

CHAPTER 2

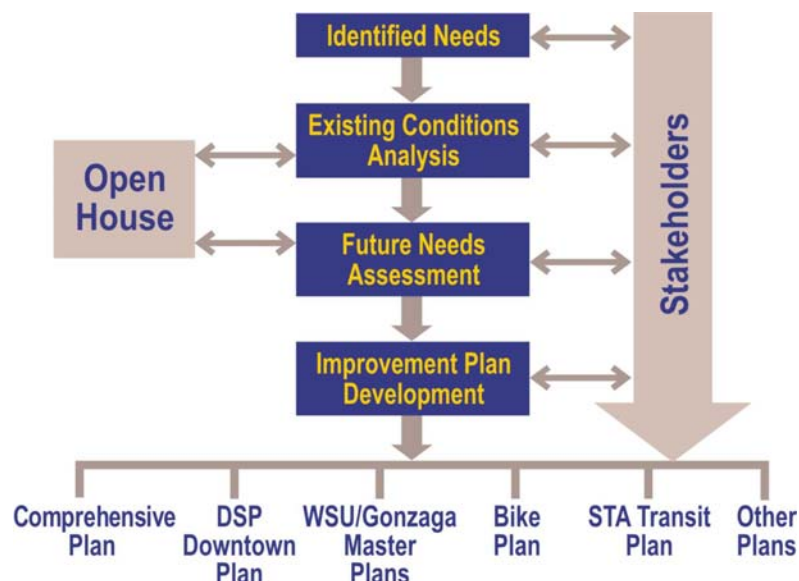
ASSUMPTIONS & METHODOLOGY

Introduction

The purpose of this chapter is to outline the project approach, methodology and assumptions used for the transportation analysis of the University District/Downtown area, present the key transportation guidelines used to determine existing transportation deficiencies and evaluate future elements of the University District/Downtown Spokane Transportation Improvement Study.

Project Approach

The University District/Downtown Spokane Transportation Improvement Study is a comprehensive study that incorporates sequential tasks aimed at developing a series of recommended improvements and a multi-modal transportation plan for the future. The initial step was the collection of existing data for evaluation. The data was then verified against field observations and calibrated with field measurements to determine the baseline conditions and indicate the traffic operations for the study area for the base year (2006). The existing conditions were then evaluated based on the performance criteria outlined within this section. Existing deficiencies and operational issues for each mode, including motor vehicle, pedestrian, bicycle and transit are identified. In the next step, future traffic volumes were developed using the regional travel demand model and the study area was evaluated for potential deficiencies. The deficiencies were then addressed with several improvement alternatives and a strategy with recommended improvement projects was developed.



Public Involvement Process

The public involvement process played an important role throughout the entire process of the University District/Downtown Spokane Transportation Improvement Study. Due to the size of the study area, numerous stakeholders were included as part of the public involvement process to assist with the needs assessment and the development of appropriate alternatives and recommendations for the future. The study was developed with regional agency coordination along with guidance and input from a stakeholder advisory committee of various neighborhoods, businesses, and interest groups. The key steps of the public involvement process are summarized below.

Preliminary Stakeholder Interviews for the Needs Assessment

The needs assessment portion of the public involvement program has been successfully completed, providing the information needed to move forward with an effective public involvement process. The needs assessment identified and interviewed key stakeholders to determine issues and concerns related to this study. Additionally, the interviews helped determine the level of interest of the various stakeholders and how they would like to be involved in the study. Nearly two dozen people provided input regarding issues and needs.

Public Open House

One public open house was held September 12, 2006 to scope the community concerns for the University District/Downtown area. The information gathered was consistent with the feedback received through the one-on-one interviews in the Needs Assessment process.

Stakeholder Advisory Committee (SAC)

The SAC comprised a broad cross-section of the community interests and needs, including but not limited to the groups listed here: City of Spokane, Downtown Spokane Partnership, Spokane Regional Transportation Council, Washington Dept. of Transportation, Public Facilities District, neighborhood councils, Eastern Washington University, Gonzaga University, Washington State University, pedestrian and bicycle committee, hospitals, Spokane Intercollegiate Research and Technology Institute (SIRTI), Greater Spokane Incorporated, and Spokane Transit Authority.

The SAC met five times during the course of the study:

- ▶ August 15, 2006
- ▶ November 17, 2006
- ▶ April 17, 2008
- ▶ May 8, 2008
- ▶ June 12, 2008

Additionally, the SAC participated in the workshops noted below.

