveways as far from the intersection as the frontage would allow (permitting for 5 feet from the property line).
- Implement City access spacing standards for new construction on County facilities within the urban growth boundary
- Meet ODOT access requirements on State facilities
- Establish maximum access spacing standards to promote connectivity.

New development and roadway projects involving City street facilities should meet the recommended access spacing standards summarized in Table 9-3. In cases where physical constraints (such as Dry Canyon, Pilot Butte Canal, Highways 97 and 126, or railroad tracks) or unique site characteristics limit the ability for the access spacing standards shown in Table 9-3 to be met, the City of Redmond should retain the right to grant an access spacing variance. All requests for an access spacing variance should be required to complete an Access Management Plan, which should include at a minimum the following items:

- Review of the existing access conditions within the study area (defined the property frontage plus the distance of the minimum access spacing requirement). This should include a review of the last 3 years of crash data, as well as collection of traffic volume information and intersection operations analysis.
- Short-term analysis of the study area safety and operations with the proposed access configuration, as well as with a configuration that would meet access spacing standards.
- Long term analysis of the study area safety and operations with the proposed access configuration. This scenario should also include consideration of the long-term redevelopment potential of the area and discussion of how access spacing standards may be achieved.

Table 9-3: Recommended Minimum Access Spacing Standards for City Street Facilities

Street Facility	Minimum Posted Speed (mph)	Minimum Spacing between Driveways and/or Streets	Minimum Spacing between Intersections	Maximum Spacing between Intersections
Arterial Streets				
Minor Arterial – Downtown Core Grid System	20-25	165 ft	330 ft	660 ft
Major Arterial – Other Areas	35-50	800 ft	½ mile	1 mile
Minor Arterial	30-45	330 ft	¼ mile	½ mile
Collector Streets				
Major Collector	25-35	165 ft	330 ft	660 ft
Minor Collector	25-35	80 ft	330 ft	660 ft
Industrial Collector	25-35	165 ft	330 ft	1,320 ft
Local Streets				
Local Industrial	20-25	*access to each lot*	330 ft	1,320 ft
Local Residential	20-25	*access to each lot*	330 ft	660 ft

Note: The minimum spacing shown for each category is a desirable design spacing for future development; existing spacing will vary.

In addition to implementing access spacing standards, the City of Redmond should require an access report for new access points, proposed to serve commercial and industrial developments, stating that the driveway/roadway is safe as designed and meets adequate stacking, sight distance and deceleration requirements as set by City of Redmond, ODOT, Deschutes County, and American Association of State Highway and Transportation Officials (AASHTO). Generally, the need for an access report is triggered by land use actions, design reviews, or land divisions.

Any proposed accesses to State facilities must be approved by ODOT. The *1999 Oregon Highway Plan* identifies access management objectives for all classifications of roadways under State jurisdiction. Both US 97 and OR 126 are classified as Statewide Highways by ODOT. ODOT has established access spacing standards for all highway classifications that vary with proximity to urbanized areas and changes in posted speeds. These standards are also provided in the *1999 Oregon Highway Plan*. Tables 9-4 and 9-5 identify the ODOT access spacing standards for Statewide and District Highways that are applicable within the Redmond urban growth boundary. Note that the spacing standards below are only to be applied to accesses on the same side of the highway and that measurement of approach spacing is from center to center.

Table 9-4: Access Spacing Standards for Statewide Highways (US 97 and OR 126)

Posted Speed (mph)	Rural		Urban	
	Expressway (at-grade only)	**Other**	**Expressway** (at-grade only)	**Other**
≥ 55	5,280 ft	1,320 ft	2,640 ft	1,320 ft
50	5,280 ft	1,100 ft	2,640 ft	1,100 ft
40 & 45	5,280 ft	990 ft	2,640 ft	990 ft
30 & 35		770 ft		770 ft
≥ 25		550 ft		550 ft

ODOT's access management requirements are implemented through OAR 734-051. These rules outline the criteria and procedure for approach permitting decisions, including the application process, conditions under which deviations from established access spacing standards can be allowed, and procedures for appealing decisions.

Local Street Connectivity

Much of the existing local street network, especially in the downtown area, provides good connectivity with multiple options for travel in any direction. However, some of the newer residential neighborhoods have been developed with limited opportunities for movement into and out of the developments, with some neighborhoods funneling all traffic onto a single street. This type of street network results in out-of-direction travel for motorists and contributes to an imbalance of traffic volumes, which impacts residential frontage. This can result in the need for investments in wider roads, traffic signals and turn lanes that could otherwise be avoided.

By providing connectivity between neighborhoods, out-of-direction travel and vehicle miles traveled (VMT) can be reduced, accessibility between various travel modes can be enhanced and traffic levels can be balanced between various streets. Additionally, public safety response time is reduced.

Some of these local connections can function in coordination with other street improvements to mitigate capacity deficiencies by better dispersing traffic. Several roadway connections will be needed within neighborhood areas to reduce out of direction travel for vehicles, pedestrians and bicyclists. This is most important in the areas where a significant amount of new development is possible. Existing structures and physical topography may make connectivity difficult in some locations.

Figure 9-5 shows the proposed Local Street Connectivity Plan for Redmond. In most cases, the connector alignments are not specific and are aimed at reducing potential neighborhood traffic impacts by better balancing traffic flows on neighborhood routes. The arrows shown in the figure represent potential connections and the general direction for the placement of the connection. These locations of interest that are the minimum required of new development. In each case, the specific alignments and design will be better determined as part of development review. The criteria used for providing connections is as follows:

- Every 300 feet, a grid for pedestrians and bicycles
- Every 500 feet, a grid for automobiles

To protect existing neighborhoods from potential traffic impacts of extending stub end streets, connector roadways should incorporate neighborhood traffic management into their design and construction. All stub streets should have signs indicating the potential for future connectivity. Additionally, new development that constructs new streets, or street extensions, must provide a proposed street map that:

- Provides full street connections with spacing of no more than 500 feet between connections except where prevented by barriers
- Provides bike and pedestrian access ways in lieu of streets with spacing of no more than 300 feet except where prevented by barriers
- Limits use of cul-de-sacs and other closed-end street systems to situations where barriers prevent full street connections
- Includes no close-end street longer than 220 feet or having no more than 25 dwelling units
- Includes street cross-sections demonstrating dimensions of ROW improvements, with streets designed for posted or expected speed limits

The arrows shown on the local connectivity map, Figure 9-5, indicate priority connections only and represent future local and neighborhood routes.

Railroads, canals, and natural topography such as Dry Canyon limit the level of connectivity in Redmond. Other stub end streets in the City's road network may become cul-de-sacs, extended cul-de-sacs or provide local connections. Pedestrian connections from the end of any stub end street that results in a cul-de-sac should be considered mandatory as future development occurs. The goal would continue to be improved city connectivity for all modes of transportation.

Intersection Spacing and Traffic Control

Traffic signals that are spaced too closely on a corridor can result in poor operating conditions and safety issues due to the lack of adequate storage for vehicle queues. A minimum traffic signal spacing of 1,000-feet may be required for arterial and collector facilities. Different signal spacing standards may be applied to lower classifications of roadways. ODOT identifies ½ mile as the desirable spacing of signalized intersections on regional and statewide highways but recognizes that shorter signal spacing may be appropriate due to a number of factors including existing road layout and land use patterns[66]. Signal spacing below these standards should be studied in detail to consider traffic signal coordination and the impacts of vehicle flow and queuing within the area. Locations for potential future traffic signals are identified in the Future Capacity Analysis section.

[66] MUTCD signal warrants must be met based on ODOT methodology and OAR 734-020-460 (1) A traffic signal shall not be installed unless one or more of the warrants identified in the MUTCD are met or will be met consistent with the requirements of OAR734-020-0490. The satisfaction of a warrant or warrants, however, is not in itself justification for a traffic signal. Installation of a signal must be approved by the State Traffic Engineer.

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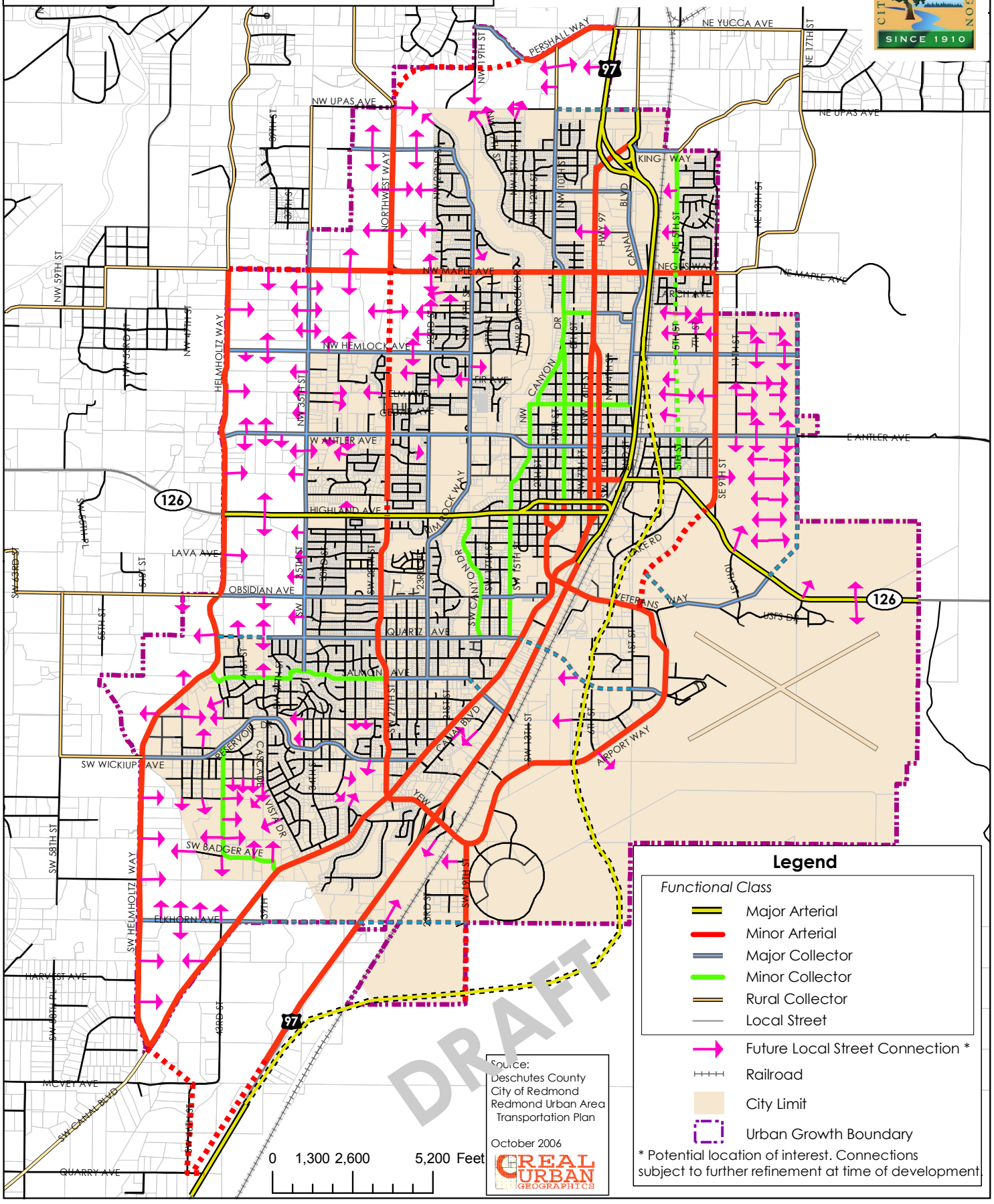
Figure 9-5
LOCAL STREET CONNECTIVITY

N
NOT TO SCALE

City of Redmond
Transportation System Plan



Roundabouts may be a feasible alternative to traffic signals in instances when two-way or all-way stop control do not provide adequate intersection capacity. Roundabouts generally require a diameter of approximately 130-200 feet, limiting implementation in some areas (such as those that are previously developed) due to geometric constraints. However, the center area of the roundabout provides an opportunity for landscaping, which is helping it to gain popularity in both urban and rural design. The capacity of roundabouts is limited by the amount of circulating traffic. Care should be taken to locate roundabouts away from rail crossings and traffic signals in order to avoid issues regarding vehicle queues. Several locations for potential roundabouts are identified in the Future Capacity Analysis section.

