9 Determining Needs

9.1 Purpose

The primary purpose for conducting the analysis presented in previous chapters is to determine how a given facility performs relative to the selected performance measures of the study. This chapter presents an overview of the process for comparing the results of the Existing and No-Build analysis with adopted OHP standards, in order to identify deficiencies in the performance of the facility. Solutions are addressed in Chapter 10. Topics covered include:

- Standards for Determining Needs
- Applicable Oregon Highway Standards
- Analysis of Transportation Systems

9.2 Standards for Determining Needs

The term ‘need’ as used by transportation professionals is defined as:

> *“A ‘need’ has generally been defined by transportation analysts as any case where the current or planned facility conditions falls below an established standard.”*

The above perspective assumes that the adopted standard is the minimum acceptable condition for a facility, and any case where conditions fall below that level is a deficiency that should be corrected. The relevant standards presented in the latest version of the *Oregon Highway Plan* should be considered, as discussed in Chapter 2. Standards provide a critical element of the decision-making framework for assessing deficiencies and improvement alternatives since they are developed to maximize overall system performance while limiting liability to the agency responsible for construction, operations and maintenance.

Selection of Performance Measures

Performance measures, sometimes referred to as measures of effectiveness, are quantitative criteria that indicate how well a function or activity is being performed. Some common performance measures used in traffic engineering include vehicle delay, v/c ratio, LOS, travel time, emissions, vehicle speed, mode shift and capacity.

Most road authorities (state, county, or city) maintain adopted standards for operational efficiency that identify specific performance measures. It is important to identify all applicable standards and corresponding performance measures for study roadways to provide a basis for evaluating the results of transportation analysis and to determine if project goals and objectives are being achieved. The use of performance measures to identify needs and evaluate alternatives is discussed further in Chapters 9 and 10. ODOT measures highway mobility performance through volume to capacity (v/c) ratios and has adopted separate standards for identifying current and future needs and project design.

Operational standards for identification of current and future needs are documented in the *1999 OHP* in Policy 1F. Tables 6 and 7 within Policy 1F list maximum allowable v/c ratios for various combinations of highway classifications and surrounding land uses, with Table 7 applying to the Metro Area and Table 6 applying to the remainder of the state. However, it should be noted that the text within Policy 1F contains exceptions to the standards listed in these tables and, therefore, must be consulted as well. Furthermore, the OHP Registry of Amendments webpage should be checked for amendments that may affect this policy.

As an example, Amendment 00-04, which was adopted on December 13, 2000, created alternate mobility standards for the South Medford Interchange and the Metro Area. These alternate standards can be found in the document *"Amendment to 1999 Oregon Highway Plan Alternate Highway Mobility Standards Metro Area."* When using these standards, it should be noted that there is an error in the Table 7 footnote. The existing first bullet under OHP Table 7 was a leftover from the original Table 7, and is proposed to be stricken from the OHP with the next revision. Each of the hours needs to be analyzed separately, using an appropriate PHF, with the results compared to the respective v/c ratios provided in Table 7.

These standards are applicable to existing, future no-build, and future build conditions for TISs (typically associated with comprehensive plan amendments, zone changes, development reviews, and approach applications) and all no-build alternative work for existing and future conditions analyzed in other types of projects including transportation facility projects, transportation system plans, corridor plans, refinement plans, interchange area management plans and access management plans. In situations where an interchange or interstate freeway needs to be modified in association with proposed development impacts, it is necessary to coordinate with Federal Highway Administration (FHWA) and the developer to work out any issues relative to the OHP versus ODOT's *HDM* guidelines.

Operational standards for project design are documented in Table 10-1 of ODOT's *HDM*. These standards (the functional equivalents of the LOS standards in the American Association of State Highway and Transportation Officials [AASHTO] Green Book) represent the level of operation for which state facilities are expected to be designed and are intended to be applied to an analysis year occurring 20 years beyond the year of completion. These standards are applicable to future build alternatives associated with all project types except Traffic Impact Studies associated with development, unless an interchange or interstate freeway is involved. It should be noted that for ramp terminals, the HDM mainline maximum v/c ratio is the standard that applies. There is no equivalent ramp terminal v/c ratio in the OHP as there is in the HDM.

Table 9-1 illustrates the appropriate sources of performance measures for different project types.

Table 9-1 Sources of Performance Measures by Project Type

	TIS	**Projects**	**Studies**
Existing Conditions	OHP	OHP	OHP
Future No-Build	OHP	OHP	OHP
Future Build(s)	OHP	HDM	HDM

9.3 Applicable Oregon Highway Standards

9.3.1 Mobility

The *OHP* establishes the mobility standards for all state facilities. ODOT measures highway mobility performance through v/c ratios and has adopted separate standards for identifying current and future needs and project design.

Most of the analysis procedures summarized in Table 2-1 have direct (or equivalent) v/c ratio results for performance assessment. The compliance with the appropriate standard (maximum v/c ratio thresholds defined in the *OHP*) is the first tier of the evaluation. These procedures are noted in Table 9-2.

