CHAPTER 5
REGIONAL TRANSPORTATION SYSTEM

5.1 TRANSPORTATION SYSTEM MANAGEMENT

INTRODUCTION

The Oregon Transportation Planning Rule defines Transportation System Management (TSM) strategies as:

> *"...techniques for increasing the efficiency, safety, capacity, or level of service of a transportation facility without increasing its size."*

TSM strategies are aimed at making the most efficient use of the existing transportation infrastructure, thus reducing the need for more costly projects, such as roadway capacity expansion. Example techniques include coordinating traffic signals, re-striping lanes, and channelizing intersections. TSM strategies can be an important component in maintaining mobility standards.

TSM needs examined in this chapter include:

- Intersection traffic control needs and improvements including signal coordination, signal upgrades and new signal installation or modifications;
- Intelligent Transportation System (ITS) needs and improvements; and
- Continuing traffic monitoring.

DATA COLLECTION AND INVENTORY

Locally, TSM strategies are considered first whenever system deficiencies are encountered. Local agencies have a history of implementing TSM projects and they are expected to continue to do so during the implementation period of the plan. Many TSM projects have relatively low capital costs in comparison to construction of new streets. TSM projects seldom require right-of-way acquisition, a sometimes lengthy, expensive and potentially disruptive process. Some TSM projects do not even require any physical construction.

Because of their relative simplicity, TSM projects often can be implemented soon after a problem is analyzed and a solution is developed. These are among the factors that make TSM projects attractive as methods of improving the transportation system of the region.

TSM Examples

Coordination of traffic signals, for example, can bring immediate congestion and air quality benefits. Coordinated signal timing in Oregon has produced 10- to 40-percent reductions in stops and 15- to 45-percent reductions in delays, yielding 5- to 25-percent reduction in travel time and up to 15-percent reduction in fuel consumption. Traffic signals within the RVMPO are operated by ODOT, Medford and Jackson County. They are owned by Ashland, Central Point, Medford and Jackson County and ODOT.

The Rogue Valley Intelligent Transportation System (RVITS) Plan, completed in 2016, contributes to TSM in areas of traffic operations and management, traveler information, incident management, public transportation management, emergency management, information management, and maintenance and construction management. RVITS is a 10-year plan for the installation and use of advanced technologies and management techniques to improve the safety and efficiency of the transportation system. This plan was developed collectively by the RVMPO member jurisdictions, including Rogue Valley Transportation District and the Oregon Department of Transportation.

Forecasting Future Demand

Chapter 10 looks at future-year demand across the entire regional transportation system. Additionally, RVMPO member jurisdictions have identified long-range system needs in their Transportation System Plans. The jurisdictions' TSPs identify numerous needs that can be met, at least in part, by TSM measures. Operational/capacity problems at intersections (volume-capacity ratio exceeding 1.0) can be addressed by intersection improvement projects. Medford and Central Point have built roundabouts to improve intersection performance. Channelization can also alleviate delay problems. Widening intersection approaches to provide left- and right-turn lanes can increase the approach capacity by up to 25 percent. Turn lanes also allow for simplified and more efficient signal timing. Most urban upgrade projects in the plan include channelization, which qualifies for Congestion Mitigation and Air Quality funds because reduced congestion reduces vehicle emissions.

Illustrating the potential effectiveness of TSM measures, Ashland in the early 2000s examined 20-year growth projections and determined that a combination of TSM measures, and an effective, area-wide transportation options (TO) policy (TO is discussed in Chapter 5.6), would yield an overall street system that operates within acceptable levels. TSM measures included in this analysis were:

- New traffic signals and signal coordination;
- Intersection approach enhancements, such as dedicated right-turn lanes; and
- Access management of private driveways and public streets.

Jurisdictions have identified signalization and other intersection-improvement projects, which are listed in Chapter 8 in the RTP Project List. These types of projects are part of an overall strategy to maximize the capacity of the existing street system.

System Deficiencies, Strengths and Weaknesses

Recurrent congestion for the most part is limited to morning and/or peak periods today. Most congestion falls within the moderate to high congestion range. The two trouble spots that fall into the severe congestion category are Table Rock Road between Antelope Road and Vilas Road, and Highway 62. Highway 62 has begun construction of its first phase of major improvement beginning in 2016. The first phase of construction of an expressway on Highway 62 will create a bypass for through traffic on the existing corridor. Chapter 10.3, Performance Measures, provides details about system performance.