Transportation Demand Management

Transportation Demand Management (TDM) is the general term used to describe any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods. As growth in the Redmond area occurs, the number of vehicle trips and travel demand in the area will also increase. The ability to change a user's travel behavior and provide alternative mode choices will help accommodate this growth.

The Transportation Planning Rule outlines a goal of reducing vehicle miles traveled (VMT) per capita. Transportation Demand Management (TDM) is the general term used to describe any action that removes single occupant vehicle trips from the roadway network during peak travel demand periods. TDM measures applied on a regional basis can be an effective tool in reducing vehicle miles traveled. Additionally, the Employee Commute Options (ECO) program administered by the Department of Environmental Quality (DEQ) under OAR 340-20-047 requires larger employers (more than 100 employees) in metropolitan areas to provide commute options that encourage employees to reduce auto trips to the work site.

Research has shown that a comprehensive set of complementary policies implemented over a large geographic area can have an effect on the number of vehicle miles traveled to/from that area.[67] However, the same research indicates that in order for TDM measures to be effective, they should go beyond the low-cost, uncontroversial measures commonly used such as carpooling, transportation coordinators/associations, priority parking spaces, etc.

Many of the TDM strategies are tailored towards large-scale urban applications, where there are major employment generators and transit opportunities. TDM measures for more modest communities require special development, as compared to those that are implemented in urban areas. TDM measures in small to medium-sized urban environments should focus on increasing travel options and creating an environment that is supportive for walking and cycling. The most effective TDM measure for Redmond include elements related to increased parking management (parking time limits and pricing) downtown and improved services for alternative modes of travel. However, TDM includes a wide variety of actions that are specifically tailored to the individual needs of an area. Table 9-5 provides a list of several strategies that could be applicable within the City of Redmond.

[67] *The Potential for Land Use Demand Management Policies to Reduce Automobile Trips*, ODOT, by ECO Northwest, June 1992.

Table 9-5: Transportation Demand Management Strategies

Strategy	Description	Potential Trip Reduction
Telecommuting	Employees perform regular work duties at home or at a work center closer to home, rather than commuting from home to work. This can be full time or on selected workdays. This can require computer equipment to be most effective.	82-91% (Full Time) 14-36% (1-2 day/wk)
Compressed Work Week	Schedule where employees work their regular scheduled number of hours in fewer days per week.	7-9% (9 day/80 hr) 16-18% (4 day/40 hr) 32-36% (3 day/36 hr)
Alternative Mode Subsidy	For employees that commute to work by modes other than driving alone, the employer provides a monetary bonus to the employee.	21-34% (full subsidy of cost, high alternative modes) 2-4% (half subsidy of cost, medium alternative modes)
Bicycle Program	Provides support services to those employees that bicycle to work, such as: secure bicycle storage, shower facilities and subsidy of commute bicycle purchase.	0-10%
On-site Rideshare Matching for HOVs	Employees who are interested in carpooling or vanpooling provide information to a transportation coordinator regarding their work hours, availability of a vehicle and place of residence. The coordinator then matches employees who can reasonably rideshare together.	1-2%
Provide Vanpools	Employees that live near each other are organized into a vanpool for their trip to work. The employer may subsidize the cost of operation and maintaining the van.	15-25% (company provided van with fee) 30-40% (subsidized van)
Gift/Awards for Alternative Mode Use	Employees are offered the opportunity to receive a gift or an award for using modes other than driving alone.	0-3%
Walking Program	Provide support services for those who walk to work. This could include buying walking shoes or providing lockers and showers.	0-3%
Company Cars for Business Travel	Employees are allowed to use company cars for business-related travel during the day	0-1%
Guaranteed Ride Home Program	A company owned or leased vehicle is provided in the case of an emergency for employees that use alternative modes.	1-3%
Time off with Pay for Alternative Mode Use	Employees are offered time off with pay as an incentive to use alternative modes.	1-2%

Source: G*uidance for Estimating Trip Reductions from Commute Options*, Oregon Department of Environmental Quality, August 1996.

While some of the peak hour issues can be attributed to commuting patterns to/from Bend and other communities, much of Redmond's current traffic congestion stems from through and recreational traffic using US 97, issues that TDM strategies do not address.

Future Capacity Analysis

A number of preliminary network and localized transportation improvements were considered in the motor vehicle Alternatives Analysis (Chapter 5). Groups of improvements that were found to best address the transportation needs in the preliminary analysis were combined to form three future alternatives. The analysis of the three alternatives led to the selection of the projects to be included in the motor vehicle master plan, which is a hybrid of the alternatives previously summarized.

Roadway Improvements

Table 9-6 lists currently funded Capital Improvement Plan (CIP) projects that were assumed to occur regardless of the network alternative selected to meet capacity needs. Costs are factored by 8% annually from the 2004 costs to account for inflation. Projects also appear in the Motor Vehicle Action Plan Figure 9-8.

Table 9-6: Currently Funded CIP Projects

CIP No	Action Plan No	Project Description	Cost (x$1,000)*
14/15	2	27th Street extension from Highway 126 to Antler Ave	$1,775
--	61	SW Quartz Ave improvements from Helmholtz to 41st Street	$545
16	4	SE/SW Quartz Ave extension from S Canal Boulevard to railroad	$2,325
17	5	SE/SW Quartz Ave extension from railroad to Airport Way	$2,105
PC7	6	SW Salmon Ave & Odem Medo Connector Project – S Canal Blvd to 19th St	$1,380
--	7	Extend Elkhorn Ave from existing alignment to SW 19th St (includes overcrossing of US 97)	$10,720
		Total of Currently Funded CIP Projects	$18,850

Note: *An annual factor of 8% was applied to 2004 CIP costs to account for inflation.

The following master plan roadway improvement projects are generally based on those that were included in the Alternative 1 and 2 capacity analysis presented in Chapter 5:

- SW 19th Street extension to Deschutes Market Road
- NW Upas Avenue overcrossing
- OR 126 widening (5 lanes from SW Rimrock Way to SW 35th Street)
- OR 126 widening (3 lanes from SW 35th Street to SW Helmholtz Way)
- OR 126 widening (3 lanes from US 97 Reroute to SE Veterans Way)
- NW/SW 27th Street widening (3 lanes from NW Maple Avenue to Obsidian Avenue)
- Helmholtz Way widening (3/5-lane connection from Pershall Way to Quarry Avenue)
- SW 19th Street connections to US 97 at SW Quarry Road
- Grade-separated (no access) at O'Neil/US 97
- South Canal Boulevard widening (3 lanes from SW Obsidian Avenue to Yew Ave)
- E 9th Street extension/improvements from Veterans Way to Hemlock Ave

Traffic Operations

Volumes for the PM peak hour were used to determine the study intersection operating conditions based on the *2000 Highway Capacity Manual*[68] methodology for signalized and unsignalized intersections. Level of service (LOS) descriptions and HCM methodology are included in the Existing Conditions chapter. Traffic volumes and level of service calculation sheets can be found in the technical appendix. Intersections within the existing alignment of US 97 that would be bypassed with the new US 97 Reroute were assumed to be transferred to City of Redmond control.

Intersection operations are summarized in Table 9-7. Applicable performance standards (based on the City of Redmond TSP target of LOS D for intersections under jurisdiction of City of Redmond and v/c ratio of 0.70 based on the Oregon Highway Design Manual for intersections under ODOT control) are listed for each location. Note that shaded values indicate that the performance standard of the intersection is not met. In addition to the general intersection performance with the assumed master plan network facility improvements, performance is also listed with additional local intersection refinements where needed. These refinements generally include additional lane channelization and traffic control measures such as signalization. Improvement projects included at each location are listed in Tables 9-11and 9-12 (Motor Vehicle Master Plan Projects). Signalized operations are provided for several all-way-stop-controlled intersections that are projected to meet performance standards to indicate performance at these arterial-collector locations in the event that signalization is warranted.

The network master plan facility improvements would generally improve operations from the 2030 Base network presented in Chapter 4. However, 25 study intersections would still not meet performance standards and would require additional local intersection refinements. The two primary areas requiring additional refinement would be OR 126 and the southern portion of US 97. Two locations (35th/Maple and Helmholtz/Wickiup) have low cross-street volumes and improvements would provide limited benefit. Traffic signals should be planned for these locations when warrants are met and signalized performance is listed for both locations in Table 9-7. Most intersections along the southern portion of US 97 would not meet performance standards with localized refinements. These locations would require parallel routes be built to divert traffic, such as the US 97 Reroute Phase II extension (included in the Master Plan but not reasonably expected to be funded as part of the Action Plan). Most of the other intersections would meet performance standards with additional intersection improvement projects as listed in Tables 9-10 and 9-11. Figure 9-6 indicates the general study intersection performance with inclusion of the Action Plan projects.

[68] *2000 Highway Capacity Manual*, Transportation Research Board, 2000.

Table 9-7: 2030 Master Plan Network - Design Hour Intersection Level of Service

Intersection	Performance Standard	Master Plan		Refined Master Plan	
		LOS	V/C	LOS	V/C
Signalized Intersections – ODOT					
SW 15th Ave/Highland (OR 126)	0.70	B	0.76	B	0.69
SW Rimrock Way/Highland Ave (OR	0.70	C	0.96	B	0.74
SW 11th St/Glacier Ave (OR 126)	0.70	B	0.39		
SW 11th St/Highland Ave (OR 126)	0.70	B	0.37		
SW 9th St/Glacier Ave/(OR 126)	0.70	B	0.41		
SW 9th St/Highland Ave (OR 126)	0.70	B	0.35		
SW 6th St/Glacier Ave (OR 126)	0.70	B	0.36		
SW 6th St/Highland Ave (OR 126)	0.70	C	0.34		
SW 5th St/Glacier Ave (OR 126)	0.70	B	0.34		
SW 5th St/Highland Ave (OR 126)	0.70	D	0.54		
US 97/Veterans Way	0.70	F	>1.0	D	0.89
US 97/Odem Medo	0.70	F	>1.0	C	0.87
US 97/Quartz	0.70	C	0.95	B	0.78
US 97 Reroute/Highland Ave	0.70	C	0.91	C	0.89
US 97 Reroute/Evergreen Ave	0.70	E	>1.0	D	0.93
Signalized Intersections – City of Redmond					
SW 19th St/Antler Ave	D	A	0.47		
Business 97/Maple Ave	D	C	0.80		
SW 6th St (Business 97 SB)/Black Butte	D	B	0.51		
SW 6th St (Business 97 SB)/Evergreen	D	B	0.66		
SW 5th St (Business 97 NB)/Evergreen	D	C	0.75		
S Canal Blvd/Veterans Way	D	D	0.91		
Business 97/Quince	D	A	0.26		
Business 97/Oak Ave	D	A	0.41		
Unsignalized Intersections – ODOT					
SW Helmholtz Way/Highland (OR 126)	0.70	B/F	0.29/>1.0	C	0.82
SW 31st Ave/Highland (OR 126)	0.70	A/B	0.47/0.07		
SW 27th Ave/Highland (OR 126) +	0.70	B/F	0.30/>1.0	C	0.70
SW 23rd St/Highland Ave (OR 126)	0.70	C/B	0.14/0.22		
US 97 (SB)/Yew Ave+	0.70	A/F	0.21/>1.0	A	0.43
US 97 (NB)/Yew Ave+	0.70	A/F	0.01/0.97	A	0.52
US 97 /Quarry Road	0.70	F/F	>1.0/>1.0	C	1.0
SE 9th Ave/OR 126	0.70	B/F	0.52/>1.0	C	0.80
SW Veterans Way/OR 126	0.70	B/D	0.01/0.29		
SE Lake Rd/OR 126	0.70	A/F	0.45/>1.0	A/E	0.10/0.70
US 97 Reroute/Antler Ave	0.70	A/D	0.73/0.38		
US 97 Reroute/Hemlock Ave	0.70	A/C	0.71/0.15		
US 97 Reroute SB Ramps/Business 97	0.70	A/B	0.06/0.23		
US 97 Reroute NB Ramps/Business 97	0.70	A/B	0.01/0.21		
Unsignalized Intersections – Deschutes County					
NW 10th St/Pershall Way	D	A/D	0.02/0.72		
Unsignalized Intersections – City of Redmond					
NW 27th St/Maple Ave**	D	A	0.49		
NW Helmholtz Way/Maple Ave	D	A/B	0.23/0.20		
W Helmholtz Way/Antler Ave	D	B/C	0.07/0.24		
SW Helmholtz Way/Obsidian Ave	D	B/D	0.01/0.25		
SW Helmholtz Way/Wickiup Ave	D	B/F	0.12/0.60	A	0.53