Community Workshops

Three public workshops were held to gather input from the community related to three specific topics. The dates and topics are noted below. Good participation provided significant input on these topics.

- ▶ October 12, 2006: One-way versus Two-Way Streets and Parking
- ▶ October 19, 2006: Alternative Travel Modes/Street Design
- ▶ November 2, 2006: Freeway Access/Congestion

Public Outreach: Website, Newsletters, Survey

Two websites were used during the study to provide information and receive comments: one was for the general

public and one was restricted to SAC members. Newsletters and updates were provided, and a survey was conducted in November 2006 to scope concerns and issues; the data received was shared with the SAC and incorporated into the study process. Initial draft chapters were also posted on the website for stakeholder review and comment; comments were incorporated into this draft document.

Re-engagement Stakeholder Interviews

Following the re-start of the project in the spring of 2008, the team spent two days in April meeting with individual stakeholder groups including: Riverpark Square, Downtown Spokane Partnership, Washington State University, and Gonzaga University to discuss preliminary findings and potential improvement recommendations. This process allowed the project team to provide updates and gather feedback related to the specific needs and interests of the various stakeholders.

Elected Officials

The elected officials were updated throughout the study process as appropriate through newsletters, personal meetings and presentations.

Goals and Policies

Several detailed goals and policies were outlined in Spokane's Comprehensive Plan³ to guide planning and decision making for the future transportation system. The relevant goals and policies are summarized below and provide a general vision for the City's transportation system.

GOAL 1: Develop and implement a transportation system and a healthy balance of transportation choices that improve the mobility and quality of life of all residents.

GOAL 2: Provide a variety of transportation options, including walking, bicycling, taking the bus, car pooling and riding private automobiles to ensure that all citizens have viable travel option and reduce dependency on automobiles.

- ▶ Physical Features - Incorporate site design and other physical features into developments that encourage alternatives to driving.
- ▶ TDM Strategies - Use Transportation Demand Management strategies to reduce the demand for automobile travel.
- ▶ Pedestrian/Bicycle Coordination - Provide adequate City of Spokane staff dedicated to pedestrian/bicycle planning and coordination to ensure that projects are developed that meets the safety, access, and transportation needs of pedestrians, bicyclists, and other non-motorized modes.
- ▶ Parking Requirements and Parking Facility Design - Design facilities to enhance mobility for all transportation users and maintain parking requirements for vehicles that adequately meet demand yet discourage dependence on driving.
- ▶ Viable Walking Alternative, Safe Sidewalks, and Crosswalks - Promote and provide for walking as a viable alternative, provide crosswalks, and safe pedestrian circulation.
- ▶ Pedestrian Linkages Across Barriers, Pedestrian Access on Bridges, and Pedestrian Access to Schools - Provide safe, convenient access to key pedestrian generators.
- ▶ Viable Bicycling, Bikeways, Bicycle Lanes and Paths, Facilities to Support Bicycling - Promote and provide for bicycling as a viable alternative to driving.

³ City of Spokane Comprehensive Plan, Planning Services Department, Revised Edition, July 2005.

- ▶ Viable Transit, Transit Shelters and Other Features, and Transit Levels of Service - Provide transit services and facilities that make transit a viable transportation for all segments of the community, provide transit shelters and other features to support transit use in key locations, and establish and measure transit levels of service to assure transit can compete with other transportation modes.

GOAL 3: Recognize the key relationship between the places where people live, work and shop and their need to have access to these places; use this relationship to promote land use patterns, transportation facilities, and other urban features that advance Spokane's quality of life.

- ▶ Transportation and Development Patterns - Use the city's transportation infrastructure to support desired land uses and development patterns to reduce sprawl and encourage development in urban areas.
- ▶ Reduced Distances to Neighborhood Services and Increased Residential Densities
- ▶ Walking and Bicycling - Oriented Neighborhood Centers and Healthy Commercial Centers

GOAL 4: Design and maintain Spokane's transportation system to have efficient and safe movement of people and goods within the city and region.