Policy Issues and Actions

The potential benefits of TSM measures – both alone and in conjunction with other kinds of projects – will keep them at the forefront of system-improvement options. And as with other system needs, funding is not expected to keep pace with demand. The funding problem is not unique to the Rogue Valley region. In the area of updating and improving traffic signals, for instance, it has been estimated that approximately two-thirds of the urban signalized intersections in the United States need upgrading of physical equipment and changes to current timing. Generally, an inventory of traffic control devices is made to determine the need for replacement with new, more modern equipment. After the inventory is complete, comprehensive planning for signal systems can take place to improve traffic operations. Among the potential benefits of improved signal systems is a reduction in congestion, with a corresponding improvement in air quality.

The expected growth will put an enormous burden on the existing transportation system. Public agencies must realize that high land and construction costs and environmental constraints make it difficult to build new transportation infrastructure as the single means of relieving congestion. Therefore, a systematic approach is necessary to effectively manage the region's transportation system and capitalize on the existing infrastructure as the region grows. This will have to include a wide range of system management tools.

Facility Requirements

TSM measures most applicable to the RVMPO region are presented below. Where possible, specific projects have been identified. This discussion of TSM strategies does not represent any priority order. A broad range of strategies must be considered for the individual problems at each location.

Traffic Control Devices – The twin purposes of traffic signals (traffic lights) are a) to provide safety at intersections where volumes are considerable on at least one of the roads and b) to enhance smooth traffic flow through signal synchronization over several miles of arterial highway. In a synchronized system, the driver, after once getting a green light should be able to travel within the speed limit uninterrupted through a series of green lights. Synchronization through use of a master control system is discussed in the next section. Local governments traditionally base their decisions concerning the installation of traffic signals on the Manual on Uniform Traffic Control Devices. They also have a good record of using signals to help achieve

optimum traffic flow. Local governments should continue to give priority to improving existing traffic signal systems. Such improvements should include regular signal maintenance, updating the signal equipment and signal timing plan improvements. These improvements should be evaluated based on detailed analyses of traffic operations at individual intersections.

The coordination of new traffic signals through interconnection with existing and other new traffic signals should be considered to improve corridor-level traffic operations. Whenever additional intersections are signalized, agencies need to consider how they are best integrated with nearby signalized intersections. In some cases, signals operate most efficiently as independent signals, but in other cases, they are best integrated into a signal system.

The City of Medford already uses traffic signal systems and coordinated traffic signals in several locations. Experience in Medford and other communities has shown an eight to ten percent improvement in travel time along arterials after interconnected systems have been installed. Reduction of some types of automobile emissions is another possible benefit of improved signal systems.

Installation of master controllers, interconnection systems, and other equipment may help to achieve increased efficiency and reduce congestion of the street system.

Eliminate Unnecessary Traffic Signals – Intersection traffic-control improvements such as traffic signals are generally based on identified traffic congestion and safety problems. Over time, a change in the surrounding land use or street system may reduce travel demand at the signalized intersection, or geometric improvements may mitigate the safety problems at the intersection. Such changes may make the signal unnecessary, thereby requiring that the signal be removed for optimum system performance.

Intersections requiring removal of traffic signals may be converted to two-way stop control with free flow in the major direction of travel, or they may be converted to all-way stop control.

Intersection Geometric Improvements – Intersection improvements such as the provision of turning lanes, traffic islands, channelization, and improved design can generally be implemented at relatively modest cost depending on their complexity. The benefits, though, in the form of improved vehicular traffic flow and pedestrian safety, are substantial.

Local governments have a history of developing intersections that conform with national standards for geometric improvements at intersections. The following are eleven guidelines established by the Institute of Transportation Engineers in designing and improving arterial intersections at grade:

- Reduce the number of conflicts among vehicular movements.
- Control speed of vehicles entering and exiting the intersection.

- Coordinate different types of traffic control devices used with the traffic volume at the intersection.

- Select proper type of intersection to serve the traffic volume. Low volumes can be served with minimal control, whereas higher volumes require turning lanes and sophisticated actuated signal operations.

- Use separate left- and right-turn lanes at high volume intersections.

- Separate conflict points. Intersection hazards and delays are increased when intersection maneuver areas are too close together or overlap.

- Favor the heaviest and fastest flows.

- Reduce areas of conflict by channelization (striping, islands, etc.).

- Segregate non-homogenous flows. Separate lanes should be provided where appreciable volumes of traffic are traveling at different speeds (e.g. turning lanes for slowing vehicles).

