Comprehensive Plan





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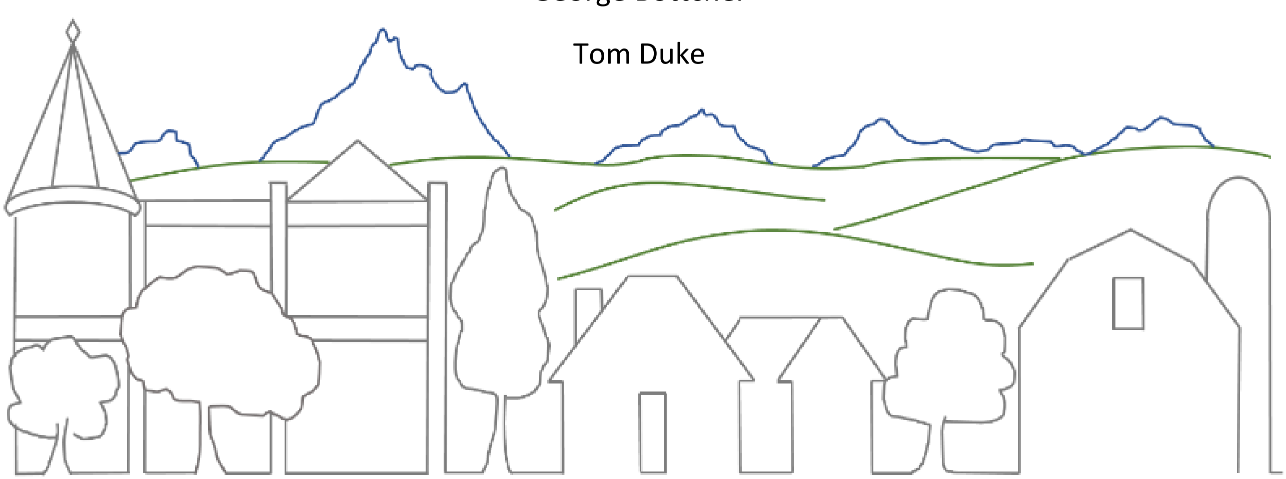

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INTRODUCTION

Welcome to the City of Ellensburg's Comprehensive Plan. This 20-year plan articulates the community's vision and reflects community values. The goals, policies, and programs included in this Plan provide a basis for the City's regulations and guide future decision-making. This Plan also addresses anticipated population and employment growth, and how facilities and services will be maintained and improved to accommodate expected growth.

Ellensburg adopted its first Comprehensive Plan in 1975. This plan was later reviewed and updated in 1995, in response to the requirements of the Growth Management Act (GMA) (RCW 36.70A). This update builds off the 2006 Comprehensive Plan update, and responds to the GMA requirement for periodic review. This plan is consistent with the Countywide Planning Policies, and is based on Community Values identified through a 2016/2017 Community Heart & Soul ® planning exercise. During the 2020 comprehensive plan amendment process, City Council docketed two proposals to add a new Diversity, Equity and Inclusion element to this Plan, with anticipated adoption in 2021.

Structure of the Comprehensive Plan

The Ellensburg Comprehensive Plan is composed of the following sections:

Section I – Introduction. This section includes a description of the comprehensive planning process and the City's Community Values.

Section II – Community Profile. This section includes a brief history of Ellensburg, demographic information, and 20-year population and employment projections.

Section III – Comprehensive Plan Elements. This section includes the following elements: Land Use, Housing, Transportation, Capital Facilities and Utilities, Parks and Recreation, Economic Development, Environment, and Historic Preservation. Each element contains a Background and Context section that includes inventories and background data, needs assessments or analyses, and identification of issues followed by specific Goals, Policies, and Programs.

Section IV – Definitions and Acronyms. Definitions of terms used throughout the Comprehensive Plan and frequently used acronyms.

Section V – Appendices.

What is a Comprehensive Plan?

A comprehensive plan indicates how a community envisions its future, and sets forth strategies for achieving the desired vision. A comprehensive plan has three primary characteristics.

1. **It is comprehensive** - the plan includes all the geographic and functional elements that impact the community's physical development.
2. **It is general** - the plan summarizes the major policies and proposals of the City, but does not usually indicate specific locations or establish regulations.
3. **It is long range** - the plan looks beyond the current pressing issues confronting the community to identify long-term goals and policy direction for achieving them.

Relationship to the Growth Management Act

The State of Washington adopted the Growth Management Act (GMA) in 1990. This legislation requires comprehensive plans to include specific elements; it obligates incorporated areas to adopt implementing regulations, and counties to develop Countywide Planning Policies to address issues of a regional nature; and it establishes protocols and deadlines for these tasks.

The GMA sets out fourteen statutory goals that guide the development of comprehensive plans. For a plan to be valid, it must be consistent with the goals and specific requirements of the GMA. In this context, consistency means that a comprehensive plan must not be in conflict with the state statutory goals, countywide planning policies, or plans of adjacent jurisdictions.

The fourteen statutory goals identified in the state legislation are summarized as follows:

1. Guide urban growth to areas where urban services can be adequately provided;
2. Reduce urban sprawl;
3. Encourage efficient multi-modal transportation systems;
4. Encourage the availability of affordable housing to all economic segments of the population;
5. Encourage economic development throughout the state;

6. Assure private property is not taken for public use without just compensation;
7. Encourage predictable and timely permit processing;
8. Maintain and enhance natural resource-based industries;
9. Encourage retention of open space and development of recreational opportunities;
10. Protect the environment and enhance the state's quality of life;
11. Encourage the participation of citizens in the planning process;
12. Ensure adequate public facilities and services necessary to support development;
13. Identify and preserve lands and sites of historic and archaeological significance; and
14. Manage shorelines of the state.

Relationship to the Countywide Planning Policies

As part of the comprehensive planning process, Kittitas County and its incorporated areas have developed Countywide Planning Policies. The intention of these policies is to help the four cities, one town, and the County address growth management in a coordinated manner. The Kittitas County Conference of Governments adopted the policies and they were subsequently ratified by the Kittitas County Board of County Commissioners.

The Countywide Planning Policies try to balance issues related to growth, economics, and the environment. Specific objectives include:

- Implement Urban Growth Areas and joint county and city planning within Urban Growth Areas;
- Promote contiguous and orderly development;
- Provide for siting of public capital facilities of regional or statewide significance;
- Provide for countywide transportation facilities;
- Consider affordable housing needs; and
- Ensure favorable employment and economic conditions in the County.

Public Participation

The Growth Management Act (GMA) requires that the comprehensive plan encourage public participation in the planning process. The Community Values, what we refer to as Ellensburg's Heart & Soul, and each chapter was developed through extensive public, staff, and volunteer involvement. The following is a summary of the public participation that occurred throughout the comprehensive planning process.

Community Network Analysis

In fall 2016 City staff kicked off the comprehensive planning process by reaching out to community members that represented diverse sectors of the community to work on the Community Network Analysis. The Community Network Analysis is an interactive tool to better understand who lives, works, and plays in Ellensburg, and how best to reach them where they are. Participants examined who to connect with and how, and helped participants to identify segments of the population that are typically underrepresented in both formal and informal social networks. Participants in the Community Network Analysis included interested members of the public and representatives from the following groups:

- Bright Beginnings for Kittitas County
- Central Washington University
- City of Ellensburg Landmarks and Design Commission
- City of Ellensburg Library staff
- City of Ellensburg Parks and Recreation staff
- City of Ellensburg Planning Commission
- Clymer Museum
- Ellensburg Downtown Association
- Ellensburg School District Board
- Gallery One

Community Heart & Soul® is a planning model for engaging a community in shaping the future.

The Community Heart & Soul approach is founded on three basic principles: Involve Everyone, Focus on What Matters, and Play the Long Game.

The Community Heart & Soul process provided a framework for how to collect input from residents and how to use the input in the comprehensive plan.

- Kittitas County Chamber of Commerce
- Kittitas County Community Network
- Kittitas County Realtors Association
- Kittitas County Republicans
- Kittitas County Democrats
- Kittitas County Youth Services
- People for People

What Matters Most Survey

The What Matters Most survey was the first step in implementing what we learned in the Community Network Analysis, and in starting to identify our core community values. The results of the What Matters Most survey were 812 responses to the following questions:

1. What do you love (or value) about Ellensburg, and why?
2. If you could improve something about Ellensburg, what would it be, and why?
3. What is your favorite place to go in Ellensburg, and why?
4. What is your connection with Ellensburg?
5. How long have you lived in Ellensburg or other area in Kittitas County?

The survey was available in both Spanish and English and was conducted over the course of several months by attending events held throughout the community and partnering with local schools. Events included:

- Bite of the Burg
- Buskers in the Burg
- First Friday Art Walk
- Hoedown in Downtown
- Kittitas County Farmers Market
- Kittitas Valley Junior Soccer Association picture days
- Resource Fair for Hispanic Families

The City partnered with Ellensburg High School and Morgan Middle School to gain input from Ellensburg youth. The *What Matters Most* survey was incorporated as an assignment for each student to interview 5 to 10 family members or friends. Bright Beginnings (head start preschool) incorporated the *What Matters Most* survey into their fall home visits with parents or guardians of preschoolers. The survey was also marketed using social media and newspaper advertisements to direct community members to the online version of the survey on Eburg Talks, the City's online engagement tool.

Community Values Workshop

Seventy community members participated in the Community Values Workshop which was held in early 2017. City staff organized and coded all of the responses from the *What Matters Most?* survey into common themes. Participants used the common themes and responses to write community value statements for each theme. City staff used Eburg Talks to vet the community value statements, and edited the statements based on community feedback. The final draft community value statements were presented to the public at the Change Over Time Activity and on the City's webpage. The community value statements are Ellensburg's Heart & Soul and serve as the guiding principles for this Comprehensive Plan.

Change Over Time Activity

At the Change Over Time activity, 34 community members worked in groups to share their views on how each of the identified community values has changed over time in the community. They also discussed their desired condition for the future of each community value. Participants worked in small groups organized by each of the community values, and brainstormed ideas for how to achieve the desired condition for each community value. The brainstorm of ideas and public comments were used to inform the goals, policies, and programs for each relevant chapter of the comprehensive plan.

Chapter Development

Each of the draft chapters went through several stages of review and development that included applicable City staff, existing City volunteer commissioners, other stakeholders, community open houses, and online surveys for community members to provide feedback on each of the draft chapters. Each of the draft chapters was also reviewed through Planning Commission meetings and City Council study sessions. The number of meetings with City volunteer commissions was dependent on how long it took each group to share their input and reach agreement on the outcome.

Table 1 provides a summary of the City volunteer commissions and the draft chapters they assisted in developing.