- ▶ Street Design and Traffic Flow - Use street design to manage traffic flow and reduce the need for street expansions
- ▶ Arterial Location and Design - Locate and design arterials to minimize impacts on neighborhoods
- ▶ External and Internal Connections - Design subdivisions and planned unit developments to be well-connected to adjacent properties and streets and to have open well-connected internal transportation connections
- ▶ Freight and Commercial Goods - Accommodate moving freight and commercial goods in ways that are safe, cost efficient, energy efficient and environmentally friendly
- ▶ Downtown Accessibility and Street Network
- ▶ Traffic Signals, Signs, and Lighting
- ▶ Awareness of Right-of-Way Streetscape Elements - Increase the understanding and awareness of the essential importance of pedestrian buffer strips, medians, traffic circles and other right-of-way streetscape elements.
- ▶ Transportation Level of Service - Set and maintain transportation level of service standards that support desired focused growth patterns and choices of transportation modes and that is consistent with other agencies and private providers of transportation.

GOAL 5: Protect neighborhoods from the impacts of the transportation system, including the impacts of increased and faster moving traffic.

- ▶ Neighborhood Traffic Issues, Traffic Calming Measures, and Neighborhood Parking - Work with neighborhoods to identify, assess and respond to traffic issues, provide traffic calming measures and provide neighborhood on-street parking.

GOAL 6: Minimize the impacts of the transportation system on the environment, including the region's air quality and environmental features, such as nature corridors.

GOAL 7: Foster a sense of community and identify through the availability of transportation choices and transportation design features, recognizing that both profoundly affect the way people interact and experience the city.

GOAL 8: Plan for transportation on a regional basis.

- ▶ Efficient Regional Transportation - Coordinate with SRTC to ensure efficient, multimode transportation of people and goods between communities regionally.

GOAL 9: Finance a balanced, multimode transportation system using resources efficiently and equitably.

GOAL 10: Prepare for the future and changing transportation needs resulting from changing populations, technology and trends.

Measures of Effectiveness

The University District/Downtown Spokane Transportation Improvement Study encompasses a large study area and is composed of motor vehicle, pedestrian, bicycle and transit facilities. Numerous general measures of effectiveness have been developed and applied to the evaluation of transportation performance. The guidelines are the thresholds for determining acceptable versus unacceptable conditions in the transportation system and were derived from existing regional policies and standards of professional transportation planning practice.

LEVEL OF SERVICE

Level of Service (LOS) and delay are typically used as measures of effectiveness for intersection operations. Level of Service 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. Level of service D or better is generally the accepted standard for signalized intersections in urban conditions.

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.

Level of Service Standards

Level of service standards⁴ outline the acceptable levels of service for signalized and unsignalized intersections within the City of Spokane. The standards indicate LOS F, not to exceed 90 seconds of intersection delay at most of the signalized arterial intersections within the study area. The study intersections not included in this category are within areas west of Monroe Street and north of the Spokane River and east of Division Street and north of Sprague Avenue. For these intersections, the standard is LOS E. The standard for unsignalized intersections is LOS E. The individual approach movements are analyzed at two-way and all-way stop controlled intersections and a lower level of service may be allowed based on major and minor movement queue length, delay and volume to capacity ratio.

VOLUME-TO-CAPACITY RATIO

The volume to capacity ratio (V/C) is also used as a measure of effectiveness for signalized intersection operation. The V/C is calculated by dividing the volume entering the intersection by the total capacity (maximum volume the intersection could serve). The V/C describes the amount of intersection capacity that is utilized by the volume. For example, a 0.65 V/C represents intersection volumes consuming 65% of the available capacity at that intersection. A V/C of 1.0 suggests there is no available capacity at that intersection and not one more vehicle could be accommodated during that time.

⁴ Transportation Concurrency Level of Service Standards, effective December 26, 2008, City of Spokane Administrative Policy and Procedure.

QUEUING

Queuing is a measure of effectiveness used to analyze the vehicle operations at both signalized and unsignalized intersections. Estimates of vehicle queues are needed to determine if the available vehicle storage in an approach lane is adequate and to determine whether spillover occurs resulting in impacts to adjacent intersections and/or driveways. Vehicle queues for design and analysis purposes are typically estimated based on the 95th percentile queue that is expected during the design period. The 95th percentile queue estimates the queue length that would not be exceeded in 95 percent of the queues during the peak period.