Intersection	Performance Standard	Master Plan		Refined Master Plan	
		LOS	V/C	LOS	V/C
SW Helmholtz Way/S Canal Blvd[o]	D	A/F	0.18/>1.0	A	0.73
W 27th St/Antler Ave*	D	F	>1.0	A	0.60
SW 27th St/Obsidian Ave*	D	C	0.72	A	0.38
SW 27th St/Salmon Ave*	D	C	0.80	A	0.55
SW 27th St/Wickiup Ave*	D	C	0.78	A	0.49
SW 27th St/S Canal Blvd[o]	D	A/F	0.25/>1.0	A	0.54
NW 19th St/Maple Ave	D	A/F	0.26/>1.0	B	0.77
NW 19th St/Hemlock Ave	D	A/C	0.03/0.20		
SW 19th St/Airport Way[69]**	D	A	0.43		
NW 9th St/Maple Ave	D	A/F	0.07/>1.0	A	0.67
Business 97/Kingwood Ave	D	A/C	0.04/0.34		
NW 6th St (Business 97 SB)/Dogwood	D	A/C	0.01/0.37		
W 6th St (Business 97 SB)/Antler Ave	D	A/C	0.02/0.19		
NW 5th St (Business 97 NB)/Dogwood	D	A/D	0.02/0.62		
W 5th St (Business 97 NB)/Antler Ave	D	A/C	0.01/0.24		
SW 5th St (Business 97 NB)/Black	D	A/F	0.16/0.66	A	0.41
SW Canal Blvd/Obsidian Ave*	D	C	0.81	A	0.43
SW Canal Blvd/Quartz Ave	D	B/F	0.51/>1.0	B	0.75
SW Canal Blvd/Salmon Ave[71]	D	A/D	0.35/0.42		
SW Canal Blvd/Odem Medo Ave	D	A/F	0.37/>1.0	C	0.86
SE Airport Way/SE 9th St**	D	A	0.56		
NE 9th St/Hemlock Ave*	D	B	0.55	A	0.51
E 9th St/Antler Ave	D	A/B	0.01/0.08		
NW 35th St/Maple Ave	D	B/F	0.29/0.67	B	0.48
NW 27th St/Upas Ave	D	A/B	0.11/0.25		
NW 27th St/Hemlock Ave*	D	D	0.92	A	0.44
SE Lake Rd/Veterans Way[72]	D	A/E	0.09/0.68	A/C	0.09/0.46

Notes: LOS and V/C given for major/minor approach at 2-way stop controlled intersections.
Shaded values indicate that performance standard is exceeded
* All-Way Stop Intersection. Signalized performance listed as mitigation (when warranted); **Roundabout
[+] improved with traffic signal as planned
[o] local refinement includes roundabout control

[69] A roundabout is planned at this location.
[70] Plan to signalize intersection in the current CIP. Assumed that parking removed and left turn lane painted.
[71] This intersection may become right-in-right-out or closed with the extension of Salmon Ave to Odem Medo.
[72] This intersection would not exist with the Reroute Phase II (Southern Extension). However, additional mitigation would be required if the intersection remains.

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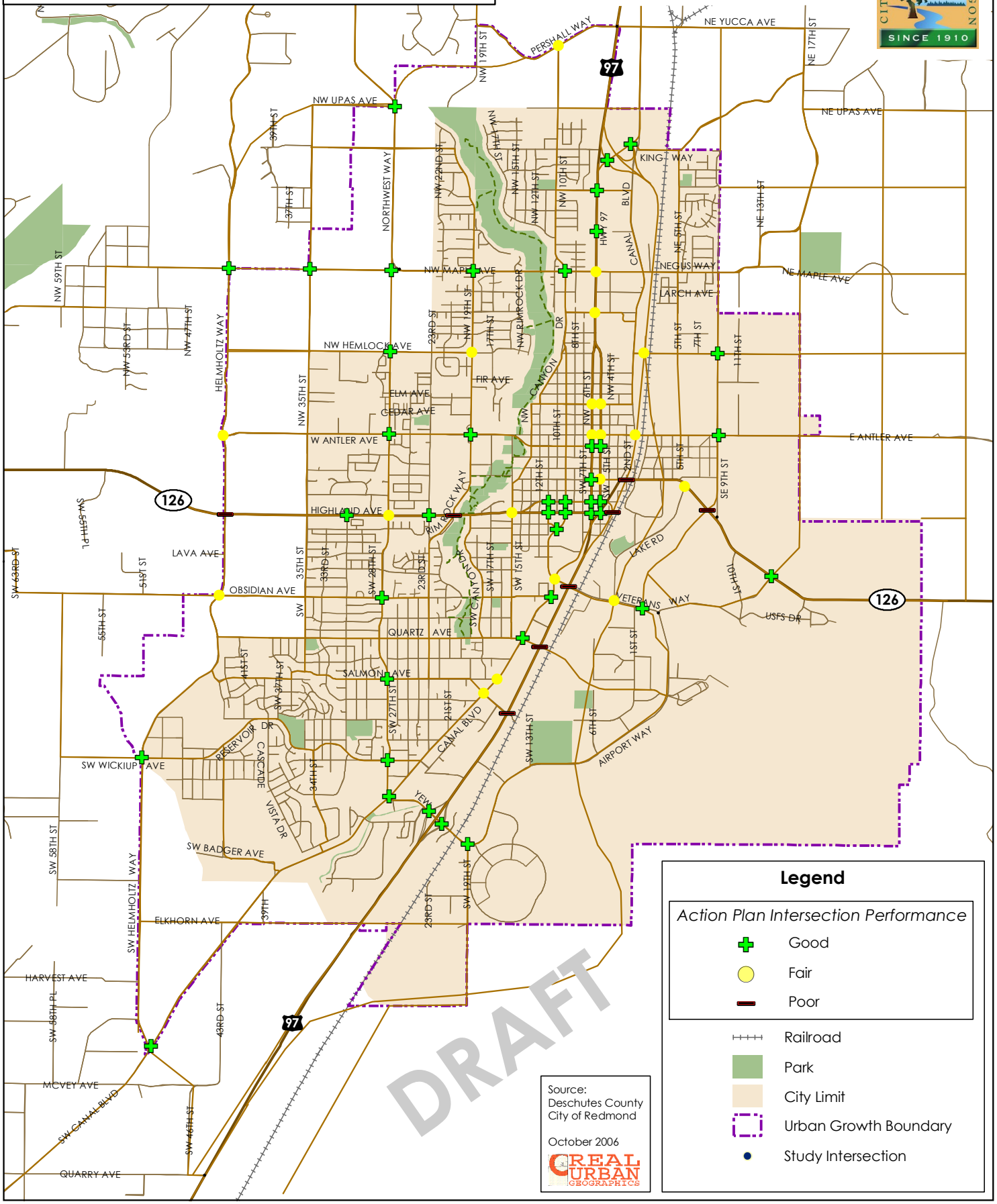
TRANSPORTATION SOLUTIONS

Figure 9-6
INTERSECTION PERFORMANCE

N
NOT TO SCALE

City of Redmond Transportation System Plan



Legend

Action Plan Intersection Performance
- Good
- Fair
- Poor

Railroad
Park
City Limit
Urban Growth Boundary
Study Intersection

Source:
Deschutes County
City of Redmond

October 2006

REAL URBAN GEOGRAPHICS

Motor Vehicle Master Plan

The improvements identified to meet 2030 system demand combine both facility widening or extension and local intersection capacity improvement projects. These improvements are listed in Tables 9-8, 9-9, 9-10, and 9-11. Some of these projects (such as US 97 Reroute Phase II) represent solutions to long-term needs that are not expected to be funded by the 2030 horizon of this TSP. The Motor Vehicle Action Plan contains a list of projects that are reasonably expected to be funded by 2030. The facility projects that compose the Motor Vehicle Action Plan are shown in Figure 9-8 and are referenced by the project numbers provided in Tables 9-6, 9-8, and 9-9.

The cost estimates shown in these tables are estimated by DKS Associates using standard assumptions for new facilities. Further refinements should be made of these estimates prior to capital budgeting. As noted, some project cost estimates are based on the Capital Improvement Plan (CIP) project list costs[73].

Inclusion of an improvement project in the TSP does not commit the City or ODOT to allow, construct or participate in funding the specific improvement. Projects on the State Highway System that are contained in the TSP are not considered "planned" projects until they are programmed into the Statewide Transportation Improvement Plan (STIP).

As such, projects proposed in the TSP that are located on a State highway cannot be considered mitigation for future development or land use actions until they are programmed into the STIP. Unanticipated issues related to project funding, as well as the environment, land use, the economy, changes in the use of the transportation system, or other concerns may be causes for re-evaluation of alternatives discussed below and possible removal of a project from consideration for funding or construction. Highway projects that are programmed to be constructed may have to be altered or canceled at a later time to meet changing budgets or unanticipated conditions.

Table 9-8: Motor Vehicle Master Plan Improvements – ODOT Facilities

Location	Description	Master Plan Project	Action Plan Project (#)	Planning Cost (x$1,000)
Hwy 126	Widen to 3 lanes from Helmholtz to 35th Avenue	X	8	$1,555
Hwy 126	Widen to 5 lanes from 35th Avenue to Rimrock Way	X	9	$5,330
Hwy 126	Widen to 3 lanes from US 97 Reroute to Vet Way	X	10	$7,535
US 97 Reroute Extension*	Extend Reroute Alt 3B to Quarry interchange (no Airport Way interchange)	X		$226,140**
Airport Interchange*	Reroute interchange at Airport Avenue	X		$6,450**
US 97/Quarry	Westside Arterial/Quarry Ave Interchange	X	13	$11,250
	Master Plan Total			**$258,260**
	Action Plan Total			**$25,670**

* Included in Master Plan but not reflected in Action Plan or intersection performance listed in Table9-7.

** Costs provided in US 97 Refinement Plan Study for Alternative 3B. Cost of Airport Way interchange was removed from the total and listed separately.

[73] An annual factor of 8% was applied to 2004 CIP costs to account for inflation.