Table 1. City of Ellensburg Volunteer Commissions and Comprehensive Plan Chapters

City Volunteer Commissions	Comprehensive Plan Chapter
Ellensburg Business Development Authority	Economic Development
Ellensburg Downtown Association	Economic Development
Environmental Commission	Environment
Landmarks and Design Commission	Historic Preservation
Lodging Tax Advisory Committee	Economic Development
Parks and Recreation Commission	Parks and Recreation
Planning Commission	Capital Facilities and Utilities Economic Development Environment Historic Preservation Housing Land Use Parks and Recreation Transportation
Public Transit Advisory Commission	Transportation
Utility Advisory Committee	Capital Facilities and Utilities

In addition, the land use designations found in the land use chapter were developed through input gathered at a land use mapping open house and online activity where community members shared their input on where different types of residential, commercial, and industrial uses should be located in Ellensburg and its Urban Growth Area.

The Housing chapter is based on the 2017 Ellensburg Housing Needs Assessment. The assessment included input from community stakeholders through two stakeholder workshops and a series of short interviews. The first workshop engaged developers and homebuilders active in the Ellensburg housing market. The second workshop engaged stakeholders from the public and non-profit housing sectors. Short interviews were conducted with property managers, landlords, and real estate professionals actively marketing housing for sale or lease in Ellensburg. In addition, interviews were also conducted with market rate and affordable housing developers working outside the Ellensburg market to better understand the factors that support new housing creation.

In response to the 2020 Comprehensive Plan docketing proposals to include a Diversity, Equity and Inclusion element, a Council subcommittee conducted a listening tour to understand the experiences of marginalized groups living in Ellensburg and their recommendations to help the Council better meet their needs. The groups included residents who identify as Indigenous, Black, Hispanic, Asian or Pacific Islander, LGBTQ, Muslim and other non-Christian religions, disabled, citizens over 65, and those with International backgrounds. At the conclusion of the listening tour, the subcommittee recommended potential changes to City policies, procedures, planning, and programming that will result in a more inclusive and welcoming community. City

Council will continue to work with the community through a robust and transparent engagement process for developing the new Diversity, Equity and Inclusion element, for inclusion in the Comprehensive Plan during the 2021 amendment process.

Ellensburg's Community Heart & Soul – Community Values

In the summer of 2016, the City initiated the Community Heart & Soul process to understand what matters most to our community with the goal of identifying value statements that will guide our 20-year plan and help maintain Ellensburg's quality of life. The following community value statements are the product of the 2016-17 Community Heart & Soul outreach process, as well as the 2020 Listening Tour sessions. These identified community values provide the guiding principles for this comprehensive plan.

Small town feel and sense of community is represented in our small town character and our friendly and supportive community.

- We value thoughtful growth management that maintains the small town community character, recognizes economic opportunities, and provides innovative ideas to improve our diverse neighborhoods for the benefit of current and future generations.
- We value a diverse, inclusive, and equitable community that is welcoming and supportive to everyone because it enriches our lives and enhances our individual and community well-being.

A community that **celebrates Diversity, Equity and Inclusion**, is welcoming and supportive of all residents and visitors. A community built upon the values of Diversity, Equity and Inclusion is a community that enriches each individual's life and the community's wellbeing and vitality.

- We value a community that cares for one another, so that all people feel a sense of belonging in this community.
- We value the rich diversity of our neighbors in Ellensburg — be that age, skin color, gender identity, sexual orientation, ethnicity, religion, or disability — because that is what makes us stronger.
- We value a future in which all who live in Ellensburg today, and in the future, will have access to what they need to reach their full potential so that each person may contribute fully to community well-being.
- We value working together collaboratively with individuals and community groups and recognize for us to do better for all requires constant review of our work and an honest self-examination of our actions.

The **built environment** provides the setting for community activity, ranging from buildings to streets and parks; these are the areas we live, work, and play on a day-to-day basis.

- We value the preservation of existing infrastructure through effective and efficient maintenance programs that keep public services affordable and in good condition for all users.
- We value the physical infrastructure of our existing neighborhoods and downtown core which balance old and new, and which together reflect the historic and distinct feel of Ellensburg and contribute to our unique sense of place.
- We value a transportation system that provides safe and efficient use for all users, and promotes efficient use of resources, facilitates access to goods and services throughout our region, encourages healthy lifestyle choices, and reduces traffic.
- We treasure the incorporation of parks, open space, and gathering spaces within our community where everyone can play, meet our neighbors, and enjoy safe and well maintained facilities year round that build community and promote physical and mental health.

Our **downtown and our local economy** strengthens the economic vitality of our community and supports the vibrancy of our downtown.

- We value a diverse local business community that strives to provide inclusive products and services to all residents and visitors in our city, that contributes to our distinctive character, helps build a strong community, and strengthens our economy.
- We promote sustainable, living wage jobs that enable a suitable standard of living, contribute to our local economy, and allow community members to live and work in our area.
- We support our vibrant and lively downtown that serves as a valued destination for our local community and visitors through its diverse and inclusive retail businesses, restaurants, galleries, gathering and event spaces, non-profit organizations, and housing and lodging opportunities.

The **local government and community service organizations** provide goods, services, and amenities that are available to our community.

- We value accessible, diverse and inclusive local government that facilitates active participation and local input into decision-making, utilizes equitable and inclusive processes when hiring city staff, and welcomes a diversity of candidates to run for city council.
- We value collaboration between city and other local entities that promote community health and education, and better quality outcomes by creating consistent, equitable, inclusive and efficient planning efforts.
- We value quality, attainable housing for everyone that positively impacts the stability, health, and safety of our community.

- We value access to community recycling and composting opportunities that have a positive impact on the environment by reducing contributions to the landfill.

Local arts, culture, and year round events include performing and visual arts and cultural events that shape our local identity.

- We value family-friendly, ethnic and cultural events that promote a thriving and diverse community.
- We treasure and support our performing and visual art community that brings together people of diverse cultures and contributes to our unique sense of identity as a diverse and inclusive community.

Our **natural environment and central location** in the state recognizes our community's connection to the natural environment and the geographic diversity of our location.

- We value diverse recreation opportunities and programs that are affordable, accessible, inclusive and environmentally friendly, and that encourages community health, and promotes cross-cultural community interaction.
- We celebrate and protect our diverse natural environment that surrounds our urban areas, and which increases our quality of life.
- We value our central location in the state that provides recreation, social, and economic opportunities.

We recognize **Central Washington University** as an integral part of our community.

- We welcome CWU students, faculty, and staff as valued community members who encourage a spirit of cultural diversity and intellectual energy, creating opportunities for enhanced collaboration and partnerships that strengthen our community.

COMMUNITY PROFILE

WHAT YOU WILL FIND IN THIS CHAPTER

- Brief community history and description of Ellensburg's setting.
- Community characteristics and demographic information.
- Population forecast based on information provided by Washington State Office of Financial Management and approved by Kittitas County Board of County Commissioners.
- Employment forecast based on best available information and approved by Kittitas County Board of County Commissioners.

OVERVIEW

Ellensburg lies at the heart of central Washington - 110 miles east of Seattle and 170 miles west of Spokane. Two interstate highways and various state highways provide access, in, out, and through the area into the Cascades to the west and the farmland to the east. The city's footprint is approximately 7.6 square miles, with another 7.1 square miles in the Urban Growth Area (UGA) to accommodate for future growth.

Ellensburg's natural environment, rich history, and community characteristics all contribute to make this town unique.

Natural Environment

The City of Ellensburg sits at an elevation of 1,540 feet in a fertile basin next to the Yakima River, east of the Cascade mountain range, and on the western side of the Columbia Plateau. Enormous basaltic lava flows 15 million years ago, and a series of glacial flooding events after the ice age, shaped the landscape of central and eastern Washington. Ellensburg has a climate that experiences both hot summers and cold winters. Temperature patterns vary considerably within the seasons. The Cascade Mountains to the west effectively block much of the rain from the wetter side of the state, producing a dry climate with less than an average of ten inches of rainfall per year.

There are four distinguishable seasons and a strong breeze in the spring and summer months. High summer temperatures (June through September) average about 80° Fahrenheit, and winter temperatures (December through March) average around 21° Fahrenheit. The Ellensburg basin is composed of agricultural land with a good portion within the 100-year floodplain. The surrounding topography includes snow-capped mountains, irrigated valley land, desert terrain, and two major rivers: the Yakima and the Columbia.

Ellensburg's History

The first inhabitants of Kittitas Valley were *Psch-wan-wap-pams* also known as the Kittitas band of the Yakama or Upper Yakama Tribe. The Kittitas Valley was one of the few places in Washington where both camas and kouse plants grew. For this and other reasons the valley was an important gathering place for regional tribes who congregated to harvest these foods, socialize, fish, and trade.

Though fur traders and Catholic missions had established themselves earlier, white settlers in greater numbers began moving into the Kittitas Valley in the early 1860s. By the end of the 1860s, a trading post known as Robber's Roost was established near the present corner of Third and Main Streets. In 1871 John Alden Shoudy, who in 1875 platted the town streets and named the community Ellensburgh in honor of his wife, Mary Ellen, purchased this post. In 1894 the United States Post Office requested the 'h' be dropped from the City's name.

During this platting period, The Northern Pacific Railroad donated land in hopes that the town would be a rail-based center for the area's abundant farmland, forests, and mines. Ellensburg grew slowly until plans for rail access were completed and the 1886 arrival of the Northern Pacific Railroad helped stimulate markets in cattle, dairy products, timber, wool, and hay. Community boosters hoped Ellensburg would be the new state capitol due to its central location. Such speculation even led to the construction of a mansion to house the future Governor on the corner of what is now Chestnut Street and Third Avenue.

A disastrous fire on July 4, 1889 changed the course of the community's history. The fire, fanned by Ellensburg's famous winds, destroyed most of the business district and many homes. Although the community put forth a heroic effort and rebuilt its downtown within the year, Olympia was ultimately chosen as the state capitol. The efforts to place the state capitol did help bring an important element to Ellensburg; during the State Legislature's first session, Washington State Normal School (now Central Washington University) was established. In 1891 the doors opened for 86 students. Today Central Washington University has an on campus enrollment exceeding 9,600 students, occupies more than 300 acres, and is the county's largest employer.

The timing and coordination of the downtown reconstruction also helped by producing a downtown with a unified and attractive appearance. Later Victorian architectural styles with a few early twentieth-century Neoclassic and Art Deco-styled buildings dominate downtown. The historic character and classic urban streetscapes define the community and serves as one of its strongest assets. Due in large part to community-wide efforts that began in the 1960s to restore and revitalize downtown, most of the downtown core remains as originally constructed. By 1972 many of the downtown improvements seen today were being implemented, including street lamps, paver-stone sidewalks, and mini-parks. The City and the Ellensburg Downtown Association have continued to work on improving and maintaining the vitality of downtown. Keeping the downtown area as the heart of financial, service, government and retail activities was made formal policy in the City's first comprehensive plan in 1975. The importance of Ellensburg's downtown has been reaffirmed in the 1995, 2006, and 2017 Comprehensive Plan update processes.