SATURATION FLOW RATES

The saturation flow rate is a critical component in the analysis of signalized intersection capacity and can be defined as the flow in vehicles per hour that can be accommodated by a lane group assuming that the green phase is displayed 100 percent of the time. The ideal saturation flow rate used for analysis was 1,900 passenger cars per hour of green per lane (pcphgl). The ideal, unadjusted saturation flow rate is converted to an actual flow rate by applying adjustment factors based on field conditions, such as lane width, heavy vehicles, grades, parking, bus blockages, turning movements and pedestrian and bicycle activity.

Field measurements were taken at select intersections along Division Street to calibrate the saturation flow rates for this study. For future conditions, the base saturation flow rate inputs were assumed at 1,800 passenger cars per hour of green per lane (pcphgl), which more closely matched the field observations.

ACCESS SPACING

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 individual properties. Proper implementation of access management techniques should guarantee reduced congestion, reduced accident rates, less need for roadway widening, conservation of energy, and reduced air pollution.

Access management is the control or limiting of vehicular access on arterial and collector facilities to maintain the capacity of the facilities and preserve their functional integrity. Access management strives to strike a balance between maintaining the integrity of the facility and providing access to adjacent parcels. Numerous driveways can erode the capacity of arterial and collector roadways. Preservation of capacity is particularly important on higher volume roadways for maintaining traffic flow and mobility. Whereas local and neighborhood streets function to provide access, collector and arterial streets serve greater traffic volume. Numerous driveways or street intersections increase the number of conflicts and potential for collisions and decrease mobility and traffic flow. Spokane, as with every city, needs a balance of streets that provide access with streets that serve mobility.

Access management is not easy to implement and often requires long institutional memory of the impacts of short access spacing – increased collisions, reduced capacity, poor sight distance and greater pedestrian exposure to vehicle conflicts. The most common opposition response to access control is that “there are driveways all over the place at closer spacing than mine – just look out there”. These statements are commonly made without historical reference. Many of the pre-existing driveways that do not meet access spacing requirements were put in when traffic volumes were substantially lower and no access spacing criteria were mandated. With higher and higher traffic volume in the future, the need for access control on all arterial and collector roadways is critical – the outcome of not managing access properly is additional wider roadways which have much greater impact than access control.

PRELIMINARY TRAFFIC SIGNAL WARRANTS

Traffic signal warrants are outlined in the Manual for Uniform Traffic Control Devices (MUTCD). Preliminary signal warrants are evaluated at all unsignalized study intersections under future traffic volume conditions. The Peak Hour Warrant analysis is based on PM peak hour traffic volumes. Intersections meeting PM peak hour traffic signal warrants should be analyzed at a future date based on Eight Hour Warrants before construction of a

traffic signal occurs. Meeting traffic signal warrants does not guarantee that a signal will be installed, but provides criteria that should be utilized along with engineering judgment.

LEFT TURN LANE WARRANTS

Left turn warrants were evaluated along roadways throughout the study area to determine where volumes warranted a need for separate left turn pockets to accommodate turning vehicles. The warrant methodology for providing left turn lanes at unsignalized intersections utilized left-turning volume, opposing volume, operating speeds, and collision history as analysis factors.

TRAFFIC SIGNAL SPACING

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 is required for major arterial, minor arterial and collector facilities.

BICYCLES

Bicycle service is primarily measured by the bicycle network and the promotion of bicycling as a safe, viable mode of transportation. The bicycle network consists of bicycle paths, bicycle routes, and bikeways. Bikeways within the City of Spokane are defined by any facility designed to accommodate bicycles, such as a path, lane, or shared roadway. General connectivity guidelines indicate there should be a well-connected bicycle facility/trail system within one mile of schools, parks, retail and other non-auto generators. Another related measure of effectiveness is the quality of gap infill and the contribution to a well-connected bicycle network. New construction of bicycle lanes also needs to be balanced with conflicting frontage and right of way considerations from adjacent businesses and land owners. The location and number of available stalls for bicycle parking also contributes to the performance of the bicycle system. Bicycle safety is another measure of effectiveness, but is more difficult to quantify. Intersections with bicycle collisions also affect the performance of the bicycle system and may indicate issues and/or system needs.

PEDESTRIANS

Many of the goals and policies established in the comprehensive plan are related to accessible, safe pedestrian facilities and other goals such as neighborhood livability. Performance measures for the pedestrian system include the nature and location of pedestrian facilities, pedestrian safety and connectivity. General connectivity guidelines indicate there should be a well-connected sidewalk/trail system should be within one-half mile of schools parks, retail, and other non-auto generators for pedestrians. Another measure of effectiveness includes the quality of gap infill within the pedestrian network. Pedestrian crossing spacing should also be regulated along arterial facilities; the general standard is ¼ mile between crossing locations.