Table 9-9: Motor Vehicle Master Plan Improvements – City of Redmond Facilities

Location	Description	Master Plan Project	Action Plan Project (#)	Planning Cost (x$1,000)
NW Upas Ave	Grade-separated crossing of US 97	X	14	$3,940
Westside Arterial	O'Neil to Quarry	X	(see below)	$50,575
(itemized projects	*Pershall Way – 3 lanes from US 97 to Dry Canyon*	*X*	*21*	*$2,220*
	Pershall Way – 3 lanes through Dry Canyon	*X*	*22*	*$3,090*
	Pershall Way – 3 lanes from Dry Canyon (E) to 27th	*X*	*23*	*$2,590*
	NW 27th St – 5 lanes from Pershall Way to Maple Ave	*X*	*24*	*$5,260*
	NW Maple Ave – 5 lanes from 27th St to 35th St	*X*	*25*	*$2,640*
	NW Maple Ave – 3 lanes from 35th St to Helmholtz	*X*	*26*	*$3,595*
	Helmholtz Way – 5 lanes from Maple Ave to Antler	*X*	*27A*	*$2,835*
	Helmholtz Way – 5 lanes from Antler Ave to Hwy 126	*X*	*27B*	*$5,665*
	Helmholtz Way – 5 lanes from Hwy 126 to Obsidian	*X*	*28A*	*$2,785*
	Helmholtz Way – 5 lanes from Obsidian to Wickiup	*X*	*28B*	*$6,750*
	Helmholtz Way – 5 lanes from Wickiup to Elkhorn	*X*	*28C*	*$5,570*
	Helmholtz Way – 3 lanes from Elkhorn to S Canal	*X*	*29*	*$3,145*
	Helmholtz Way – 3 lanes from S Canal to Quarry Ave	*X*	*30*	*$4,430*
NW 27th Ave	Widen to 3 lanes from Maple Avenue to Greenwood	X	15	$2,640
SW Canal Blvd	Widen to 3 lanes from SW Obsidian Ave to Yew Ave	X	16	$7,560
SW 19th St	Extend to Deschutes Market Road as 2-lane collector	X	17	$7,250
SW Quarry Rd	Connect US 97 to 19th Street extension	X	18	$2,730
NW O'neill Ave	Grade-separated crossing of US 97	X	19	$1,930
NE 17th St	Eastside collector from OR 126 to Antler Ave	X	20	$3,200
SE 9th St	Extend from Veterans Way to OR 126 as Minor Art	X	31	$2,925
E 9th St	Improvements from OR 126 to Hemlock Ave	X	33	$2,730*
SW Odem Medo	Corridor Improvements	X	35	$1,040*
SW 15th St	Improvements from SW Quartz to SW Obsidian Ave	X	36	$480*
Forked Horn Butte	Wickiup Ave to S Canal Blvd Connection	X	37	$2,650
SW Elkhorn Ave	Helmholtz Way to S Canal Blvd	X	60	$1,735
SW Obsidian Ave	W UGB to 35th Street	X	62	$1,520
W Antler Ave	Helmholtz to 35th Street	X	63	$1,520
NW 35th St	NW Hemlock to NW Oak Avenue	X	64	$2,150
NW Spruce Ave	NW 22nd to NW 33rd	X	65	$1,430
NW 10th St	NW Upas Ave to NW Pershall Way	X	66	$1,140
NE 5th St	NE Hemlock to E Antler Avenue	X	67	$1,230
SW Canal Blvd	Widening from SW Yew Ave to SW Badger Ave	X	68	$3,785
SW Canal Blvd	SW Badger Ave to SW Helmholtz Way	X	69	$4,465
SW Wickiup Ave/ Reservoir Dr	SW 31st to SW 35th, SW 39th to Helmholtz Way	X	70	$2,790
SW Veterans Way	Add a center turn lane from RxR to SE 1st St	X	71	$1,375
	Master Plan Total			**$112,790**
	Action Plan Total			**$112,790**

* Costs provided in CIP lists and increased 8% annually to 2007 costs to account for inflation

Table 9-10: Master/Action Plan Intersection Improvement Projects - ODOT Facilities

Location	Description	Master Plan	Action Plan	Planning Cost (x$1,000)
SW 15th Avenue/ Highland (OR 126)	Restripe (no widening) and modify signal to add northbound/southbound left turn lanes	X	X	$50
SW Rimrock Way/ Highland Ave (OR 126)	Add southbound right turn lane and overlap	X	X	$250
	Add a westbound right turn lane (includes fill and retaining wall)	X	X	$1,000
US 97/ Veterans Way**	Add a southbound right turn lane		X	$250
	Add a westbound right turn lane*		X	$0
	Add a second eastbound left turn lane and widen canal structure		X	$1,250
US 97/Odem Medo**	Add a second northbound left turn lane		X	$250
	Add a second receiving lane to west leg and drop lane at parking access (275 ft)		X	$500
	Add an eastbound left turn lane*		X	$0
	Widen structure over canal to support additional lanes*		X	$0
	Add a southbound right turn lane*	X	X	$0
US 97/Quartz St	Add a westbound left turn lane	X	X	$250
US 97 Reroute/ Highland Ave	Add a single eastbound right turn lane	X	X	$250
US 97 Reroute/ Evergreen Ave	Add a westbound right turn lane	X	X	$250
SW Helmholtz Way/ Highland (OR 126)	Add a traffic signal	X	X	$250
	Add a westbound right turn lane*	X	X	$500
	Add a northbound right turn lane	X	X	$500
SW 27th Ave/ Highland (OR 126)	Add a traffic signal*	X	X	$0[74]
US 97 (SB)/Yew Ave	Add a traffic signal*	X	X	$350
US 97 (NB)/Yew Ave	Add a traffic signal*	X	X	$350
E 9th Ave/OR 126	Add a traffic signal	X	X	$250
	Add a northbound right turn lane	X	X	$250
	Add an eastbound right turn lane	X	X	$250
	Add a westbound right turn lane	X	X	$250
	Add eastbound/westbound left turn lanes	X	X	$500
SE Lake Rd/OR 126	Add a northbound right turn lane	X	X	$250
	Master Plan Total			**$5,750**
	Action Plan Total			**$8,000**

Note: * planned for 2008

** If US 97 Reroute Phase II is constructed (as in Master Plan), some of these additional projects are not needed. However these projects are included as Action Plan projects since US 97 Reroute Phase II is not in Action Plan.

[74] Cost included with Action Plan project #2 – 27th Street extension from Highland Avenue to Antler Avenue

Table 9-11: Master/Action Plan Intersection Improvement Projects – City of Redmond Facilities

Location	Description	Master Plan	Action Plan	Planning Cost (x$1,000)
SW 5th St (Business 97 NB)/Black Butte Ave	Remove parking and restripe to add an eastbound left turn lane	X	X	$50
	Add a traffic signal	X	X	$250
NW 27th St/Maple Ave	Add a roundabout with two circulating and two entry and exit lanes at each approach	X	X	$1,200
NW 10th St/ Pershall Way	Add an eastbound right turn lane	X	X	$250
SW Helmholtz Way/ S Canal Blvd	Add a single-lane roundabout	X	X	$800
W 27th St/Antler Ave	Add a traffic signal	X	X	$250
SW 27th St/ S Canal Blvd	Add a single-lane roundabout	X	X	$800
NW 19th St/Maple Ave	Add a traffic signal	X	X	$250
NW 9th St/Maple Ave	Add a traffic signal	X	X	$250
SW Canal Blvd/Quartz Ave	Add a traffic signal	X	X	$250
SW Canal Blvd/ Odem Medo Ave	Add a traffic signal	X	X	$250
	Add a westbound left turn lane*	X	X	$0[75]
SE 9th St/ Veterans Way	Add a single-lane roundabout	X	X	$800
SW 19th St/Airport Way	Add a single-lane roundabout*	X	X	$800
SE Lake Rd/ Veterans Way	Add a southbound right turn lane	X	X	$250
	Master Plan Total			**$6,450**
	Action Plan Total			**$6,450**

Note: * planned for 2008

Traffic Control Master Plan

In addition to mitigation that was triggered due to performance deficiencies in the operations analysis, several locations that are currently all-way-stop-controlled may be signalized in the future as traffic signals are warranted. Traffic signals were not assumed at these locations in the capacity analysis, however signalized operations are listed under the refined conditions of Table 9-7. Figure 9-7 shows the proposed future traffic control for study intersections. This traffic control master plan considers facility type, spacing, capacity and other needs related to intersection traffic control.

[75] Cost included with Action Plan #35 – Odem Medo Rd corridor improvements

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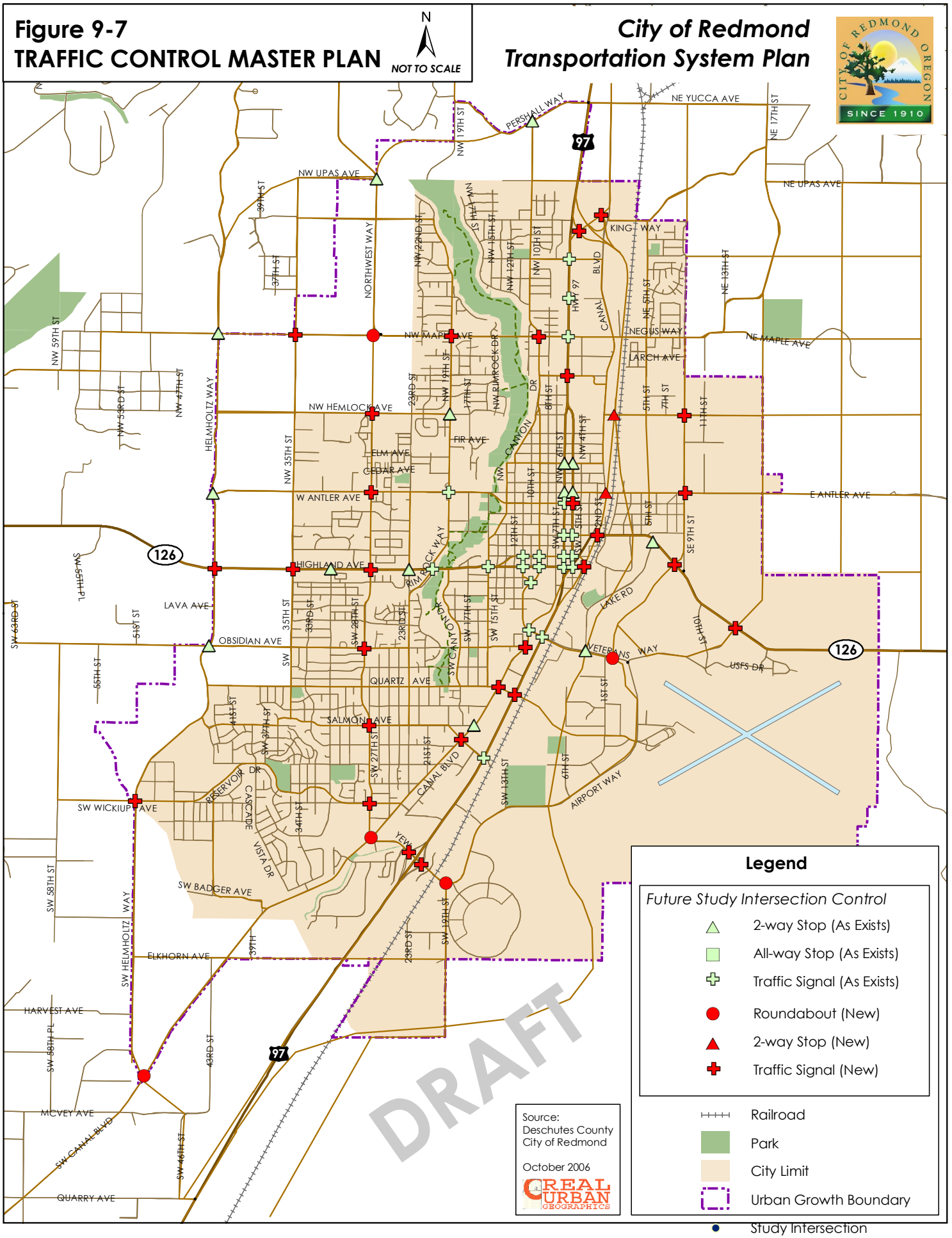
Figure 9-7
TRAFFIC CONTROL MASTER PLAN

N
NOT TO SCALE

City of Redmond Transportation System Plan



DRAFT

Source:
Deschutes County
City of Redmond

October 2006

REAL URBAN GEOGRAPHICS

Legend

Future Study Intersection Control

- 2-way Stop (As Exists)
- All-way Stop (As Exists)
- Traffic Signal (As Exists)
- Roundabout (New)
- 2-way Stop (New)
- Traffic Signal (New)

- Railroad
- Park
- City Limit
- Urban Growth Boundary
- Study Intersection

Table 9-12: Signalization Projects (When Warranted)

Location	Description	Planning Cost (x$1,000)
SW 27th St/Obsidian Ave	Add a traffic signal when warranted	$250
SW 27th St/Salmon Ave	Add a traffic signal when warranted	$250
SW 27th St/Wickiup Ave	Add a traffic signal when warranted	$250
S Canal Blvd/ SW Obsidian Ave	Add a traffic signal when warranted	$250
NE 9th St/Hemlock Ave	Add a traffic signal when warranted	$250
NE 9th St/Antler Ave	Add a traffic signal when warranted	$250
NW 35th St/Maple Ave	Add a traffic signal when warranted	$250
SW Helmholtz Way/Wickiup Ave	Add a traffic signal when warranted	$250
US 97 Business/Kingwood Ave	Add a traffic signal when warranted	$455
OR 126/SE Veterans Way	Add a traffic signal when warranted	$250
NW 27th St/Hemlock Ave	Add a traffic signal when warranted	$250
OR 126/ SW 35th St	Add a traffic signal when warranted	$250
US 97 Reroute NB/ US 97 Business	Add a traffic signal when warranted	$250
US 97 Reroute SB/ US 97 Business	Add a traffic signal when warranted	$250
	Total	**$3,705**

Table 9-13 lists the various components of the motor vehicle master plan and the summarized costs that are presented in the preceding tables.