Today, the community of Ellensburg has established its position as a central, rooted, and unique community influenced by the history and future of farming, University students and faculty that represent over half of the population, families that have been here for generations, and newcomers that have all chosen to call Ellensburg home. Community members consider Ellensburg a quiet, comfortable, safe, and family-oriented city (2016 What Matters Most Survey). Community members celebrate Ellensburg's year-round recreational activities, numerous downtown and University events and programs, variety of performing and visual arts, and diversity of shopping and dining opportunities.

To the world outside Kittitas County, Ellensburg is most famous for its annual Fair and Rodeo. The Ellensburg Rodeo was founded in 1922 through the combined efforts of local ranchers and cowboys, the Kittitas County Fair organization, local businesspersons, and the Yakama Native

American tribe. The Ellensburg Rodeo served as a nostalgic celebration of the frontier lifestyle, where townspeople could join ranchers, farmers, and Native Americans in an annual gathering. The Fair and Rodeo has become a way to foster business and promote Ellensburg's identity as a destination.

Community Characteristics

The following is an overview of Ellensburg's current demographics and how they have changed over time. For more detailed information on households and housing, please see the Housing chapter. For more detailed information on employment and income, please see the Economic Development chapter.

The City of Ellensburg and its UGA contain almost 50% of Kittitas County's total population. Ellensburg's population has grown substantially over the past 20 years (*Table 2*), with the highest percent increase in the decade from 1990 to 2000 (19.8%). One of the most notable trends has been an increase in the Hispanic/Latino population. In 2015 about 10.5% of Ellensburg residents identified their ethnicity/race as Hispanic or Latino, compared to 6.3% in 2000 and only 2.8% in 1990.

Attributable to the presence of Central Washington University, Ellensburg's median age has remained very young and fairly constant. CWU is a major presence in Ellensburg; during the 2015-2016 school year there were 9,656 students attending university on-campus in Ellensburg, or about half the population of Ellensburg. The University is projecting on-campus enrollment to increase to about 12,000 students over the next 10 years. This is consistent with the overall population projections for Ellensburg.

Since 1990 Ellensburg has seen a decrease in the percentage of people age 65 years and older. However, Washington State Office of Financial Management (OFM) demographers predict an increase in people age 65 years and older in Kittitas County over the next 20 years. As the center for urban services in the County, Ellensburg should expect this population to increase during this planning period.

Table 2. Demographic Trends in Ellensburg

Ellensburg	2015	2010	2000	1990
Total Population	**18,637**	**18,174**	**15,414**	**12,361**
Median age	23.9	23.5	23.6	-
Persons 65 years and older (%)	9.2%	8.9%	9.4%	10.9%
Persons under 18 years old (%)	14.1%	14.2%%	15.8%	15.8%
Hispanic/Latino (%)	10.5%	9.7%	6.3%	2.8%
Average household size	2.22	2.16	2.12	2.10
Family households (%)	36.8%	39.6%	42.4%	44.5%
Nonfamily households (%)	63.2%	60.4%	57.6%	55.5%
Owner Occupied (%)	27.0%	31.0%	32.1%	34.7%
Renter Occupied (%)	62.7%	61.8%	60.7%	60.7%

Households

Household composition has shifted since 1990 with a continuous decrease in both the percentage of family households and owner occupied houses. It is predictable that these characteristics would change together because family households are more likely than non-family households to be homeowners.

The Office of Financial Management estimates there are 7,823 households in the City of Ellensburg, and another 660 in the UGA. The majority of family households are small families (two to four members) with no elderly members. Estimates indicate that nearly 50% of households in Ellensburg are CWU students living off campus, either living alone or sharing apartments or single family homes with other students. Over two thirds of households in Ellensburg have only one or two members. Much of this difference is likely attributed to the large university student population in Ellensburg.

Income and employment

In 2014, the median income for households residing inside the City of Ellensburg was $28,341. This number reflects the large number of households that consist of university students living on little or no personal income. Among family households, the median income in Ellensburg is $60,650.

In Ellensburg owner-occupied households are far more likely to be in a higher income category, with 69% earning more than Area Median Income (AMI); only 14% of renter households earn more than AMI. With the exception of student households, the largest numbers of very low, low, and moderate income households are elderly people living alone, and small families.

Between 2000 and 2014, Kittitas County had an annual employment growth rate of 1.4%; this includes the 2008 economic recession. In Ellensburg and its UGA, employment growth has been slower than countywide. Between 2013 and 2014 there was an 8% decline in the total number of workers in Ellensburg. Ellensburg has also been experiencing a slow decline in the number of Ellensburg residents who work in Kittitas County, and a steady increase in the number of Ellensburg residents who work outside Kittitas County.

Kittitas County Area Median Income (AMI): $65,600:

The Department of Housing and Urban Development (HUD) calculates Area Median Income (AMI) based on the median income for a four-person household in Kittitas County.

Growth Forecasts

As established by the GMA, OFM prepares twenty-year growth management population projections for each county planning under GMA. The OFM prepares high, medium, and low forecasts for each county, with the middle range representing what they predict as the most likely scenario. Total county forecasts must use the most recent projection provided by the OFM when counties and jurisdictions make population projections for planning purposes.

The County and five incorporated areas reviewed the OFM county-level projections through a collaborative process. The Kittitas County Conference of Governments (COG) is the body charged with leading this process. This collaborative process included a countywide analysis of population and employment growth trends, and determination of capacity for population and employment growth based on supply of vacant, partially developed, and underutilized land using available spatial and permit data and current land use regulations. For further information on the countywide studies refer to *Kittitas County Population Growth Projection Review and Analysis*, *Kittitas County Employment Projections and Allocation Scenarios*, *Kittitas County Land Capacity Analysis*, and *Kittitas County Preferred Population and Employment Projections and Allocations, 2015-2037*.

Population Forecast

In April 2017 the Board of County Commissioners approved the COG countywide population allocation based on a projected 2% average annual growth rate for 2015 through 2037. This rate is within the range provided in the 2012 OFM population projections (*Table 3**Error! Reference source not found.***) for Kittitas County. It results in a total county population forecast of 65,967 residents in 2037. Currently about 60% of Kittitas County's population resides in urban areas, and 40% reside in rural areas. The allocation recommended by COG, and approved by the Kittitas County Board of County Commissioners, is based on the assumption that 65% of the future population will reside in urban areas and that 35% will reside in rural areas of the County.

Urban areas: includes areas within city limits and areas inside a city's Urban Growth Area.

Rural areas: unincorporated areas outside of Urban Growth Areas.

The population allocated to the City of Ellensburg and its UGA takes into consideration Ellensburg's current share of the County population, as well as trends that indicate Ellensburg will continue to grow over the 20-year planning period. This comprehensive plan is designed for Ellensburg's forecasted 2037 population of 32,540. This forecast is consistent with Ellensburg and its UGA maintaining about 49% of the total County population.

Table 3. City of Ellensburg and UGA Population Allocation

Jurisdiction	2015 Population	20 year population allocation	2037 Population
Ellensburg	20,783	11,757	32,540
Total County	42,670	23,297	65,967

Employment Forecast

In April 2017 the Board of County Commissioners approved the COG-recommended countywide employment allocation based on a projected 2% average annual growth rate. The allocation adopted assumes that the current employment split between urban and rural areas will continue over the 20-year planning period. This would result in 80% of job growth locating in urban areas, and 20% locating in unincorporated rural areas. The adopted employment projection and allocation in Ellensburg, assumes that Ellensburg will maintain its current share of approximately 60% of countywide employment and will also maintain a similar ratio of jobs per household over the next 20 years.

Table 4. City of Ellensburg and UGA Employment Allocation

Jurisdiction	2015 Employment	20 year employment allocation	2037 Employment
Ellensburg	11,490	6,998	18,488
Total County	19,362	11,155	30,517

CHAPTER 1 LAND USE

WHAT YOU WILL FIND IN THIS CHAPTER

- Information about the City's expected population and employment growth.
- Description and capacity of existing and future land use designations.
- Policies that direct the City's growth strategy and land uses.
- A map of future land uses.

OVERVIEW

One of the fundamental roles of the City of Ellensburg's Comprehensive Plan is to anticipate, guide, and plan for growth. The plan is a tool to look ahead to the likely growth and ensure alignment of the City's plan for land uses, infrastructure, and services.

The Land Use chapter addresses the general pattern of land use within the City and its Urban Growth Area (UGA) and provides a framework to guide the City's overall growth and development. It ensures an appropriate mix of land uses are available to support the City's economic goals, provide an array of housing choices, and ensure that adequate infrastructure and services are available.

The Land Use goals, policies and programs help protect environmentally sensitive areas, maintain the character of established neighborhoods, and promote opportunities for healthy lifestyles while allowing the City to evolve to meet the changing needs of the community.

BACKGROUND AND CONTEXT

Core community values this chapter supports:

- Attractive residential neighborhoods and a lively and vital downtown contribute greatly to Ellensburg's high quality of life.
- Allowing for a variety of housing types will add to Ellensburg's diversity and appeal, and will help to address housing affordability.
- Encouraging sustainable practices related to both the environment and social equity will preserve a high quality of life for generations to come.
- Allowing for more neighborhood commercial development and more mixed-use areas will provide easier access to goods and services in the community.
- Encouraging entertainment and cultural uses will enrich the community and provide activities for all age groups.
- Increasing opportunities for local businesses will help supply employment for Ellensburg's residents.
- Suitable locations for industrial and institutional uses will protect the city's neighborhoods, while providing essential facilities needed by every community.

Existing Land Use Patterns

Residential

Residential land uses make up about 44% of land within the City limits and the Urban Growth Area. The 2006 Comprehensive Plan created two residential categories: mixed residential and high density residential. Mixed residential currently makes up 97% of designated residential land. Most of the high-density residential areas are located near the Central Washington University (CWU) campus and house large numbers of students residing off campus. Mixed residential is intended to provide for the development of housing at approximately four-to-12 dwelling units per acre. High density residential provides a target density of eight-to-18 units per acre. The high-density areas are located north of the CWU campus, on the north side of the Kittitas Highway, and southeast of the west Interstate-90 interchange.

PUBLIC HEALTH AND LAND USE

The intersection between health and land use planning is becoming more important in today's communities. Long term plans impact how people make choices about where to live and how to get around in their communities. The way we plan our communities can affect things like access to healthy foods, safe and accessible opportunities for physical activity, and easy access to health and social services, as well as issues such as clean air, clean water, and social equity. Our environments have a key role in helping healthy choices be the easy choices.

Commercial

Ellensburg's downtown remains the main retail and commercial center of the City and the lower Kittitas Valley. Maintaining the prominence and vitality of downtown has been an important goal for Ellensburg dating back to the City's first Comprehensive Plan in 1975. The Central Commercial land use (which includes downtown and South Water Street) makes up about 12% of land designated commercial. More recent developments on South Water Street and Mountain View Avenue have shifted some of the retail from the downtown area and currently about 43% of commercial land is located at the west and south freeway interchanges on the edge of town.