Table 9-2 Types of Performance Measures Applications

Type of Analysis	Volume to Capacity Ratio	Meets / Does Not Meet	Speed	Queue Length
Signalized Capacity	X			
Unsignalized Capacity	X			
Preliminary Signal Warrants		X		
Segment Analysis	X			
Signal Warrants		X		
Turn Lane Criteria Analysis		X		
Queuing Analysis				X
Segment Analysis	X		X	
Progression Analysis			X	
Weaving Analysis	X		X	
Merge/Diverge Analysis	X		X	
Passing/Climbing Lanes	X		X	
Simulation Modeling	X		X	
Arterial Analysis			X	

However, several procedures do not yield v/c ratio outcomes. For example, traffic signal warrants are one guide to assess the readiness of an intersection or junction to be controlled by signals, but it is not, by itself, a performance indicator. However, these analyses are useful to flag potential modifications in traffic controls or facility designs that should be incorporated into Build scenario evaluations.

The other category of performance measures focuses on travel speeds, including progression analysis, arterial analysis and selected outputs of many simulation models. The vehicle speed outcomes can be compared to target or design speeds to assess relative benefit, but there is no direct comparison with v/c ratio in these analyses. It is recommended that these types of measures should be used in conjunction with either intersection or segment analysis that do have v/c ratio related outcomes to determine the compliance with mobility standards.

9.3.2 Safety

The safety evaluations parameters are less discrete compared to mobility standards, and generally rely on a comparative evaluation to other state facilities as a basis for acceptability. Section 5.2 of the *Oregon State Highway Crash Rate Table* states:

> *"Table II presents a five-year comparison of crash rates for the state highway system, for urban and rural areas by functional classification."*

For the crash analysis, use this table to compare the historical segment crash rate for a studied section to the statewide average rate in the table for a comparable type. The analyst must determine if the studied segment is within an urban or rural area, the roadway classification and whether it is a state primary or secondary highway. A listing of primary and secondary highways is included after Table IV in the Crash Rate Table. Note that the category "State Highway System" provided alongside the primary and secondary system categories is a combination that should NOT be used for most crash rate comparisons.

When comparing a statewide average rate to a segment crash rate for a study highway, simply exceeding the statewide average rate should not be interpreted as proof that a section is hazardous. Much like an intersection crash rate of 1.0 or greater, a segment crash rate that exceeds the statewide average crash rate should merely be considered as an indication that further investigation is necessary. The analyst should also examine the collision type and collision information such as time of day, milepost, roadway conditions and other factors to more accurately understand the crash history.

9.4 Analysis of Transportation System

9.4.1 Existing System

The analysis scoping, selecting performance measures and procedures for evaluating the existing transportation system are described in Chapters 2, 3, 5, 6, 7 and 8 of this manual. Refer to those sections for appropriate methods and techniques.

Elements of the existing transportation system that do not fall below current adopted performance standards should be flagged for consideration in developing facility alternatives. See Chapter 10.

Similarly the crash analysis procedures are described in Chapter 5. Locations that fall above the statewide average for a similar facility type and setting should be flagged for possible countermeasures or other improvements to be incorporated into the build plan alternatives. See Chapter 10.

9.4.2 Future No-Build System

The Future No-Build System typically includes the same street and intersection network, traffic controls and operational assumptions that were applied for the Existing System analysis without any improvement. In some cases, the Future No-Build System may include improvement projects that are assumed to be funded and constructed within the project planning horizon. The analyst should coordinate with Region Planning staff to identify these projects. Typically such projects would be listed in the STIP, city or county TSPs or MPO Regional Transportation Plans (RTPs). In these cases, it may be more useful to refer to this situation as the Future Base scenario, to reduce confusion with suggestion that no-build implies no improvement projects.

The same measures and analysis techniques applied for the Existing Transportation System will be applied on the Future No-Build System. However, the forecasted future volumes will be used in this analysis to assess how the future No-Build System operates. The future volumes should be developed according to the guidelines described in Chapter 4.

Elements of the transportation system that fall below current adopted performance standards should be flagged for consideration in developing facility alternatives. See Chapter 10.

There is no widely accepted method for assessing future traffic safety conditions. The detailed type of analysis used in Chapter 5 is not applied to future year traffic volumes. However, some project alternatives may help to resolve existing safety issues or deficiencies by upgrading substandard designs (modernization) or eliminating the primary conflicts (e.g., constructing a grade-separated crossing).

9.4.3 Travel Demand Management Options

The future analysis may also include elements that modify the initial travel demand that are expected in the future no-build forecasts. There are many techniques and programs that effectively manage future traffic demands, both on a temporal and modal basis, to work towards reducing the overall travel demands within the project area. Common demand management techniques could include:

- Proposed changes to the current land use zoning.
- Restrictions to the intensity of development within an existing zone (e.g., trip caps).
- Increase or enhanced transit services.
- Comprehensive Travel Demand Management (TDM) programs applied to larger employment centers that increase auto occupancy, bus ridership, and help to spread out the peak demand levels for a given site.

It is recommended that the alternatives development process give consideration to TDM components that can augment physical or operational improvements within the study area. Refer to Chapter 10 for more details about TDM options.