Table 9-13: Motor Vehicle Master Plan Cost Summary

Project Type	Cost (x$1,000)
Currently Funded CIP Projects	$18,850
ODOT Facility Capacity Improvements - Local Match*	$24,585
City of Redmond Facility Capacity Improvements	$112,790
ODOT Facility Intersection Improvements – Local Match*	$5,750
City of Redmond Facility Intersection Improvements	$6,450
Additional Signalization Projects	$3,705
Total Motor Vehicle Master Plan Cost	**$172,130**

**provided in Draft City of Redmond CIP Update*

Motor Vehicle Action Plan

A motor vehicle system action plan project list was created to identify motor vehicle projects that are reasonably expected to be funded by the year 2030, which meets the requirements of the updated Transportation Planning Rule[76]. In addition to facility capacity needs previously discussed in the Master Plan, the City has modernization and reconstruction needs for existing facilities. The City of Redmond CIP currently identifies several locations for modernization/reconstruction improvements as listed in Table 9-14. The costs of these projects are summarized in Table 9-15 with the additional components of the action plan identified in the TSP update analysis. The inclusion of the action plan

[76] *OAR Chapter 660*, Department of Land Conservation and Development, Division 012, Transportation Planning, adopted on March 15, 2005, effective April 2005.

projects is reflected in the intersection performance listed in Table 9-7 and shown in Figure 9-6. Figure 9-8 shows the location of the action plan projects.

Table 9-14: Facility Modernization/Reconstruction – Current CIP Projects

CIP No	Action Plan No	Project Description	Cost (x$1,000)*
9	50	SW 27th St reconstruction and extension from Yew Ave Interchange to Highland Ave.	$7,000
2002-6	51	Maple Ave reconstruction from NW 19th St to NW 27th St	$680
2002-9	52	Antler Ave Modernization: Extend to E UGB	$1,610
8	53	N Canal Blvd reconstruction from Antler Ave to US 97 Reroute	$2,695
A	54	Airport Way reconstruction south of airport	$1,670
2002-8	55	Hemlock Avenue Modernization Project	$2,600
2002-10	56	Obsidian Avenue Modernization/Street In-fill	$120
2002-13	58	NW 35th Street Modernization	$1,795
		Total of Current Modernization/Reconstruction CIP Projects	$18,170

Note: *An annual factor of 8% was applied to 2004 CIP costs to account for inflation.

Table 9-15: Motor Vehicle Action Plan Cost Summary

Project Type	Cost (x$1,000)
Currently Funded CIP Projects	$18,850
ODOT Facility Capacity Improvements - Local Match*	$24,585
City of Redmond Facility Capacity Improvements	$112,790
ODOT Facility Intersection Improvements – Local Match*	$8,000
City of Redmond Facility Intersection Improvements	$6,450
Additional Signalization Projects	$3,705
Total Motor Vehicle Action Plan Cost	**$174,115**

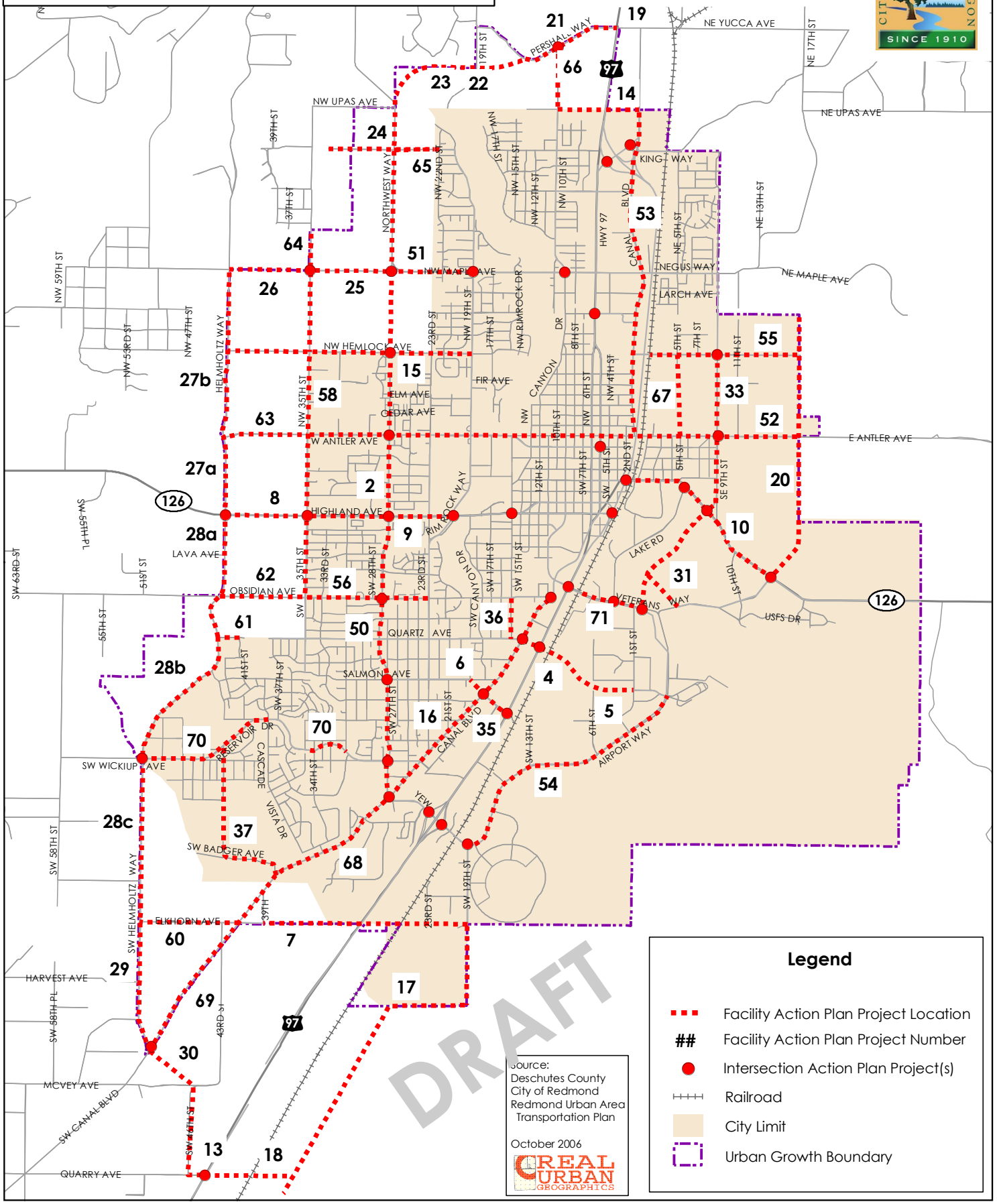
**provided in Draft City of Redmond CIP Update*

DKS Associates
TRANSPORTATION SOLUTIONS

Figure 9-8
MOTOR VEHICLE ACTION PLAN

NOT TO SCALE

City of Redmond Transportation System Plan



Trucks

Efficient truck movement plays a vital role in maintaining and developing Redmond's economic base. Well planned truck routes can provide for the economical movement of raw materials, finished products and services. Trucks moving from industrial areas to regional highways or traveling through Redmond are different than trucks making local deliveries. The transportation system should be planned to accommodate this need for a movement of goods.

The establishment of through truck routes provides for this efficient movement while at the same time maintaining neighborhood livability, public safety and minimizing maintenance costs of the roadway system. The objective of this route designation is to allow these routes to focus on design criteria that is "truck friendly", i.e., 12 foot travel lanes, longer access spacing, 35 foot (or larger) curb returns and pavement design that accommodates a larger share of trucks. Because these routes are through routes and relate to regional movement, they should relate to the regional freight system.

The existing truck routes are located along the state facilities of US 97 and OR 126 through Redmond and adequately serve the future needs. The existing north-south route along the US 97 couplet through downtown Redmond will shift to the US 97 Reroute when it is operational. Removing the through truck traffic from Redmond's downtown core will increase mobility for local trips and reduce noise, increasing the commercial potential of the area. Figure 9-9 shows the existing and future truck routes.

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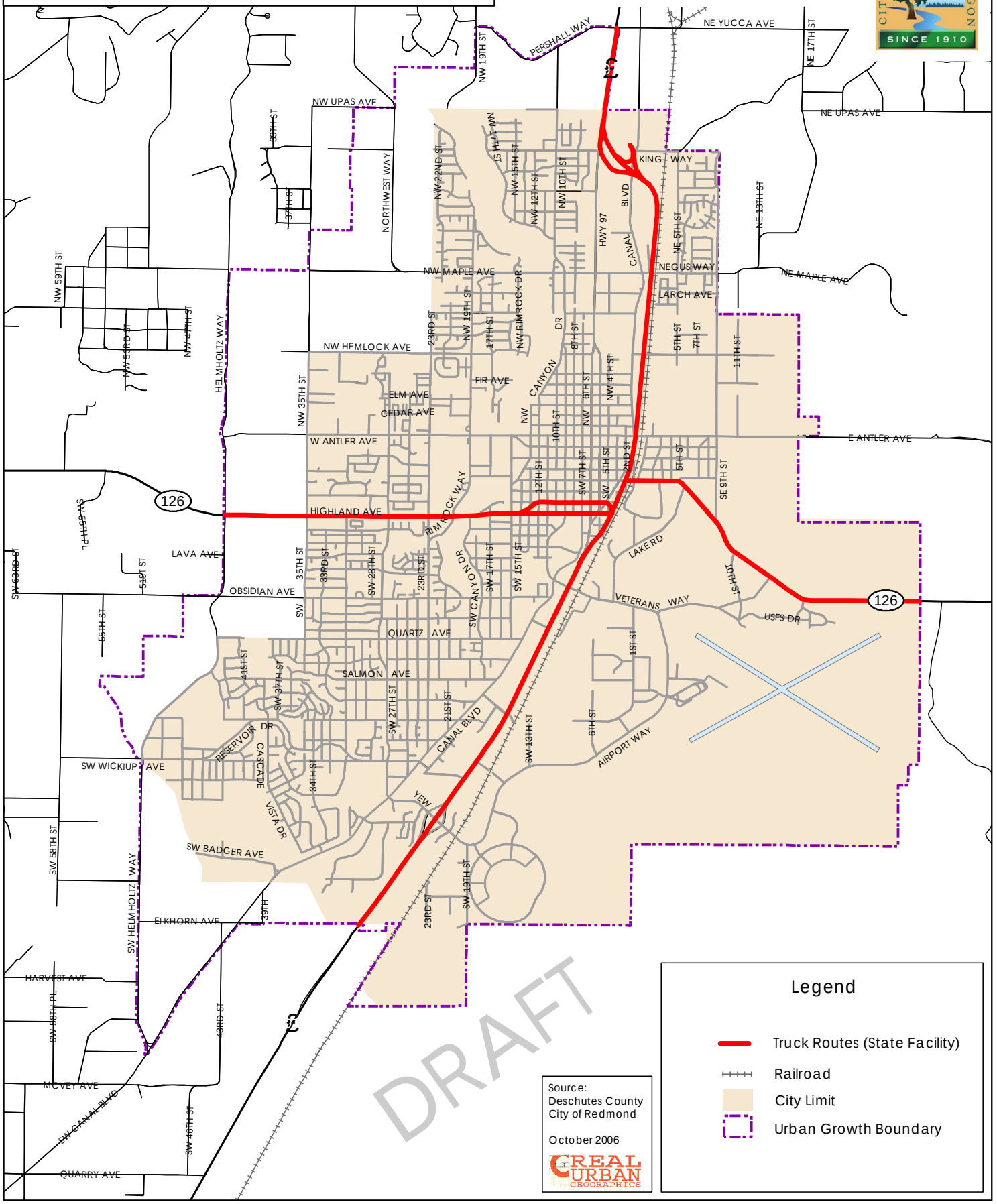
TRANSPORTATION SOLUTIONS