Industrial

Ellensburg's industrial sector has not seen as much growth as the retail commercial sector. Government, education, healthcare, and agriculture continue to be Ellensburg's largest employers. Activity in the agricultural sector has been relatively constant, and there has been little growth in other industrial areas. The result is that there has been relatively little industrial land development since 1995.

Ellensburg's early industrial development centered along the railroad tracks to the west of the existing central commercial area. The heavy industrial land continues to be located on a narrow strip paralleling the railroad tracks, but light industrial land has expanded along Dolarway Road to the west interchange area, and to the area around the airport located north of the University.

Public/institutional

Ellensburg has a long-standing and important institutional component. Ellensburg is home to Central Washington University, it is the County seat, and it hosts Kittitas County's central medical and hospital services. Institutions are by far the largest employers in Ellensburg. The University campus is the primary public/institutional land use and occupies approximately 380 acres and employs almost 1,400 full time staff. Other public uses are spread throughout Ellensburg and include city and county offices, Kittitas Valley Healthcare, schools, fire stations, the Kittitas County Event Center, and other public services that provide necessary services to Ellensburg and the surrounding region.

Parks and open space

Ellensburg operates a park system that encompasses more than 300 acres. Current open space land includes both publicly owned land and private property that is generally open in nature and may or may not be developed.

The following table includes estimated acreages of existing land uses within the City of Ellensburg and the Urban Growth Area.

Table 5. Inventory of Existing Uses

Current Land Use Designation	Acres	Percent
Mixed residential	3,950	43.5%
Residential high density	131	1.4%
Central commercial	206	2.3%
Industrial residential	24	0.3%
Neighborhood commercial	175	1.9%
Commercial tourist	420	4.6%
Business office park	42	0.5%
General commercial	590	6.5%
Light industrial	2,039	22.5%
Heavy industrial	95	1.0%
Public/institutional	646	7.1%
Open space	758	8.4%
Total	**9,074***	**100%**

*Differences in total acres between existing uses and future uses are due to slight difference in mapping methods. Existing land use designations were mapped to exclude road right-of-ways. Future land use designations (*Table 6*) were mapped to include road right-of-ways, which is consistent with 2017 zoning maps.

Growth projections

The Kittitas County Conference of Governments projects that between 2017 and 2037 the region will grow by over 23,000 people, and that the economy will generate more than 11,000 additional jobs. Within this regional context, Ellensburg is expected to grow by about 11,757 people and 6,998 jobs by 2037.

These local projections are based on state and regional growth forecasts and collaboration with Kittitas County's incorporated areas and the County to identify where growth should be anticipated. The projections reflect commitment from each jurisdiction to have the infrastructure and zoning in place to support anticipated growth within the 20-year planning period.

GROWTH PROJECTIONS

- Ellensburg works cooperatively with Kittitas County and other incorporated areas to establish long-range population growth targets based on state and regional forecasts.
- The City's current adopted growth targets are for 11,757 additional people 6,998 additional jobs for the 2017-2037 planning period.
- The City uses these targets to identify the needed zoning and infrastructure to accommodate this level of growth. The projections are not a commitment that the market will deliver these numbers.

Residential and employment growth capacity

Based on existing land use regulations and zoning, Ellensburg has sufficient land capacity to accommodate the projected population and employment growth. A Land Capacity Analysis conducted in 2016 showed that there are vacant commercial/industrial lands near each of the interchanges, and that capacity for developing commercial/industrial lands in the downtown area will primarily be through infill and redevelopment. In terms of residential capacity there is both vacant and partially developed land surrounding and to edges of the urban core and in the downtown area.

Future Land Use

Land use designations and policies provide a guide for the appropriate development, and redevelopment locations for residential, commercial, and industrial uses. The future land use designations (*Table 6*) are aimed at ensuring a safe, livable, and sustainable environment that will shape Ellensburg's future development within the 20-year planning cycle. The City's comprehensive plan establishes the overarching guide for decisions related to land development regulations and patterns, with this chapter functioning as a summary of the intent.

The City of Ellensburg has been using land use designation maps since the mid-1970s. Descriptions and mapping of land use designations visually depict the community's desired direction as it meets new growth challenges and changing times. The descriptions of each land use designation along with the recommended locations for land use designations help to set a broad understanding of land use patterns that enables city services and agencies, along with residents and property owners to effectively plan.

Land use designations are general in nature and serve as a guide; they do not carry the same force of law as zoning. The guiding land use designations help set up future considerations for zoning, but do not change zoning district locations or descriptions. Zoning is a private property development right that requires a separate public process for changes.

To provide a complete understanding of potential land development patterns, this chapter describes and illustrates the land use designations. Land use mapping is a visual representation of the goals, policies, and programs within this comprehensive plan. The map and the policies they represent are the general foundation for land use decisions and implementation strategies.

The land use patterns and policies discussed in this chapter apply to the Ellensburg City limits. Areas outside of the city limits and within Ellensburg's Urban Growth Area, which change from time to time with annexations, are included to inform private and public parties of the desired pattern for development as the city grows. The land use designations outside of city limits (within the UGA) are not binding in nature until lands are incorporated within the municipal boundaries. The process of looking beyond the city limits and planning for 20 years of growth within the Urban Growth Area helps to facilitate City-County coordination in land use planning and related issues, and provides a greater level of predictability to landowners and interested parties.

The Future Land Use Map (*Figure 2*) reflects desired uses and implements the land use goals and policies in this plan; it does not always represent existing uses. Decisions and implementation based on these designations should include consideration of the entire comprehensive plan and site-specific conditions.

A description as well as the intent of specific land use designations are included for each designation. The Future Land Use Map provides recommended locations for each designation. The land uses designations include four main categories: residential, mixed use, commercial, and industrial.

Residential

Residential land use designations are areas in the City where the primary activity is residential dwellings. Uses that complement residences should be incorporated into these areas, such as: parks, low-intensity home based occupations, fire stations, churches, small-scale neighborhood commercial services, schools, and other public facilities. The Future Land Use map, goals, and policies in this chapter encourage high density residential in close proximity to commercial centers to facilitate access to services and employment opportunities. All implementing zoning districts should consider the compatibility with adjacent development, natural constraints such as watercourses, and the overall goals of the Ellensburg comprehensive plan. The residential land use category includes three land use designations that support a range of housing densities to achieve the City's housing and affordability goals: Residential Neighborhood, Blended Residential Neighborhood, and Urban Neighborhood.

- RESIDENTIAL NEIGHBORHOOD

  This designation applies to areas that have traditionally accommodated single-family detached homes and generally surround the urbanized core of the community, or exist at the edge of the city in compatibility with unincorporated land. The residential neighborhood designation supports a range of residential zones with housing densities that help to achieve the City's housing diversity and affordability goals. The intent of this designation is to accommodate the many established residential neighborhoods and acknowledge the single dwelling residential building type as the primary use with the potential for accessory dwellings, townhouses, cottage housing, clustered housing, and other small-scale housing forms.

- BLENDED RESIDENTIAL NEIGHBORHOOD

  This designation applies to areas close to the core of the community, and where city services and infrastructure are readily available but the pattern of existing development is less intense than primary multi-dwelling buildings. This designation accommodates a range of housing types, and functions as a transition between neighborhoods with less density and core uses such as mixed-use areas and higher density residential and commercial areas. This designation accommodates a range of building types from small-lot single dwellings, attached or semi-attached dwellings, duplexes, and small-scale multi-dwelling developments, such as triplexes and fourplexes.

  Implementing zoning districts that accommodate lower density housing types are appropriate adjacent to existing single family residential areas and are characterized primarily by detached housing units and zero lot line projects. Implementing zoning districts that accommodate higher density housing types are more appropriate adjacent to parks and the University campus, along transit routes and principal and minor arterials, on local streets adjacent to commercial areas and served by transit routes, and near recreational activity centers, shopping centers, and entertainment areas. Higher density zones would also be appropriate adjacent to existing or planned higher density development.

- URBAN NEIGHBORHOOD

  This designation accommodates areas close to the University campus, accessible by public transportation, close to other goods and amenities, and where city services and infrastructure are readily available. This designation accommodates a wide range of housing types and allows for the development of transitional areas between lower density neighborhoods and higher density residential and commercial areas. This designation accommodates a wide range of building types, from small-lot single dwellings to large-scale multistory, multi-dwelling developments.

  Implementing zoning districts that accommodate for lower density housing are appropriate adjacent to existing single family residential areas characterized primarily by detached housing units and zero lot line projects. Implementing zoning districts that accommodate higher density housing types are more appropriate adjacent to parks and the University campus, along transit routes and principal and minor arterials, on local streets adjacent to commercial areas and served by transit routes, and near recreational activity centers, shopping centers, and entertainment areas. Higher density zones would also be appropriate adjacent to existing or planned higher density development.

Mixed-use

Mixed-use developments provide a complementary mix of land use and development types to create focal points for community activity and identity. Mixed-use areas serve as a transition from the urban center toward primarily residential neighborhoods, and as a transition between commercial or industrial areas to residential neighborhoods. Mixed-use developments should be developed in an integrated, pedestrian-friendly manner and should not be overly dominated by any single type of land use. Higher intensity employment or residential uses are encouraged in the core of the area or adjacent to major streets or intersections, or adjacent to existing or planned higher density development.

Mixing residential and commercial uses within the same building or within the same development serves both residential and commercial uses. This enables people to live near their places of employment and services and thereby reduce vehicle miles traveled. The mixed-use designations accommodate a horizontal and/or vertical mixture of retail, service, office, restaurant, entertainment, cultural, and residential uses. Mixed-use structures that *vertically* integrate uses will have housing above ground floor commercial, office, or other pedestrian-active uses. A mixed-use development that is *horizontally* integrated may have a combination of buildings that are exclusively nonresidential, exclusively residential, and vertically mixed buildings. The four mixed-use land designations are Neighborhood Mixed Use, Urban Center, Community Mixed Use, and Industrial Residential.

- NEIGHBORHOOD MIXED USE

  The purpose of this designation is to provide for a mix of residential, employment, retail, service, and other related uses at a scale that serves individual or small groupings of neighborhoods. Commercial uses typical of this designation include retail, offices, entertainment, professional services, eating and drinking establishments, live/work units, and shop front retail that serve a market at a small neighborhood scale. Implementation of this designation includes a range of housing equivalent to the Blended Residential designation. Development in this area requires lower demand on city resources (utilities are already installed) and is advantageous for development of denser affordable housing types.