PARKING

Parking facilities throughout the City of Spokane can generally be categorized into on-street/off-street and metered/free. The issue of parking is more qualitative in nature compared to some of the operation measures of effectiveness outlined above. The addition and removal of parking spaces requires a balance between the following factors:

- ▶ Impacts to adjacent businesses
- ▶ Impacts on pedestrian, bicycle, and transit users
- ▶ Current supply and demand
- ▶ Alternate transportation need (e.g. capacity issue requiring lane expansion)
- ▶ Impacts on pedestrian, bicycle, transit users

These factors are evaluated on an individual case by case basis, based on surrounding land use, right of way considerations, and overall available supply and forecasted demand. Parking goals and policies may differ by

specific areas of the City, but generally indicate the need to provide enough parking to adequately serve the area, without providing an abundance of parking to encourage other viable modes of transportation.

TRANSIT SERVICE

Several components of transit service can be measured and influence the perceived efficiency and overall performance of service. These components include number of routes, frequency of service, spacing and location of stops, and reliability of service. General transit planning guidelines from the Highway Capacity Manual⁵ offer evaluation measures for bus headway, service coverage and reliability and are outlined in Table 2-1. The allocation of service is weighted on each of these three strategies; the most consideration is given to the equity strategy.

TRANSPORTATION PERFORMANCE MEASURES

The transportation performance measures used for this analysis are summarized by mode in Table 2-1.

Table 2-1: Transportation Performance Standards

Characteristic	Description	Methodology/Other Comments
<i>Motor Vehicle</i>		
Intersection	Peak hour level of service (downtown): <ul style="list-style-type: none"> ▪ Minimum LOS F-90 seconds of delay (signalized) ▪ Minimum LOS E (unsignalized) Peak hour level of service (west of Monroe and north of Spokane River; east of Division and east of Sprague): <ul style="list-style-type: none"> ▪ Minimum LOS E 90 seconds of delay (signalized) ▪ Minimum LOS E (unsignalized) 	Spokane Transportation Concurrency Level of Service Standards defined by area
Vehicle Safety	Crash rate per million entering vehicles (MEV): Intersection: <ul style="list-style-type: none"> ▪ > 1.0 crashes/MEV 	Based on crash data reported by the Washington Department of Transportation and City of Spokane
Access Spacing/Signal Spacing	Signal spacing <ul style="list-style-type: none"> ▪ Minimum 1000 feet on arterial and collector facilities 	
<i>Pedestrian</i>		
System Connectivity	Continuity and proximity of sidewalk/trail system. Minimum standard: <ul style="list-style-type: none"> ▪ 1/2 mile from schools, parks, retail and other major pedestrian generators 	Based on GIS data and field review.
Crossing Spacing on Arterial Facilities	Minimum standard between adjacent crossing facilities <ul style="list-style-type: none"> ▪ 1/4-mile on arterials 	Crossing control types, in descending order (grade-separated structure, pedestrian signal with crosswalks, uncontrolled crosswalk.
Gap Filling	Infill gaps in sidewalk facilities	Based on GIS data and field review
<i>Bicycle</i>		
System Connectivity	Continuity and proximity of bicycle facility/trail system. Minimum standard: <ul style="list-style-type: none"> ▪ 1 mile from schools, parks, retail and other major non-auto generators 	Based on GIS data and field review.

⁵ Highway Capacity Manual, Transportation Research Board, Chapter 27, 2000.

Characteristic	Description	Methodology/Other Comments
Gap Filling	Infill gaps in bicycle facilities	Based on GIS data and field review
<i>Transit</i>		
Bus Headway	Frequency of bus service during hours of operation. <ul style="list-style-type: none"> No minimum standard 	Based on methods in Highway Capacity Manual, 2000, Chapter 27.
Service Coverage	Level of service rating for employment and housing densities above minimum required for transit service within 1/4 mile walking distance from bus stops. <ul style="list-style-type: none"> No minimum standard 	Based on methods in Highway Capacity Manual, 2000, Chapter 27.
Reliability	Measures the likelihood of on-time transit service based on historical travel data. <ul style="list-style-type: none"> 95% on-time performance 	Requires detailed operation information by route and time of day.