Figure 9-9
TRUCK ROUTES

NOT TO SCALE

City of Redmond
Transportation System Plan



Intelligent Transportation Systems (ITS)

ITS involves the application of advanced technologies and proven 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 (and will) make better travel decisions and to transportation system operators so they can better manage the system and improve system reliability. A regional ITS framework plan[77] has been developed by Deschutes County, ODOT, City of Bend, Bend MPO and City of Redmond that includes projects in the Redmond area, such as:

- Traffic monitoring and surveillance
- Signal controller interconnect
- Information availability
- Incident management
- Weather data collection
- Traffic data retrieval
- Advanced rail warning systems

While the existing ITS infrastructure in Redmond is limited, projects planned through 2025 will greatly increase coverage and type of ITS equipment utilized in Redmond and throughout Deschutes County. Figure 9-10 shows existing ITS equipment in Redmond, future equipment that is included in the Deschutes County ITS Plan, and additional future equipment that will improve the operations of the transportation network and supplement projects that are included in this TSP.

Several ITS strategies can be utilized to improve future transportation operations in Redmond.

- Provide travel time information for traffic using US 97. This highway serves as an important freight route through the state and such information would facilitate the movement of goods.
- Provide CCTV equipment to allow monitoring important links in the transportation network.
- Provide redundancy of the communication system to minimize the effects of a communication failure.
- Provide information to travelers regarding traffic conditions and alternate routes.
- Implement devices to collect traffic data for use in improve facility operations and understand planning needs
- Coordinate with ODOT regarding control of new traffic signals and appropriate software to retain compatibility.

The following actions should be taken as part of this TSP:

- Implement ITS projects previously contained in the Deschutes County ITS plan, including:
    - Install fiber communication lines along OR 126 from the existing fiber at Rimrock Way to Helmholtz Way, along the US 97 Reroute, along US 97 Business from the north US 97 Reroute interchange to Bend, and on Veterans Way from US 97 to Airport Way
    - Install CCTV equipment at US 97/Upas Ave, US 97 Reroute/Maple Ave, US 97 Reroute/Evergreen Ave, Glacier Ave/SW 9th St, Highland Ave/SW 9th St, US 97

[77] *Deschutes County ITS Plan*, prepared for ODOT by DKS Associates and IBI Group, March 2005.

Business/Kalama Ave, US 97/Odem Medo, US 97/Yew Ave, Airport Way/Deschutes County Fairgrounds Acess, and Helmholtz Way/OR 126
    - Install an automated traffic recorder (ATR) station on the US 97 Reroute at Oak Ave
    - Install advanced rail warning system devices for the rail crossings on King Way, Hemlock Ave, Antler Ave, Evergreen Ave, Veterans Way, and Yew Ave
    - Install traffic count stations at Maple Ave/US 97 Business, 5th Ave/Evergreen Ave, and 6th Ave/Evergreen Ave
    - Install a weather station at Yew Avenue/SW 25th Pl
    - Install a variable message sign along US 97 Business (for traffic traveling in the southbound direction) between Odem Medo and Yew Ave
    - Install a communications node at the City of Redmond public works building near Roberts Field Airport to allow communication with ITS devices in the City.

- Revise ITS projects previously contained in the Deschutes County ITS plan to support modifications to the transportation network contained in the TSP, including:
    - Install a variable message sign along US 97 (for traffic traveling in the southbound direction) north of Pershall Way. This equipment was previously planned in the vicinity of Upas Avenue. Relocating the equipment will provide additional time for drivers to make decisions and would allow for through traffic to potentially be diverted to the Westside arterial (Helmholtz Ave) in the event of an incident on US 97.
    - Install a variable message sign along US 97 (for traffic traveling in the northbound direction) south of Quarry Ave. This equipment was previously planned in the vicinity of McVey Ave. Relocating the equipment will provide additional time for drivers to make decisions and would allow for through traffic to potentially be diverted to the alternate routes such as the Westside arterial (Helmholtz Ave) or US 97 Business in the event of an incident on US 97 Reroute.
    - Install CCTV equipment at OR 126/27th St instead of the previously planned location of OR 126/23rd St. The new location provides improved spacing of CCTV equipment and greater visibility along OR 126, as well as visibility of 27th St (an arterial).

- Implement additional ITS projects not included in the Deschutes County ITS Plan to support the TSP network, including:
    - Install fiber communication lines along 27th St between Antler Ave and US 97 Business (that connect to the planned fiber along US 97 Business) to connect the future traffic signals along 27th St and provide redundancy in the communication network.
    - Install fiber communication lines along OR 126 from the future lines at US 97 Reroute to SE Veterans Way. An alternative option for providing communication to the future traffic signal controller (and data collection) at OR 126/SE 9th St and the controller at OR 126/SE Veterans Way is to utilize wireless broadband service.
    - Install CCTV equipment to provide greater coverage at US 97 O'Neil Hwy, US 97 Business/Jackpine Ave, SW 5th St(US 97 Business)/Antler Ave, SW 6th St(US 97 Business)/Antler Ave, US 97/Quarry Ave, Quartz Ave/27th St, Wickiup Ave/27th St, US 97 Reroute @ Airport Way, and US 97 Reroute along the horizontal curve that is located south of the UGB.
    - Install count stations on OR 126 at SE 9th St and at SW 27th St (possibly utilizing traffic signal loops)
    - Install an ATR station on US 97 Reroute north of the Quarry interchange.

- Install an advanced rail warning system for the potential at-grade rail crossing on Quartz Ave.

Revisions or additions to the regional ITS plan will require coordination with the agencies involved (including Deschutes County, ODOT, City of Bend, Bend MPO, and City of Redmond) to implement changes to the plan.

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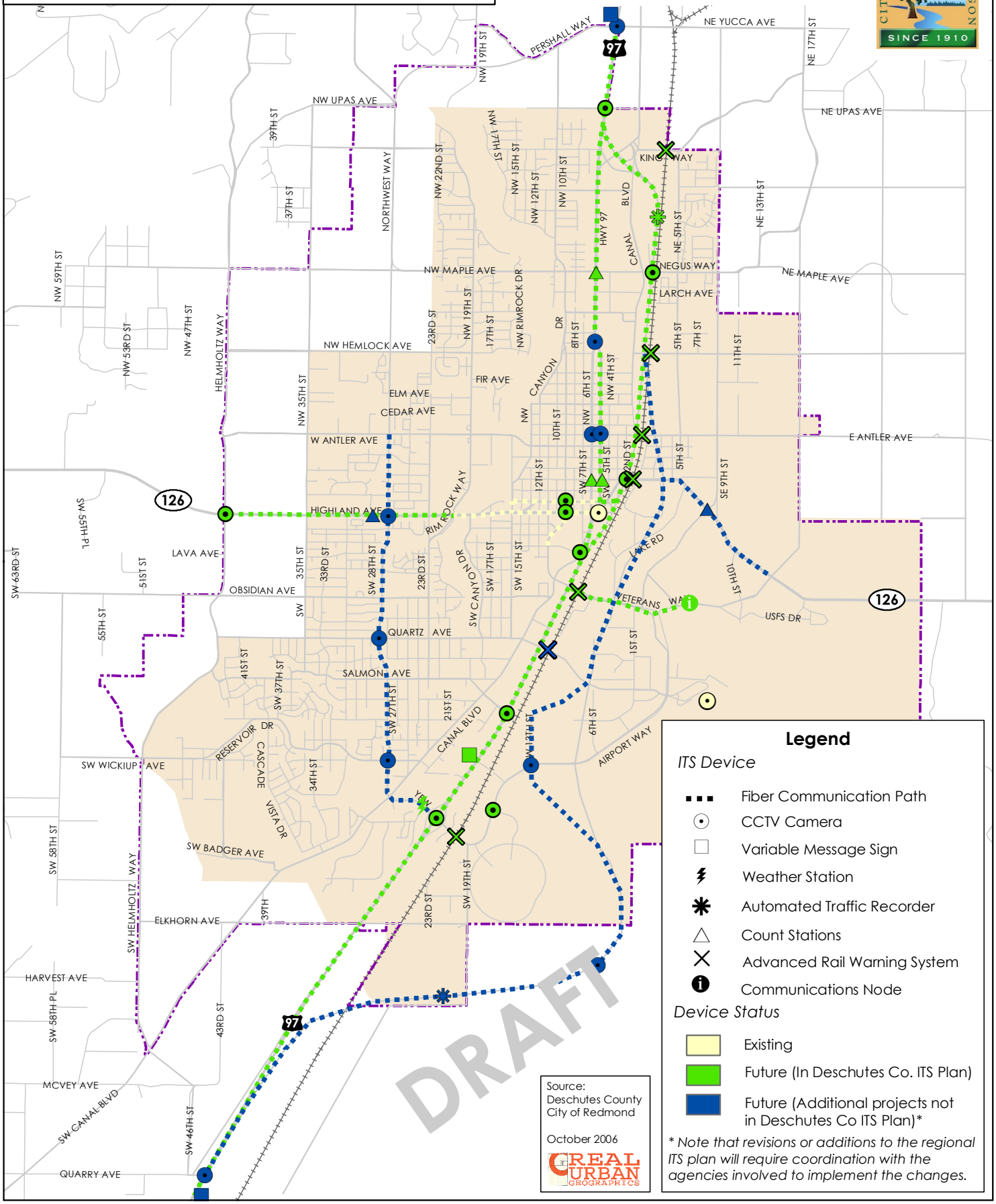
TRANSPORTATION SOLUTIONS

Figure 9-10
ITS PLAN

N
NOT TO SCALE

City of Redmond Transportation System Plan



Legend

ITS Device

- Fiber Communication Path
- CCTV Camera
- Variable Message Sign
- Weather Station
- Automated Traffic Recorder
- Count Stations
- Advanced Rail Warning System
- Communications Node

Device Status

- Existing
- Future (In Deschutes Co. ITS Plan)
- Future (Additional projects not in Deschutes Co ITS Plan)*

** Note that revisions or additions to the regional ITS plan will require coordination with the agencies involved to implement the changes.*

Source:
Deschutes County
City of Redmond

October 2006

REAL URBAN GEOGRAPHICS

10. Other Travel Modes

Overview

This chapter summarizes future needs and improvements for the modes of air, rail, water and pipeline in the City of Redmond.

Air

Roberts Field – Redmond Municipal Airport provides commercial air service to Redmond. The four carriers currently provide approximately 50 arriving and departing daily flights to Western US locations. The Airport Master Plan, prepared in 2005, documents the existing conditions and planned improvements for Roberts Field.

Annual enplanements are projected to double from approximately 150,000 in year 2003 to 300,000 in year 2023[78]. In order to meet the future airport needs, the Master Plan includes capital improvement projects that are grouped into three implementation phases. Improvement costs are funded by user leases and fees as well as federal airport improvement program (AIP) and passenger facility charge (PFC) revenues. General tax money is not used for improvements.