- URBAN CENTER

  The purpose of this designation is to create and sustain a commercial district that caters to pedestrians and emphasizes street activity. This area addresses the concentration of downtown uses including commercial office, retail, arts, and entertainment, eating and drinking establishments, and residential uses. This is where people can live, work, and recreate within minutes of each activity. Urban streetscapes, plazas, outdoor seating, public art, and open space and park amenities appropriately designed for urban character help to keep this area a vibrant community destination. This designation is consistent with the historic downtown district and is supportive of evening and weekend activity of lively uses and services to accommodate residents, employees, and visitors to our community. This designation accommodates zoning districts that provide a mix of retail and residential uses, and an increasing amount of evening and weekend entertainment and leisure activities. This land use designation extends beyond the historic downtown core of Ellensburg to include transitional areas between downtown and the University, and between downtown and higher intensity industrial and commercial activity to the west and south of downtown.

  Implementation of this land use designation should encourage second and third floor residential, and office uses in the downtown core. It should also encourage new high-density residential or mixed use developments while providing areas of transition to adjacent areas and preservation of the downtown character.

- COMMUNITY MIXED USE

  This designation accommodates a combination of commercial and/or office activities that include a residential component within a self-contained planned development. Activities within this land use designation are the basic employment and services necessary for a vibrant community. Establishments located in this designation draw from the community as a whole for the employee and customer base. They serve the larger community as well as adjacent neighborhoods. A broad range of functions including retail, education, financial institutions, professional and personal services, offices, residences, and general service activities are typical in this designation.

Community mixed use areas should be integrated with main transportation corridors, including public transit and active transportation systems. The density of development may be higher than currently seen in most commercial areas in Ellensburg. Mixing commercial and residential uses within this designation, typically with residences on upper floors, will facilitate access to services and retail opportunities without requiring the use of an automobile. Implementation of this land use designation should include encouraging medium to high-density residential uses.

- INDUSTRIAL RESIDENTIAL

  This designation accommodates a dynamic living and working environment that supports artisanal production. Light industrial and residential uses are vertically or horizontally integrated into small-scale business park environments characterized by artist studios, design offices, and low impact facilities producing food products, garments, carpentry, or custom-made products.

  This designation accommodates mixed-use projects that create small-scale business park environments suitable for residential, very-low impact light industrial uses, artisan industrial, and supporting commercial activity. A range of housing equivalent to the Urban Neighborhood designation is appropriate for this designation.

Commercial

The commercial land use designations provide for the creation of local jobs and other local economic activity in a manner consistent with the character of the community. Commercial based uses provide employment opportunities as well as the primary retail and service opportunities. These areas provide an array of commercial uses at a range of intensities to meet the demand of current and future market conditions. The land use designations include Neighborhood Commercial, Mixed Business Park, and Regional Commercial and Services.

- NEIGHBORHOOD COMMERCIAL

  This designation accommodates employment, retail, service, and other related uses at a scale that serves individual or small groupings of neighborhoods. Commercial uses typical of this designation include retail, offices, entertainment, professional services, eating and drinking establishments, live/work units, and shop front retail that serve a market at a small neighborhood scale.

- MIXED BUSINESS PARK

  This designation accommodates a range of commercial and industrial activities typified by office uses, low impact light industrial uses, businesses that may include several uses such as manufacturing, research and development, warehousing, distribution, office, retail, customer service, or showrooms. Retail, residential, or services should be accommodated in an accessory or service role. This designation is often a transitional area between other uses and the scale and intensity of implementing zoning districts should be compatible with adjacent developments. Uses may be mixed vertically and horizontally with vertical mixed uses encouraged. Higher intensity uses are encouraged in the core of the area or adjacent to significant streets, intersections, or existing higher intensity development. This designation includes a broad spectrum of land uses, some of which can be compatible with mixed-use developments, regional commercial services, and live/work developments.

- GENERAL COMMERCIAL AND SERVICES

  Ellensburg is a retail, education, health services, public administration, and outdoor recreation hub, and provides opportunities for these activities at a regional scale. This designation accommodates uses with large land requirements, which may involve outdoor storage of merchandise; uses which are automobile or regional-retail related; uses that provide support service to business or industry; and uses that support highway travel. It is necessary that these types of facilities be located in proximity to major transportation routes. Since uses in this designation are large prominent facilities within the community and region, design guidelines ensure compatibility with the remainder of the community. Mixing of uses that encourages broad activity levels is encouraged. Any development within this designation should have a well-integrated transportation network that accommodates different modes of transportation and provides ready access within and to adjacent development.

  Residential space should not be a primary function and should only be included as a use in combination with other compatible commercial uses if supportive residential services and spaces are within ¼ mile of the proposed development. Supportive residential uses include public parks or open space, grocery, school, and transit.

Industrial

The industrial land use designations provide for the creation of local jobs and other local economic activity in a manner consistent with the character of the community. Industrial land typically includes businesses that manufacture, process, or otherwise generate products sold to commercial businesses later. Industrial land needs good transportation access, preferably with access to truck routes, for transport of products as well as for workers. These areas provide a range of intensities including heavy and light industrial uses.

- LIGHT INDUSTRIAL

  This designation typically accommodates activities that include light manufacturing, research and development, office, technology centers, light assembly, storage, and support services to industry. Light industry includes a broad spectrum of land uses, some of which can be compatible with mixed-use developments, regional commercial services, and live/work developments.

- HEAVY INDUSTRIAL

  This designation generally accommodates industries that process large volumes of raw materials into refined products and/or have significant external impacts. The uses in these areas tend to generate truck traffic and should have access to major transportation networks. Typically, these areas would not be compatible with residential uses.

Other land use designations

- PUBLIC/INSTITUTIONAL

  This designation accommodates a variety of activities. Schools are a dominant use including Central Washington University. Other typical uses are libraries, fire stations, Kittitas Valley Event Center, and publicly operated facilities and utilities. A significant portion of Ellensburg's employment occurs within this category.

- PARKS AND OPEN SPACE

  All publicly owned recreation lands, including parks, are included within this category, as well as certain private lands. These areas are generally open in character and may or may not be developed.

- OPEN SPACE

  This designation is for land that is currently open space but is either private or non-city owned and may or may not be developed and is not publicly accessible.

The following table includes estimated acreages of proposed future land use designations within the City of Ellensburg and the Urban Growth Area.

Table 6. Future Land Use Designations

Future Land Use Designation	Acres	Percent
Residential Neighborhood	1,704	18.4%
Blended Residential Neighborhood	930	10.1%
Urban Neighborhood	939	10.1%
Neighborhood Mixed Use	100	1.1%
Urban Center	208	2.2%
Community Mixed Use	583	6.3%
Industrial Residential	139	1.5%
Neighborhood Commercial	100	1.1%
Mixed Business Park	206	2.2%
General Commercial and Services	406	4.4%
Light Industrial	1,960	21.2%
Heavy Industrial	235	2.5%
Public/Institutional	659	7.1%
Parks and Open Space	631	6.8%
Open space (private/non-city owned)	455	4.9%
Total	**9,400***	**100%**

*Differences in total acres between existing uses (*Table 5. Inventory of Existing UsesTable 5*) and future uses are due to slight difference in mapping methods. Existing land use designations were mapped to exclude road right-of-ways. Future land use designations were mapped to include road right-of-ways, which is consistent with 2017 zoning maps.

Since the names and descriptions of the land use designations have changed it is useful to compare the broad categories of residential, mixed-use, commercial, industrial, public/institutional, and open space. See *Figure 1* for a comparison of the current land use designations with those proposed in this comprehensive plan update.