- Consider the needs of pedestrians and bicyclists.

Intersection Turning Movement and Lane-Use Restrictions – Left-turning vehicles along major undivided highways can impede the flow of through traffic, especially when storage lanes are not provided for left-turning traffic. Turning movements are sometimes prohibited at arterial intersections to minimize conflict between turning vehicles and pedestrians, and between turning vehicles and other vehicles approaching from the opposite direction, thereby reducing delay and safety problems. In such cases, the turn movements should be prohibited during those hours when study data indicate that a significant capacity or safety problem exists, provided a suitable alternative route is available.

Alternatively, at signalized intersections, turning movements can be restricted to certain phases of the signal operation by use of separate displays and appropriate signs. This type of turn restriction is most effective only when a separate lane is provided for the use of turning vehicles.

Turn prohibition studies should consider the following:

- Amount of congestion and delay caused by turning movements;

- Number of collisions involving vehicles making the turning movements;

- Possible impact of traffic diversion on congestion and accidents at intersections required to accommodate traffic diverted by the prohibition;

- Reaction from local property owners;

- Possible adverse environmental impacts caused by re-routed traffic; and

- Feasibility of alternative solutions, such as providing separate storage lanes for turning movement, and separate turn-movements phasing at signalized intersections. The metropolitan area currently has few intersections where left-turns are prohibited. Additional candidate locations may be identified as the region grows. Turn prohibitions may be a viable solution where a separate left-turn lane and signal protection cannot be provided because of expense or right-of-way constraints.

Access Management – Roadways have two principal functions: the provision of access to adjacent properties and the provision of mobility for traffic already on the street. Streets of different categories have different blends of access and mobility functions.

Access management involves the balance between access to adjacent parcels and accommodating the flow of traffic. Not all of the local governments of the region have adopted access management plans. However, access management standards are a required component of local Transportation System Plans (TSPs). Currently, RVMPO member jurisdictions are in different phases of developing and implementing TSPs.

Access issues can be highly controversial since access management often regulates and limits access to individual businesses or requires access from side streets or frontage roads. Access issues must be handled individually for existing business sites. Significant concerns have been raised in Phoenix along Fern Valley Road, in Medford at the South Medford Interchange, and in Medford and Jackson County along Highway 62. Other local access issues have been raised on arterial and collector streets.

Experience throughout the United States has shown that a well managed access plan for a street system can:

- Minimize the number of potential conflicts between all users of the street system, providing a safer and more efficient system; and

- Minimize local costs for transportation improvements needed to provide additional capacity and access improvements.

Without an access management program along arterials and collectors, roadways may need to be periodically widened to accommodate demands of increased development. This cycle is a result of continually trying to satisfy traffic demands resulting from increased business activity. In turn, improved traffic conditions lead to further traffic demands. The number of vehicle conflict points rises because of an increase in the number of driveways, causing road capacity to diminish. Vehicle delay increases, and safety and comfort are reduced. The cost of allowing unplanned development to occur along arterials can be great because the inevitable solution calls for more capital expenditure, as the traffic conditions reach intolerable proportions. However, if proper planning in the form of an access management system is used, costs can be minimized.

The following are some of the more important components of an access management strategy that would be applicable to the metropolitan area.

Regulate minimum spacing of driveways – Several ways to accomplish this including:

- Regulate maximum number of driveways per parcel.
- Require access on adjacent cross street (when available).
- Consolidate access for adjacent properties.
- Encourage connections between adjacent properties that do not require motorists to traverse the public streets.
- Require adequate internal site design and circulation plan.
- Regulate the maximum width of driveways.
- Improve the vertical geometrics of driveways.
- Optimize traffic signal spacing and coordination.
- Install raised median divider, left-turn deceleration lane.
- Install continuous two-way left-turn lane.

Ramp Metering – Ramp meters are employed at freeway on-ramp entrances with the objective of optimizing throughput capacity on the mainline freeway. The optimization is achieved by regulating the entry of vehicles onto the freeway during the peak hours of operation with ramp signals at the on-ramps. Very often, optimization of freeway throughput capacity is achieved at the expense of additional delays at the metered on-ramps. Another important consideration is the ability to provide adequate queuing or storage capacity for the stopped vehicles on the ramps leading to the through road.