Table 10-1[79] lists the projects included in the 20-year Capital Improvement Plan for Roberts Field and the funding sources for each. Note that project costs are from 2004.

The future growth and expansion of Roberts Field will affect the transportation network of Redmond in several ways. Aside from general growth and the associated traffic use around the airport, two roadway realignment projects (Veterans Way/Airport Way Relocation, and OR 126 Reroute) on the CIP list are associated with providing clearance for runway protection zones and will have a direct impact on the roadway system in Redmond. The realignment of Veterans Way/Airport Way is consistent with the planned extension of SE 9th Street connection to OR 126, and future roundabout control presented in the motor vehicle master plan. The OR 126 Reroute will affect the alignment of the highway but does not impact any local connections shown in Figure 9-2.

[78] Redmond Airport Master Plan, Exhibit 2E – Forecast Summary, April 2005.
[79] Redmond Airport Master Plan, Table 6B, April 2005.

Table 10-1: Roberts Field 20-Year CIP Project List and Costs

TABLE 6B
Roberts Field – Redmond Municipal Airport
20-Year Capital Improvement Program
Airport Master Plan 2004

Year(s)	Project Description	Total Cost	Federal/ AIP Share	Local/ PFC Share
2005	Perimeter Road Construction – Runway 10	$250,000	$237,500	$12,500
	Terminal Building Expansion – Phase 1 (Design)	450,000	427,500	22,500
	Taxiway D Reconstruction and Extension	500,000	475,000	25,000
	General Aviation Apron Reconstruction	850,000	807,500	42,500
	Subtotal	**$2,050,000**	**$1,947,500**	**$102,500**
2006	Taxiway G (North) Reconstruction	$2,340,000	$2,223,000	$117,000
	Taxiway C (North & South) Reconstruction	2,350,000	2,232,500	117,500
	Taxiway C Extension – South	4,800,000	4,560,000	240,000
	Terminal Building – Phase 2 (Construction) Multi-Year	3,000,000	1,500,000	1,500,000
	Subtotal	**$12,490,000**	**$10,515,500**	**$1,974,500**
2007	Apron Expansion/Helipads	$555,000	$527,250	$27,750
	Taxilane Development (Hangars)	480,000	456,000	24,000
	Terminal Building – Phase 2 (Construction) Multi-Year	3,000,000	1,500,000	1,500,000
	Subtotal	**$4,035,000**	**$2,483,250**	**$1,551,750**
2008	Terminal Building – Phase 2 (Construction) Multi-Year	$3,000,000	$1,500,000	$1,500,000
	Veterans Way/Airport Way Relocation	900,000	810,000	90,000
	Utility Extension to East Side – Phase 1	2,200,000	0	2,200,000
	Subtotal	**$6,100,000**	**$2,310,000**	**$3,790,000**
2009	Utility Extension to East Side – Phase 2	$2,200,000	$0	$2,200,000
	Master Plan Update	250,000	225,000	25,000
	Subtotal	**$2,450,000**	**$225,000**	**$2,225,000**
	Subtotal Short Term (2005-2009)	**$27,125,000**	**$17,481,250**	**$9,643,750**
2010-2014	Runway 4-22 Extension – West	$5,640,000	$5,076,000	$564,000
	Install CAT I Approach (Runway 4L)	1,500,000	1,350,000	150,000
	Expand Maintenance Building	350,000	315,000	35,000
	Water and Sewer Connection – West Side	4,700,000	2,350,000	2,350,000
	Re-route Highway 126	1,500,000	1,350,000	150,000
	Master Plan Update	250,000	225,000	25,000
	Subtotal Intermediate Term (2010-2014)	**$13,940,000**	**$10,666,000**	**$3,274,000**
2015-2024	Runway 4-22 Extension – East	$5,700,000	$5,130,000	$570,000
	Relocate CAT I Equipment (Runway 22)	750,000	675,000	75,000
	Parallel Runway (4R-22L)	16,200,000	14,580,000	1,620,000
	Install CAT I Approaches (Runway 4R-22L0	3,000,000	2,700,000	300,000
	Parallel Taxiway K	10,000,000	9,000,000	1,000,000
	Parallel Taxiway L	7,200,000	6,480,000	720,000
	Taxiway E Connector	2,460,000	2,214,000	246,000
	Master Plan Update	250,000	225,000	25,000
	Subtotal Long Term (2015-2024)	**$45,560,000**	**$41,004,000**	**$4,556,000**
	Grand Totals	**$86,625,000**	**$69,151,250**	**$$17,473,750**

Sources: Cost estimates for pavement and utility extensions provided by Morrison Maierle, Inc.
Cost estimates for terminal expansion provided by HNTB Corp.

Notes: AIP – Airport Improvement Program, PFC – Passenger Facility Charge
CAT I Approach consists of a localizer, glide slope, and medium intensity approach light system.

Rail

The existing conditions inventory identified nine existing at-grade rail crossing in the study area. This will be reduced by the construction of the US 97 North Reroute, which will grade separate the crossing at Negus Way. The planned roadway system in the City will construct roadways across the rail line at Quartz Avenue and at Elkhorn Avenue. The crossing at Quartz Avenue will be at-grade since grade separation is not feasible due to the proximity of US 97. The crossing at Elkhorn Avenue should be grade-separated for safety and to maintain freight and auto mobility.

Water

While a series of canals exists in Redmond, no waterways are used for commercial transportation purposes. As such, no policies or recommendations in this area of transportation are provided for Redmond.

Pipeline

Cascade Natural Gas provides natural gas services in Redmond and the surrounding area. The existing pipelines in Redmond are outside of the maintenance responsibilities of the City. As such, no policies or recommendations in this area of transportation are provided for Redmond.

11. Finance and Implementation

Overview

This chapter outlines the funding sources that can be used to meet the needs of the future transportation system. The costs for the modal elements of the transportation system plan are outlined and compared to the potential revenue sources. Options are discussed regarding how to balance costs of the plan and revenues.

Current Funding Strategies

Transportation funding is commonly viewed as a user fee system where the users of the system pay for infrastructure through motor vehicle fees (such as gas tax and registration fees) or transit fares. However, a greater share of motor vehicle user fees goes to road maintenance, operation and preservation of the system rather than construction of new system capacity. Much of what the public views as new construction is commonly funded (partially or fully) through local improvement districts (LIDs) and frontage or off-site improvements required as mitigation for land development.

The City of Redmond utilizes a number of mechanisms to fund construction of its transportation infrastructure as described below. The first two sources collect revenue each year that is used to repair street facilities or construct new streets, with some restrictions on the type and location of projects. The last program is different in that it does not generate on-going revenue, but is a means to acquire needed property and improvements (Exaction) as development occurs.

State Fuel Tax and Vehicle License Fee

The State of Oregon Highway Trust Fund collects various taxes and fees on fuel, vehicle licenses, and permits. A portion is paid to cities annually on a per capita basis. By statute, the money may be used for any road-related purpose. Redmond currently uses these funds for street operating and maintenance needs.

Oregon gas taxes are collected as a fixed amount per gallon of gasoline served. The gas tax in Oregon has not increased since 1992 (currently 24 cents per gallon.) The tax does not vary with gas prices changes, nor is there an adjustment for inflation. The lack of change since 1992 means that the net revenue collected has gradually eroded as the cost to construct and repair transportation systems has increased. Fuel efficiency in new vehicles has further reduced the revenue stream.

Oregon vehicle registration fees are collected as a fixed amount at the time a vehicle is registered with the Department of Motor Vehicles. Vehicle registration fees in Oregon have recently increased from $15 per vehicle per year to $27 per vehicle per year for passenger cars, with similar increases for other vehicle types. There is no adjustment for inflation tied to vehicle registration fees.

Redmond receives about $1,020,000 per year in gas tax and vehicle license fee revenue for streets, bikeways and sidewalks. Essentially all of these funds are spent on surface maintenance of local streets and administrative costs. Because there is no index for cost inflation, this revenue level will increase only proportionate with the city's population growth relative to Deschutes County growth.

System Development Charge

The System Development Charge (SDC) for streets is used as a funding source for capacity adding projects for the transportation system. The SDC is collected from new development based on the proposed land use and size. SDC fees are based on each land use's potential vehicle trip generation. The current SDC rate was set in 1999 and updated in 2005. SDCs are based on the number of PM peak hour trips estimated for each development. The current SDC rate per PM peak hour trip is $2,877. The estimated growth in vehicle trips in the 22 year horizon of the TSP is 21,200 PM peak hour trips[80]. The total SDC fees collected over the next 23 years would be approximately $60,992,400. A total of $6,200,000 currently exists in SDC reserves.

Exactions

These are improvements that are obtained when development is permitted. Developers are required to improve their frontage and, in some cases, provide off site improvements depending upon their level of traffic generation and the impact to the transportation system. Off-site mitigation measures can include, but are not limited to, Master Plan projects identified in the TSP. Developer funding and frontage improvements were estimated to total $46,761,800 based on the Draft City of Redmond CIP Update.

Urban Renewal Funds

An Urban Renewal District (URD) is a tax-funded district within the City. The URD is funded with the incremental increases in property taxes that result from construction of applicable improvements. This type of tax increment financing has been used in Oregon since 1960. Uses of the funding include, but are not limited to, transportation. The City of Redmond has created an URD in the airport area, which is named the South Airport Urban Renewal Area (SAURA). The transportation capital program identified in the SAURA totals $11,609,000. The amount available for CIP use is estimated to be $9,857,000 based on the Draft City of Redmond CIP Update.

General Fund

At the discretion of the City Council, the City can allocate General Fund revenues to pay for its Transportation program. General Fund revenues primarily include property taxes, use taxes, and any other miscellaneous taxes and fees imposed by the City. This allocation is completed as a part of the City's annual budget process, but the funding potential of this approach is constrained by competing community priorities set by the City Council. General Fund resources can fund any aspect of the program, from capital improvements to operations, maintenance, and administration. The average amount allocated per year is approximately $1,293,000. The amount available for CIP use is estimated to be $29,866,475 based on the Draft City of Redmond CIP Update.

[80] This estimate is derived by adjusting for the difference between ITE household trip rates and average model household trip rates, as well as factoring internal trips to determine trip ends within the city

ODOT Surface Transportation Program (STP) Funds

The STP funds are allocated from a federal program through ODOT to local agencies in a grant-type program. The City of Redmond determines how best to utilize these revenues. Over the past several years, the City of Redmond has averaged $177,000 per year in STP funds.

Summary

Table 11-1 summarizes the current renewable funding sources, including recent annual revenues and the projected revenues through the planning horizon year 2030. Assuming the renewable funding sources outlined above, the City of Redmond will collect approximately $1.02 million for transportation operations and maintenance and $4.62 million for capital improvements each year. This revenue will be generated from the state (fuel taxes and license fees), the Urban Renewal Fund, System Development Charges, and other revenue sources. Total revenues to be collected over 23 years between 2007 and 2030 would be $133.2 million with current funding sources and projected population and employment growth.

Table 11-1: Summary of Current Revenues for Transportation

Funding Category	Funding Allocation	Estimated Revenues Through 2030	Annual Historical Amount
State Fuel Apportionment & Vehicle License Fee	Operations and Maintenance	$22,440,000	$1,020,000
General Fund	Capital Improvements	$29,866,000	$1,293,000
ODOT STP Fund	Capital Improvements	$3,894,000	$177,000
System Development Charge	Capital Improvements	$60,992,000	$2,652,000
SDC Reserves	Capital Improvements	$6,200,000	-
Urban Renewal Fund	Capital Improvements	$9,857,000	$504,700
	O&M Revenue Subtotal	**$22,440,000**	**$1,020,000**
	Capital Revenue Subtotal	**$110,809,000**	**$4,626,700**
	Total Revenues	**$133,249,000**	**$5,646,700**

Note: The annual amount indicates average annual totals over the last four years.