Figure 1. Comparison of Current and Future Land Use Designations

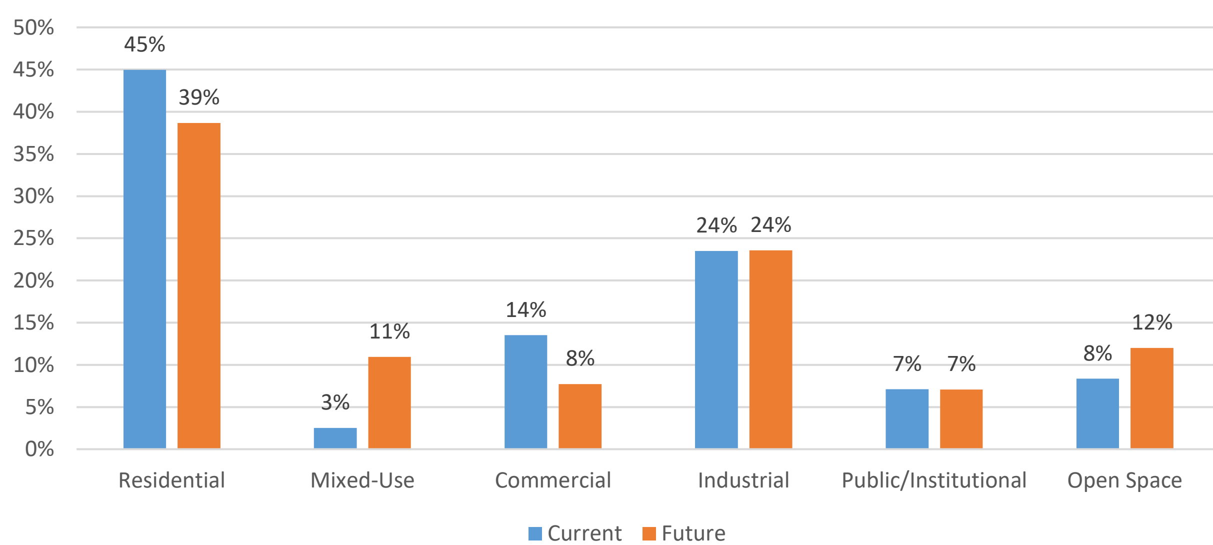


Figure 2. Future Land Use Map

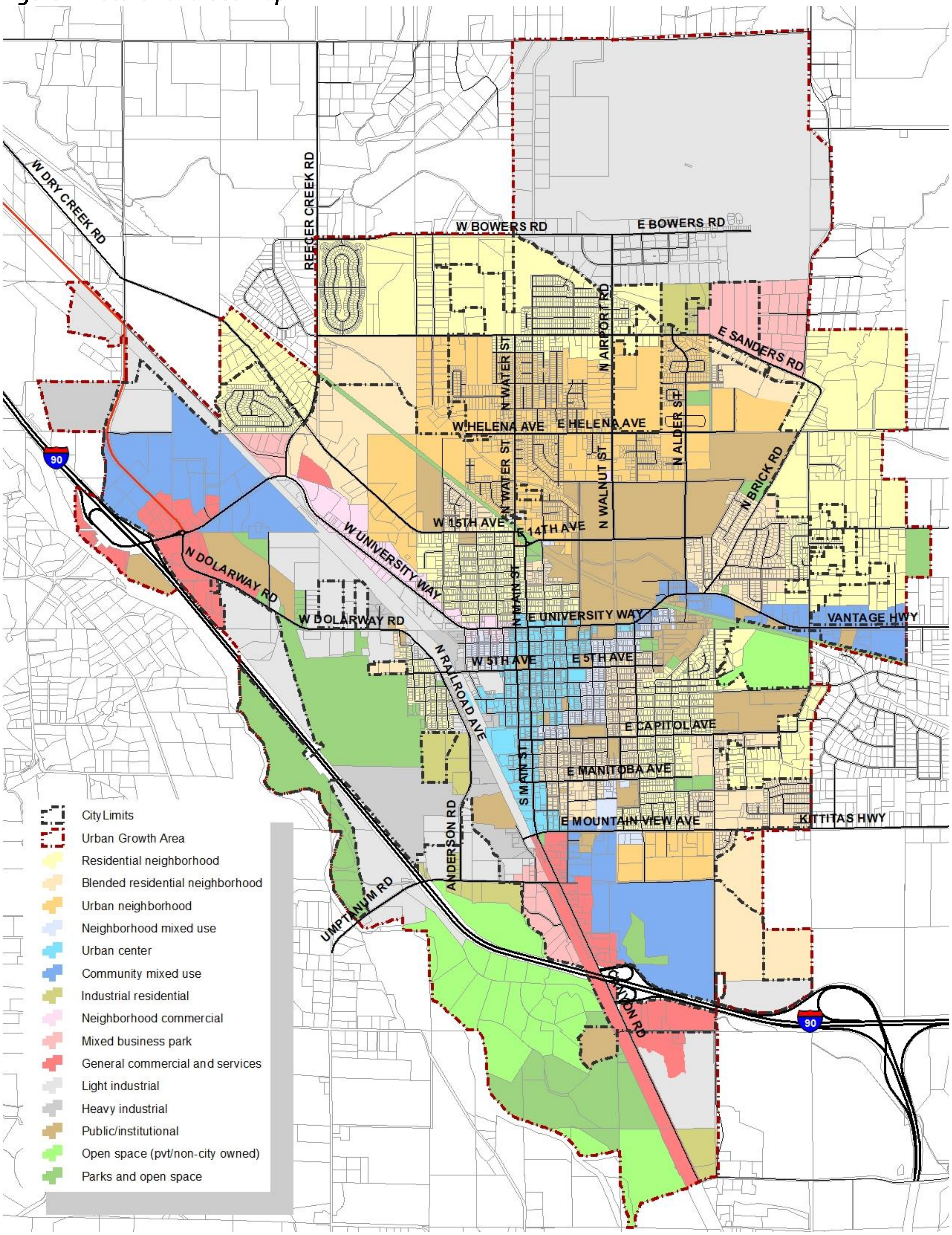


Table 7. Future Land Use- Zoning Conversion Table	
Future Land Use	**Zoning Options**
Residential Neighborhood	Residential Suburban (R-S)
	Residential Low (R-L)
	Residential Medium (R-M)
	Residential High (R-H)
	Residential Office (R-O)
	Commercial Neighborhood (C-N)
Blended Residential Neighborhood	Residential Low (R-L)
	Residential Medium (R-M)
	Residential High (R-H)
	Commercial Neighborhood (C-N)
Urban Neighborhood	Residential High (R-H)
	Residential Office (R-O)
	Commercial Neighborhood (C-N)
Neighborhood Mixed Use	Residential Medium (R-M)
	Residential High (R-H)
	Residential Office (R-O)
	Commercial Neighborhood (C-N)
Community Mixed Use	Residential Medium (R-M)
	Residential High (R-H)
	Residential Office (R-O)
	Neighborhood Center (NCMU)
	Regional Center Mixed Use (RCMU)
	Commercial Highway (C-H)
Neighborhood Commercial	Commercial Neighborhood (C-N)
	Residential Office (R-O)
Mixed Busines Park	Industrial Light (I-L)
	Commercial Highway (C-H)
	Regional Center Mixed Use (RCMU)
Urban Center	Central Commercial (C-C)
	Central Commercial II (C-CII)
General Commercial and Services	Commercial Highway (C-H)
Light Industrial	Industrial Light (I-L)
Heavy Industrial	Industrial Heavy (I-H)
Industrial Residential	Industrial Light (I-L)
Public Institutional	Public Reserve (P-R)
Open Space (Private)	Public Reserve (P-R)
Parks and Open Space (Public)	Public Reserve (P-R)

GOALS, POLICIES, AND PROGRAMS

This chapter contains goals, policies, and programs necessary to support the City's responsibility for managing land uses and to implement regulations, guidelines, and programs. The Land Use policies contained in this chapter, along with the future land use map (*Figure 2*), identify the intensity of development and density recommended for each area of the city. These designations help to achieve the City's goals by providing for sustainable growth that encourages housing choice; locates population centers adjacent to transit and services; provides areas with the city to grow businesses, services, jobs, and entertainment; respects existing neighborhoods; provides for appropriate transitions between uses with differing intensities; safeguards the environment; and maintains Ellensburg's sense of community.

Goal LU-1: Encourage development that creates a variety of housing, shopping, entertainment, recreation, gathering spaces, employment, and services that are accessible to neighborhoods.

Policy A **Encourage infill development and increased residential density in and around the downtown area.**

Program 1 Review and revise the residential density bonus program to promote infill development in and around the downtown area.

Policy B **Integrate new development with consideration to design and scale that complements existing neighborhoods and provides effective transitions between different uses and intensities.**

Program 1 Incorporate Planned Unit Developments into the City's land development code.

Program 2 Encourage new neighborhood commercial uses in residential areas with particular attention to establishing pedestrian-oriented neighborhoods and regulating offsite impacts to adjoining residential areas.

Program 3 Allow healthy food purveyors, such as grocery stores, farmers markets, and community food gardens, in proximity to residential uses and transit facilities.

Program 4 Recognize the place making value of arts and cultural facilities and work to site them throughout the City as a means to enhance neighborhoods.

Program 5 Regularly review and update the City's zoning regulations, design standards, and review process as needed to allow design flexibility and creativity, address emerging issues, and foster compatibility of development with the character of surrounding areas.

Policy C **Support development of compact, livable, and walkable mixed use centers.**

Program 1 Support downtown's development with the mix of uses, amenities, and infrastructure that maintain it as a cultural, retail, and social destination.

Program 2 Assess the design and scale of commercial uses and other higher density uses when located in mixed use and predominantly residential areas.

Goal LU-2: Establish land use patterns that promote walking, biking, and using transit to access goods, services, education, employment, and recreation.

Policy A **Enhance the character, quality, and function of existing residential neighborhoods while accommodating anticipated growth.**

Program 1 Encourage and promote rezoning requests that will allow for and permit the mixing of residential and commercial uses.

Program 2 Encourage compact form for urban development, particularly in newly developed areas and where infill is possible.

Program 3 Encourage large commercial or residential projects to include transit stop improvements when appropriate.

Program 4 Review parking requirements and costs and consider including regulatory provisions to reduce parking standards for those uses located within a quarter mile of public transit, or serving a population characterized by low rates of car ownership.

Program 5 Prepare corridor plans for Canyon Road, University Way, and Dolarway Road to ensure land use designations along them are consistent with overall development strategies.

Policy B **Adopt and maintain policies, codes, and land use patterns that promote walking and biking in order to increase public health.**

Program 1 Locate new community facilities near major transit routes and in areas convenient to pedestrians and bicyclists.

Goal LU-3: Encourage pedestrian-scale design in commercial and mixed-use areas.

Policy A **Develop programs that address on and off-street parking in the downtown area.**

Program 1 Prepare a parking study to assess parking demand and supply in the downtown area.

Policy B **Facilitate development of vacant land in and around downtown into commercial, financial, government, high density residential, and cultural uses while respecting design, scale, and uses of surrounding neighborhoods.**

Program 1 Provide historic renovation training to contractors/developers interested in developing or renovating upper-story buildings.

Program 2 Encourage development of second floor housing and/or professional offices in the downtown area.

Program 3 Seek grant opportunities and partnerships to facilitate elevator placement in downtown buildings to foster ADA accessibility.

Goal LU-4: Support downtown's development as an economic, tourist, and retail destination.

Policy A **Encourage development and activity which increases automobile and pedestrian traffic in the downtown area.**

Program 1 Support and encourage a mix of businesses in downtown.

Policy B **Maintain interconnectedness and high levels of access to downtown.**

Program 1 Identify critical rights of way and important pedestrian corridors that access downtown.

Program 2 Implement a program of trails, signs, and other strategies to connect downtown with the west and south interchanges, and the CWU campus.

Program C **Protect and take advantage of Ellensburg's historic buildings, districts, objects, sites, and structures.**

Program 1 Integrate the train depot and other historically significant places into continued revitalization of downtown.

Program 2 Attract tourists to the City through regional promotion of the historic downtown.

Goal LU-5 Plan for commercial and industrial areas that serve the community, are attractive, and have long-term economic vitality.

Policy A **Provide a diversity of commercial and industrial lands to provide an array of businesses and development opportunities that serve the community.**

Program 1 Land designated or zoned industrial in the City and UGA should be reserved for industrial and appropriate accessory uses.

Program 2 Access high-traffic generating land uses from arterials whenever possible. If this is not possible, provide mitigation to address access impacts.

Program 3 Encourage the master planning of multi-building and multi-parcel developments and large institutions to emphasize aesthetics and community compatibility. Include circulation, landscaping, open space, storm drainage, utilities, and building location and design in the master plan.

Program 4 Review and regularly update the City's commercial zoning regulations, design standards, and design review process as needed to allow design flexibility and creativity, address emerging issues, and foster compatibility of development with the character of surrounding areas.

Program 5 Separate heavy industrial uses from incompatible land uses. Use transition zoning, buffers, and other techniques to protect industrial areas and nearby uses from conflicts.

Program 6 Encourage live/work units in appropriate transitional zones, including light industrial zones.

Goal LU-6 Collaborate with Kittitas County to provide coordinated services and facilities in a manner that will be best suited to geographic, economic, demographic, and other factors that influence development needs.

Policy A Adopt an interlocal agreement with Kittitas County regarding land use designations, zoning districts, and public works standards for the UGA that are consistent between the City and County.

ACTION ITEMS

Density Bonus Program

Review, revise, and publicize the density bonus program to promote infill development in and around downtown.

Design Charrettes

Conduct community design charrettes to develop gateway designs for each entryway to the City.

Interlocal Agreement with Kittitas County

Adopt an interlocal agreement with Kittitas County regarding land use designations and public works standards for the UGA that are consistent between the City and County.

Parking Study and Review of Parking Requirements

Review parking requirements and assess parking costs and consider revising parking requirements in areas within a quarter mile of transit and residential uses that are characterized by low rates of car ownership. Prepare a parking study to assess parking demand and supply in the downtown.

Planned Unit Developments

Incorporate Planned Unit Developments into the City's land development code.

Review Zoning Districts

Review and revise zoning districts, and the allowable uses within each zoning district, as necessary to permit and encourage mixing of residential and commercial uses and ensure compatible land use patterns.

Review Land Use Regulations

Review land use regulations and revise as necessary to allow neighborhood commercial uses in residential areas with particular attention to establishing pedestrian-oriented neighborhoods and regulating offsite impacts to adjoining residential areas.