Ramp metering has proven to be one of the most cost-effective techniques to improve traffic flow on the freeway. A Federal Highway Administration study of seven ramp-metering sites in the United States and Canada revealed that average highway speeds increased by 29 percent after installing ramp metering. An analysis of the system in Seattle revealed that in addition to speed and corresponding travel time improvements, highway volumes increased between 12 and 40 percent because of ramp metering. Also, accident rate reductions between 20 and 58 percent have been recorded as a result of improved merging operations associated with ramp metering at freeway and on-ramp merge points.

The possibility of future metered on-ramps to I-5 has been raised, and could be evaluated more thoroughly by ODOT in cooperation with local governments as the region grows and travel-demands increase. Although I-5 and the ramps are under the jurisdiction of ODOT, it will be important for agencies to work cooperatively to

balance the competing demands on the interstate system and to ensure that any ramp delays can be accommodated by the local street system.

Goods Movement Management – The efficient movement of goods into and out of urban areas is essential for the economic vitality of the region. Goods-movement management strategies are aimed at mitigating congestion and improving safety conditions along the arterials. Strategies include restricting truck deliveries and pick-ups to off-peak periods, using alleys for loading and unloading, and providing additional curb space for loading and unloading operations. Such strategies should be investigated in commercial areas along heavily congested roads.

Issues associated with goods movement management strategies include traffic management, improvements at shipping/receiving points, reductions in operational and physical constraints, changes in business operating practices, and changes in public policy. Shifting goods movement activities to off-peak hours through various incentives (tax and otherwise) assists in the reduction of peak period traffic congestion. Traffic management strategies include incident management, night shipping and receiving, and peak-period truck bans.

Restricting deliveries or trucking activities in locations where it has long been conducted with little regulation may be unpalatable. It may, however, be possible to require on-site loading and unloading as a design feature for new developments. It is recognized that existing businesses will strenuously object to any restriction on deliveries or any change to the way in which they have been doing business. It is particularly difficult to implement a strategy that gives one business a real or perceived advantage over a competitor. It is also difficult for an agency to justify removal of on-street parking and, potentially, the loss of meter revenue, to accommodate more or larger truck loading zones. The implementing agencies need to evaluate these concerns in light of the advantages and disadvantages.

Bus Bays – Bus bays are areas along a roadway that allow buses to pull out of the travel lane while boarding or discharging passengers. They may be used to relieve congestion and to reduce the interference between buses and other traffic. Buses stopping frequently in through traffic lanes may frustrate the vehicle drivers who are following, possibly causing a following driver to take unsafe risks to overtake the bus. Bus bays may also prevent following traffic from stopping in intersections. Bus bays are more effective on heavily traveled arterials or collectors, where their use may be an effective TSM strategy.

A potential disadvantage of bus bays is that it may be difficult for buses to re-enter the stream of traffic once they have stopped in the bus bay. This can slow transit service considerably, making it a less viable mode of transportation. Currently, Oregon has a “Yield to the Bus” Law requiring drivers to yield to buses that are trying to merge back into traffic. Potential disadvantages to bus bays can be mitigated by equipping RVTD’s fleet with electronic yield signs, using public service announcements to explain the law, and enforcement of the law by local officers.

Intelligent Transportation Systems – In 2017 the RVMPO completed a comprehensive Intelligent Transportation Systems plan (RVITS). This 10-year plan identifies advanced technologies and management techniques that can relieve traffic congestions, enhance safety, provide services to travelers, and assist transportation system operators in implementing suitable traffic management strategies. Updates to the plan, with ongoing consultation with the RVMPO TAC and emergency services providers, continues. The Security chapter, 5.10, has additional information. The plan is maintained on the RVMPO website, www.rvmpo.org.

Example of ITS Application

RVITS is part of a federal initiative to use ITS to increase the efficiency of existing transportation infrastructure, improving overall system performance and reducing the need to add capacity. Efficiency is achieved by providing services and information to travelers so that they can make better travel decisions and to transportation system managers so they can better manage the system. To assure the development of a relevant plan, RVITS was produced with guidance from RVMPO member jurisdictions and key stakeholders from emergency services and communications agencies.

The RVITS plan provides a framework of policies, procedures and strategies for integration of ITS with the region's existing resources to meet future regional transportation needs and expectations. The plan includes the continuation and expansion of TSM projects and programs that have been under way for some time, such as coordination of traffic signals.

RVITS projects address the following categories:

- Travel and Traffic Management
- Communications
- Public Transportation Management
- Emergency Management
- Information Management
- Maintenance and Construction Management.

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