Source: City of Redmond, Adopted Budget, Fiscal Years 2003-2004 through 2006-2007

Projects and Programs

This section presents the recommended projects and programs developed for the City of Redmond to serve local travel for the coming 23 years. The Pedestrian, Bicycle, Transit, and Motor Vehicle projects were identified in the Action Plan for each mode, and represent those projects that have the highest short-term need for implementation to satisfy performance standards or other policies established for the Redmond Transportation System Plan. The costs for the remaining projects noted in the modal Master Plans are identified, but these have not been included in the funding needs analysis for the City because the Action Plan is limited to projects most likely to be funded within the planning horizon. Other projects on the Master Plan list require additional funding, and they are expected to be built beyond the 23 year horizon or completed with development exactions or other unanticipated funding sources.

Project Cost Estimates

Cost estimates (general planning level) were developed for the projects identified in the motor vehicle, bicycle, transit, and pedestrian elements. Cost estimates from the existing City planned projects were used in this study, if they were determined to be reasonable. Other projects were estimated using general unit costs for transportation improvements, but do not reflect the unique project elements that can significantly add to project costs[81]. Development of more detailed project costs can be prepared in the future with more refined financial analysis. Since many of the projects overlap elements of various modes, the costs were developed at a project level incorporating all modes, as appropriate. It may be desirable to break project mode elements out separately, however, in most cases, there are greater cost efficiencies of undertaking a combined, overall project. Each of these project costs will need further refinement to detail right-of-way requirements and costs associated with special design details as projects are pursued.

All cost estimates are based on 2007 dollars. Historical construction costs price index has increased by 2.5 to 2.75 percent per year according to Engineering News Record research[82] . Construction costs have increased 100 percent in the 20 years from 1979 to 1999.

Other Transportation Programs and Services

In addition to the physical system improvements identified in the previous section, the transportation facilities will require on-going operation and maintenance improvements across a variety of areas. These other transportation programs are recommended to respond to the specific policies and needs in maintaining roadway pavement quality, allocations for implementing neighborhood traffic management, and on-going update and support of related planning documents.

- **Roadway Maintenance:** The annual cost of maintaining the streets and sidewalks within Redmond was estimated at $1,752,000, a portion of which is paid for by gas tax revenues from the state. This does not include road maintenance responsibilities on the arterial streets that are serviced by Deschutes County or ODOT. Over 23 years, the City's road maintenance responsibility accounts for $40.3 million. The actual maintenance costs could vary from this estimate.
- **Transit Operations:** The Action Plan for transit service provides a framework that will be refined with the City's Transit Feasibility Study. Commuter service to Bend was estimated at $100,000 per year. The actual costs could vary from this estimate.
- **Roadway Reconstruction:** The City's Capital Improvement Plan (CIP) includes a series of roadway reconstruction and modernization projects for collector or arterial roadways with failing bases or that are in need of urbanization. The total cost of completing these reconstruction projects was estimated at $18.17 million, a portion of which is SDC eligible. The actual reconstruction costs could vary from this estimate.

[81] General plan level cost estimates do not reflect specific project construction costs, but represent an average estimate. Further preliminary engineering evaluation is required to determine impacts to right-of-way, environmental mitigation and/or utilities. This level of cost-estimating is typically completed during project development and design. Experience has shown that individual projects costs can increase by 25 to 75 percent as a result of the above factors.

[82] Engineering News Record Construction Cost Index as reported for the past ten years for 20 cities around the United States. Reference: http://www.enr.com/features/conEco/costIndexes/constIndexHist.asp

Redmond Costs for TSP Action Plans

The costs outlined in the Transportation System Plan to implement the Action Plans for Streets, Transit, Bicycles, and Pedestrians total $210.8 million, and several other recommended transportation operations and maintenance programs would add $43.8 million for a total cost over 23 years of $254.5 million. This total exceeds the expected 23-year revenue estimate of $133.2 million (see Table 11-1) by approximately $121.3 million. Alternative solutions to address this funding deficit for the Action Plan projects are discussed in the next section.

Table 11-2: Redmond Transportation Action Plans Costs over 23 years (2007 Dollars)

Transportation Element	Approximate Cost ($1,000)
System Improvement Projects (Action Plans projects to be funded by City)	
Motor Vehicle	$174,115
Roadway Reconstruction/Modernization	$18,170
Bicycle	$9,440
Transit	$750
Pedestrian	$8,315
Total Capital Projects	**$210,790**
Operations and Maintenance Programs and Services	
Roadway Maintenance ($1,752,000 per year)	$40,300
ADA Enhancement Program ($50,000 per year)	$1,150
Local Transit Operations ($100,000/yr)	$2,300
Total Operations and Maintenance Programs	**$43,750**
23 YEAR TOTAL COST	***$254,540***
23 YEAR TOTAL FUNDING	***$133,249***
23 YEAR ADDITIONAL NEED	***$121,291***

Note: in 2007 Dollars

New Funding Sources and Opportunities

The new transportation improvement projects and action plans will require funding beyond the levels currently collected by the City. There are several potential funding sources for transportation improvements. This section summarizes several funding options available for transportation improvements. These are sources that have been used in the past by agencies in Oregon. In most cases, these funding sources, when used collectively, are sufficient to fund transportation improvements for local communities. Due to the complexity of today's transportation projects, it is necessary to seek several avenues of funding projects. Unique or hybrid funding of projects generally will include these funding sources combined in a new package.

Because of the need to gain public approval for transportation funding, it is important to develop a consensus in the community that supports needed transportation improvements. That is the value of the Transportation System Plan. In most communities where time is taken to build a consensus regarding a transportation plan, funding sources can be developed to meet the needs of the community.

Transportation program funding options range from local taxes, assessments, and charges to state and federal appropriations, grants, and loans. All of these resources can be constrained based on a variety of factors, including the willingness of local leadership and the electorate to burden citizens and businesses; the availability of local funds to be dedicated or diverted to transportation issues from other competing City programs; and the availability and competitiveness of state and federal funds. Nonetheless, it is important for the City to consider all of its options and understand where its power may exist to provide and enhance funding for its Transportation programs.

The following funding sources have been used by cities to fund the capital and maintenance aspects of their transportation programs. There may be means to begin to or further utilize these sources, as described below, to address new needs identified in the Transportation System Plan.

Voter-Approved Local Gas Tax

Communities such as Sandy, Woodburn, and Tillamook have adopted local gas taxes by public vote. In Sandy, the tax is one cent per gallon, paid to the city monthly by distributors of fuel. The process for presenting such a tax to voters will need to be consistent with Oregon State law as well as the laws of the City of Redmond.

Transportation Utility Fee Revenue

A number of Oregon cities supplement their street funds with street utility fees. Local cities with adopted street utility fees include Hubbard, Milwaukie, Wilsonville, Sherwood, and Tualatin. Establishing user fees to fund applicable transportation activities and/or capital construction ensures that those who create the demand for service pay for it proportionate to their use. The street utility fees are recurring monthly or bi-monthly charges that are paid by all residential, commercial, industrial, and institutional users. The fees are charged proportionate with the amount of traffic generated, so a retail commercial user pays a higher rate than a residential user. Typically, there are provisions for reduced fees for those that can demonstrate they use less than the average rate implies, for example, a resident that does not own an automobile or truck.

From a system health perspective, forming a utility fee also helps to support the ongoing viability of the program by establishing a source of reliable, dedicated funding for that specific function. Fee revenues can be used to secure revenue bond debt used to finance capital construction. A transportation utility can be formed by Council action and does not require a public vote.

Based on average utility fee rates, a preliminary estimate for transportation utility fee revenue in Redmond ranges from $18 million to $50 million over the next 23 years; this corresponds to approximately $20 to $55 per person per year. A specific fee study would be required to establish a fee program for the City of Redmond to determine specific allocations to its residents and merchants.

Exactions

Exactions are improvements that are obtained when development is permitted. Developers are required to improve their frontage and, in some cases, provide off site improvements depending upon their level of traffic generation and the impact to the transportation system. The City of Redmond utilizes exactions today, but the Development Code may need some revision to enforce the TSP Action Plan for development exactions. Based upon review of the TSP Action Plan projects, an assessment was made of potential exactions for frontage improvements where projects were adjacent to vacant parcels or parcels with redevelopment potential. This assessment assumed that $46,761,800 of the Action Plan

project costs could be funded through development exactions based on the Draft City of Redmond CIP Update.

Other Funding Sources

Local Improvement District Assessment Revenue

The City may set up Local Improvement Districts (LIDs) to fund specific capital improvement projects within defined geographic areas, or zones of benefit. LIDs impose assessments on properties within its boundaries. LIDs may not fund ongoing maintenance costs. They require separate accounting, and the assessments collected may only be spent on capital projects within the geographic area. Citizens representing 33% of the assessment can terminate a LID and overturn the planned projects so projects and costs of a LID must meet with broad approval of those within the boundaries of the LID.

Direct Appropriations

The City can seek direct appropriations from the State Legislature and / or U.S. Congress for transportation capital improvements. There may be projects identified within this Plan for which the City may want to pursue these special, one-time appropriations.

Special Assessments

A variety of special assessments are available in Oregon to defray costs of sidewalks, curbs, gutters, street lighting, parking and CBD or commercial zone transportation improvements. These assessments would likely fall within the Measure 50 limitations. A Portland area example would be the Westside LRT where the local share of funding was voter approved as an addition to property tax.

Debt Financing

Debt financing can also be used to mitigate the immediate impacts of significant capital improvement projects and spread costs over the useful life of a project. Though interest costs are incurred, the use of debt financing can serve not only as a practical means of funding major improvements, but is also viewed as an equitable funding strategy, spreading the burden of repayment over existing and future customers who will benefit from the projects. The obvious caution in relying on debt service is that a funding source must still be identified to fulfill annual repayment obligations.

Voter-Approved General Obligation Bond Proceeds

Subject to voter approval, the City can issue General Obligation (G.O.) bonds to debt finance capital improvement projects. G.O. bonds are backed by the increased taxing authority of the City, and the annual principal and interest repayment is funded through a new, voter-approved assessment on property City-wide (a property tax increase). Depending on the critical nature of any projects identified in the Transportation Plan, and the willingness of the electorate to accept increased taxation for transportation improvements, voter-approved G.O. bonds may be a feasible funding option for specific projects. Proceeds may not be used for ongoing maintenance.

Revenue Bonds

Revenue bonds are debt instruments secured by rate revenue. In order for the City to issue revenue bonds for transportation projects, it would need to identify a stable source of ongoing rate funding. Interest costs for revenue bonds are slightly higher than for general obligation bonds, due to the perceived stability offered by the "full faith and credit" of a jurisdiction.

Recommendations for New Transportation Funds

The City shall consider establishing a transportation utility fee as the backbone of its operations and maintenance funding approach. Street utility fees provide a stable source of dedicated revenue useable for transportation system operations and maintenance and/or capital construction. Rate revenues also secure revenue bond debt if used to finance capital improvements. Transportation utilities will be formed by Council action, and billed through the City utility billing system (e.g. water bills).

The City should also consider increasing the System Development Charges (SDCs) to fund the capital projects portion of the TSP Action Plan. An increase from the current amount of $2,877 to $4,700 per PM peak hour trip could generate an additional $38.6 million over the next 23 years.

A transportation utility fee and an increased SDC could generate approximately $36 million in additional funds over the next 23 years, as shown in Table 11-3. If development exactions were also pursued, total additional funds would be approximately $121.6 million, which meets the amount of additional funds needed ($121.3 million) as identified in Table 11-2. These additional funds are expected to reasonably generate sufficient revenues to fully fund the Action Plan projects and maintenance programs.

Table 11-3: Recommended New Funding Sources for Transportation Programs

Transportation Funding Source	Estimated Revenue ($1,000)
SDC – Additional Share (Increase by $1,823 / trip)*	$38,648
Exactions	$46,762
Transportation Utility Fee**	$36,230
23 YEAR TOTAL ADDITIONAL FUNDING (in 2007 Dollars)	**$121,640**

* Note that this additional revenue is based on a $4,700 / trip

** Assumes utility fee corresponding to $40 per capita per year (a typical single family household may be charged approximately $6 per month)