POLICY CONNECTIONS

The **Transportation** chapter contains a set of policies on active modes of transportation and ways to improve street and neighborhood connectivity.

The **Housing** chapter contains a set of goals and policies that provide a framework for increasing housing supply and diversity while protecting existing neighborhoods.

The **Capital Facilities and Utilities** chapter contains goals and policies to ensure that public services and infrastructure are available to meet growth and development demands.

CHAPTER 2 HOUSING

WHAT YOU WILL FIND IN THIS CHAPTER

- Information about the need for housing in the community.
- Policies that seek to protect the quality of Ellensburg's housing inventory.
- Policies that provide a framework for increasing housing supply and diversity while protecting existing neighborhoods.
- Policies that direct the City's efforts to maintain and increase affordable housing.
- Policies that address the needs of members of the community who require housing accommodation or assistance due to disability, health, age, or other circumstance.

OVERVIEW

The following information creates the overall picture of housing availability and affordability in Ellensburg. Over the past ten years the community has seen a great deal of population growth, and with it escalating prices in both rental costs and home sale prices. Demand for housing has also increased, particularly among those with low to moderate incomes.

This chapter contains information on housing supply, condition, occupancy, and affordability. The City of Ellensburg conducted an Ellensburg Housing Needs Assessment in 2016, and the results from that study supplement the information in this chapter.

The goals, policies, and programs found at the end of this chapter identify the steps the City of Ellensburg can take in response to housing issues found within the community. These steps are intended to ensure the vitality of existing neighborhoods and homes, estimate current and future housing needs, and provide direction to implement programs that satisfy those needs.

BACKGROUND & CONTEXT

The Kittitas County Conference of Governments (COG) established growth projections for each jurisdiction in the county. This includes Ellensburg, Cle Elum, South Cle Elum, Roslyn, and Kittitas, as well as the unincorporated areas of the County. Each projection is the amount of growth expected to be accommodated during the time period from 2017-2037. Ellensburg's growth projection for this period is 11,757 additional people, or about 4,755 additional households over the next 20 years.

In order to plan for these new households, the City must identify that there is sufficient land and zoning capacity to accommodate this growth. The City must also identify strategies to show that there will be available housing and services for this projected increase in population. New housing could include traditional single-family homes, cottage housing, accessory dwelling units, duplexes, triplexes, townhomes, or apartment buildings. Planning for expected growth requires an understanding of household characteristics, demographic trends, current housing inventory, and housing market conditions.

Household Characteristics

As of 2016, 21,340 people live in the City of Ellensburg and its surrounding Urban Growth Area (UGA). This equates to 7,823 total households in the City of Ellensburg and 660 additional households in the UGA. According to data from the Washington State Office of Financial Management (OFM), 11% of the population reside in group quarters, such as college residence halls, jails, or nursing facilities, while the remainder reside in households.

Figure 3 breaks down the households inside the city by type. Family households make up about 41% of the total households in Ellensburg, with the majority (30%) being small families with no elderly members. Nearly a quarter of households are non-elderly residents living alone, and another 24% are other non-family households. It is likely that many of the households in these two categories are Central Washington University (CWU) students living alone or sharing apartments or single family

HOUSEHOLD TYPES

Family – 2 or more people living together, related by birth, death, marriage, or adoption

Small Family – families with 2-4 members (excluding elderly families)

Large Family – families with 5 or more members

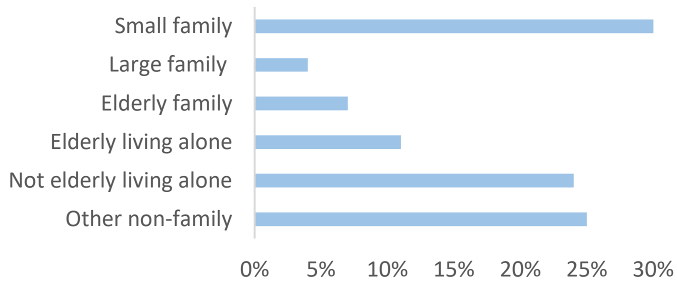
Elderly Family – 2 people, either or both 62 years or over

Elderly Living Alone – 62 years or over, living alone

Not Elderly Living Alone – 62 years or under, living alone

Other Non-Family – 2 or more non-elderly and unrelated people living together homes off campus. Over two-thirds of households in Ellensburg have only one or two members, and just 15% of households have four members or more.

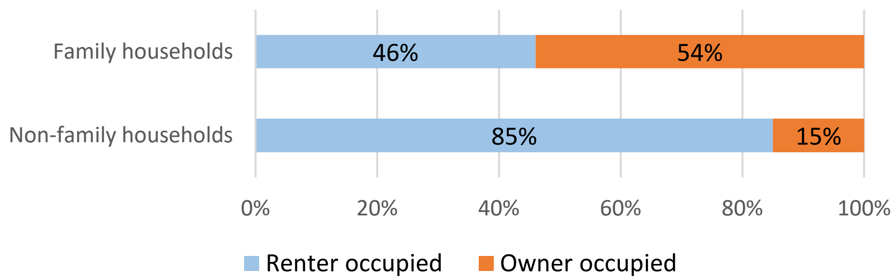
Figure 3. Households by Household Type



Source: U.S. Census, American Community Survey 5-Year Estimates, 2010-2014; BERK, 2017

About 70% of households in Ellensburg are renter-occupied. As shown in *Figure 4,* non-family households are much more likely to be renters than family households are. This is expected given that many non-family households in Ellensburg consist of students living off campus.

Figure 4. Household Tenure by Household Type



Source: U.S. Census, American Community Survey 5-Year Estimates, 2010-2014; BERK, 2017

Demographic trends

Central Washington University is a major presence in Ellensburg. There are over 9,600 full time students attending university on-campus. Approximately one third of the population of Ellensburg consists of students living off campus. The University is projecting that within the next 5 to 10 years enrollment will be capped at about 12,000 full time students attending university on-campus. The presence of CWU within the city limits significantly affects, and will continue to affect, housing types and distribution.

There are over 1,000 households in Ellensburg with a senior householder, about 43% of which are renters *(Table 7*). According to the 2012 OFM projections, approximately 14% of Kittitas County's population is 65 years and older. This population share is projected to rise to 20% by 2030 as today's baby boomers enter their 70s and 80s. As the urban center of the county, Ellensburg could expect similar increases in the population of people 65 years and older.

Table 7. Households with a Senior Householder

	Households
Total households with a senior householder	1,023
Renter-occupied	438
Owner-occupied	585

Source: U.S. Census, American Community Survey 5-Year Estimates, 2010-2014; BERK, 2017

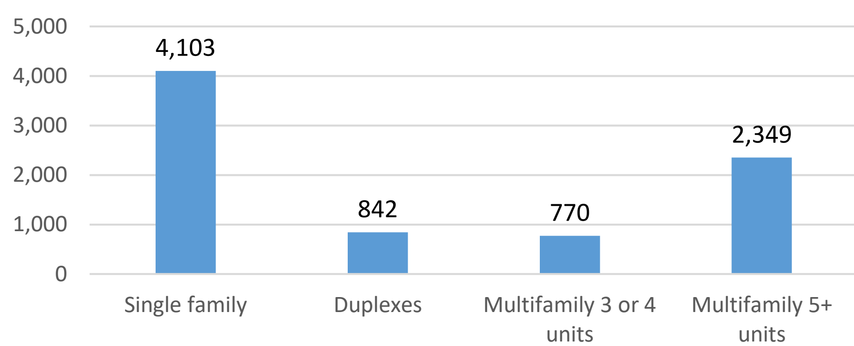
Homelessness and unhoused population

Data on homeless and unhoused population in Ellensburg is limited and sometimes inconsistent because different institutions define and count homeless populations differently. One method of tracking homelessness is through census data. At the time of the 2010 census, there were 30 homeless individuals, including 11 in emergency and transitional shelters, and 19 who were most likely unsheltered or living in vehicles. Another method of tracking is through the annual point in time (PIT) county of the homeless population, conducted every January. The 2017 PIT count identified a total of 37 homeless people, 29 sheltered (including both emergency and transitional) and 8 unsheltered. Ten of the sheltered households included minors.

Existing Housing Stock

As of 2016, there were 8,363 housing units in the City of Ellensburg. *Figure 5* breaks down all units in the City by unit type. Single family homes make up 49% of the housing stock, 47% are in multifamily structures, and less than 4% are mobile homes. Among the multifamily units, the majority are in larger buildings with five or more units.

Figure 5. Housing Units by Housing Stock

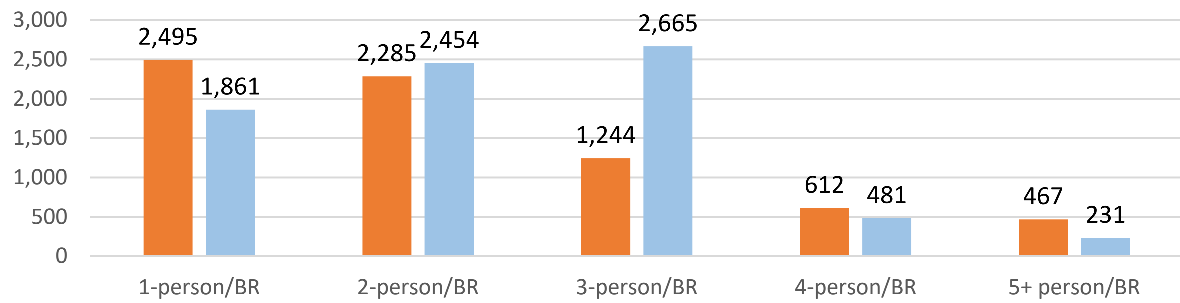


Source: OFM, 2016; BERK, 2017

Figure 6 breaks down the housing stock by the number of bedrooms and compares it to the size of households in Ellensburg. There are nearly 2,500 households with only one member, yet there are less than 1,900 studio and one-bedroom housing units combined, and much of the current supply of smaller unit apartment homes are marketed exclusively to students. While not all one person households are looking for a studio or one bedroom unit, it is likely that there are people living in larger shared houses that would prefer to live in a studio or one bedroom unit if they are available. Sharing of larger houses indicates the demand for studio and one bedroom units potentially exceeds what is indicated by looking at census data about household sizes. Smaller units may also be suitable for residents without families or small families seeking an affordable housing option.

Housing units with three or more bedrooms make up 44% of the existing housing stock while only 33% of households have three or more members. Assuming that people seeking small apartment units are instead sharing larger units due to lack of appropriate supply in the apartment market, there is potential that the number of households with three or more members is higher than actual demand.

Figure 6. Alignment between Household Sizes and Size of Units in Housing Stock



Source: U.S. Census, American Community Survey 5-Year Estimates, 2010-2014; BERK, 2017

Between 2010 and 2016 570 new housing units were built or placed in Ellensburg; 56% of the units produced were single family homes. Less than a quarter of the production during this period were multifamily residences. With nearly two thirds of the households in Ellensburg having one or two members, and 70% of households being renters, there may be greater demand for multifamily housing and smaller unit sizes than the market is currently providing.

A 2016 Washington Center for Real Estate Studies survey of apartment buildings in Kittitas County provides a snapshot of vacancy rates and rents, broken down by unit type. The most notable finding from this survey is the very low vacancy rates. For studio, one bedroom, and three bedroom apartments, apartment managers reported 0% vacancy, and overall the apartment vacancy rate was 0.8%. These low vacancy rates are far below the 5% vacancy rate which is considered to be a healthy balance between supply and demand.

HOUSING VACANCY RATE

Without housing vacancies, to change houses you would need to find someone who has the house you want and wants the house you have, and then trade.

Very low vacancy rates cause housing prices to increase as demand surpasses supply.

Very high vacancy rates may lead to decreases in civic activity, safety, and property values.

CWU student housing

Table 8 shows current operating capacity within student housing provided by CWU. Most of the capacity is in the residence halls. However not all of the current capacity is in use because many rooms originally designed as doubles have been renovated and converted to single person rooms.

Table 8. CWU Student Housing: Current Operating Capacity

	Beds
Residence halls	2,761
Apartments	892
Total	**3,653**

	Apartment units
Studios	20
1 bedroom	97
2 bedroom	281
3 bedroom	71
Total	**469**

Source: CWU, 2016; BERK, 2017

Subsidized housing

Subsidized housing is publicly assisted housing for eligible low-income families, the elderly, and persons with disabilities when available (see definitions for more information). There are a total of 804 subsidized housing units in Ellensburg. The income eligibility requirements for these units vary by building, but range between 30% of Area Median Income to 95% of Area of Median Income. With the Area Median Income for Kittitas County calculated at $65,600 in 2016, this means 30% of AMI is $19,680.

In addition to the subsidized housing units that are available in Ellensburg, an additional 30 households receive housing choice vouchers (see definition) to subsidize rental units available on the private market.

Table 9. Subsidized Housing Units by Population Served and income Eligibility

Population Served	Unit County by Eligibility				Unit Count
	Below 30% AMI	Below 50% or 60% AMI	Below 80% AMI	Below 95% AMI	
Senior/Disabled	120	174	30	0	324
Families	95	0	44	0	139
Mixed (individuals and families)	168	122	0	51	341
Total	**383**	**296**	**74**	**51**	**804**

Source: National Housing Preservation Database, 2016; HUD Low Income Tax Credit Database, 2016; Multifamily Assistance and Section 8 Contracts Database, 2016; Kittitas County Housing Authority, 2016; HopeSource, 2016; AptFinder.org, 2016; BERK, 2017

None of the units have subsidies that are expected to expire within the next six years. However, 599 units are in buildings with subsidies that will expire within the next 20 years. Of these, 224 units have private owners that may not maintain the property permanently as affordable housing.

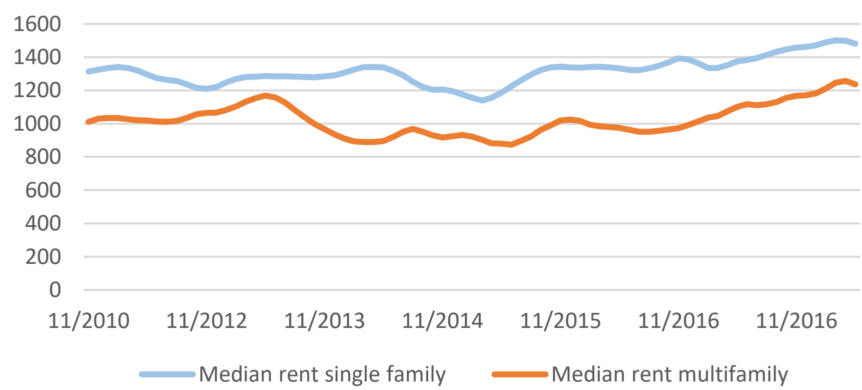
According to the Kittitas County Housing Authority, wait times for qualified applicants seeking units in their buildings is typically twelve to eighteen months. Wait times for three bedroom units have a shorter wait time (three to six months) and wait times for four bedroom units can be up to three years. The eligibility and demand for all unit types significantly exceed the number of units available. The vast majority of the subsidized housing stock in Ellensburg is available to renter households.

Kittitas County Habitat for Humanity runs an affordable home ownership program. This program provides homes to families earning 30% to 60% of Area Median Income based on need and ability to contribute sweat equity. Since 1994, 11 units have been built in the City of Ellensburg.

Housing market trends and housing affordability

Rental costs for apartments and single family homes have increased between November 2010 and September 2016. Between 2011 and 2016, single-family rents rose at an annual rate of 2.9% (18% for the 5-year period). During that same period multifamily rents rose by 1.8% annually (12% for the period). The rate of increase has been higher in recent years; between 2013 and 2016 single-family rents rose at an annual rate of 5.4% and multifamily rents rose by 5.9% annually.

Figure 7. Median Monthly Rent



Source: Zillow Rent Index 2017; BERK 2017

These increased rental prices, combined with wages that have not kept pace with inflation, and a shortage of housing units, have culminated in a shortage of affordable housing for many Ellensburg residents. The U.S. Department of Housing and Urban Development deems housing to be affordable if a household spends no more than 30% of their gross income on housing costs. Gross housing costs

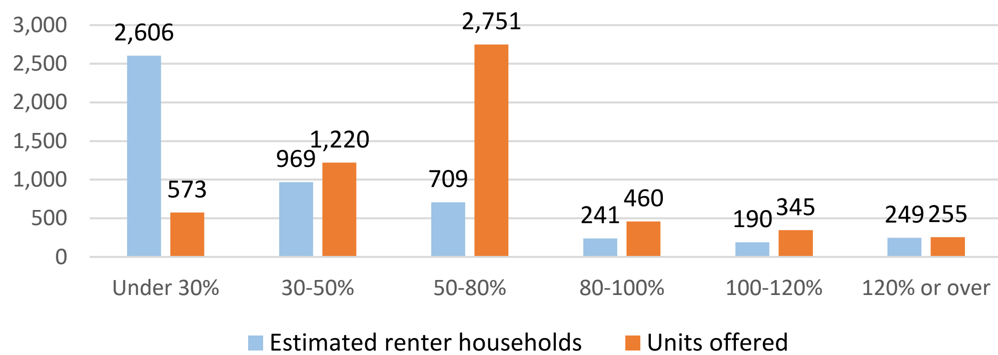
AREA MEDIAN INCOME is determined by the U.S. Department of Housing and Urban Development (HUD) using American Community Survey five-year estimates of median household income for a family of four.

Kittitas County Area Median Income: $65,600

A household is considered **COST BURDENED** if they spend more than 30% of their gross income on housing costs; more than 50% on housing cost is considered **SEVERE COST BURDEN.**

consist of rent or gross monthly owner costs plus basic utilities. During the 2010 to 2014 period, the United States Census estimates indicate there were 2,606 Ellensburg households earning below 30% area median income while only 573 units were offered at a rent affordable to these households. This means that there were 2,033 households that were unable to find rental units at prices that would be considered affordable. However, U.S. Census also estimates that there was a surplus of units affordable to all other income levels. The largest surplus was in units affordable to moderate income households (those earning 50%-80% of Area Median Income). *Figure 8Figure 8* visually compares household income level to units offered at that affordability level to highlight the areas of greatest shortage and surplus.

Figure 8. Renter Households by Income Level Compared to Units Offered by Affordability Level



Source: Zillow Rent Index 2017; BERK 2017

In order to better understand where the needs are in Ellensburg *Table 10* shows cost burdened households by household type. The household type 'Other' includes non-family households with no members 62 years and older. It is likely that a great number of these households include CWU students, and it is the best proxy for student households for which cost burden data is available. The largest number of cost burdened renter households are in this category. The other household types in *Table 10* are useful for understanding needs among households that are not likely occupied by university students. Among these household types, the greatest need is affordable housing for small families and elderly people living alone.

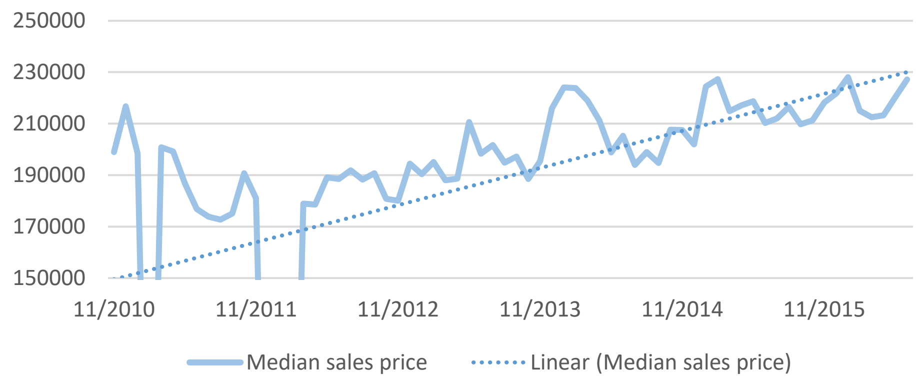
Table 10. Cost Burdened Renter Households by Household Type

Household type (renters only)	Household Income Level					Total
	Very Low (<30% AMI)	Low (30-50% AMI)	Moderate (50-80% AMI)	Lower Middle (80-100% AMI)	Above AMI	
Elderly Family	20	0	0	0	20	40
Elderly Non-Family	185	130	0	15	0	330
Large Family	0	10	0	0	0	10
Small Family	274	220	85	10	0	589
Other	1,625	545	245	35	30	2,480
Total cost burdened households	2,104	905	330	60	50	3,449
% of households	93%	87%	44%	25%	7%	70%

Source: U.S. Department of Housing and Urban Development, Consolidated Housing Affordability Strategy (based on U.S. Census American Community Survey 5-Year Estimates, 2009-2013); BERK 2017

Figure 9 shows changes in median home sale prices between November 2010 and June 2016. Between June 2011 and June 2016, the median home sales price rose by 5.2% annually. Assuming a household can afford a 20% down payment, a household requires at least $47,480 in yearly income to afford a mortgage for a home at the 2016 median selling price of $227,250. Real estate professionals reported there is significantly less housing stock on the market than ever before. Prior to 2016, the lower Kittitas County market (which includes Ellensburg) maintained listings of about 200 units at any given time. Throughout 2016, listings were consistently about half that number.

Figure 9. Median Home Sale Price



Source: Zillow, 2017; BERK 2017

Table 11 shows cost burden for all owner-occupied households by income level. About 25% of these households which are owner-occupied are cost burdened.

Table 11. Cost Burdened Owner-Occupied Household by Household Type

Household type	Household Income Level					Total
	Very Low (<30% AMI)	Low (30-50% AMI)	Moderate (50-80% AMI)	Lower Middle (80-100% AMI)	Above AMI	
Elderly Family	0	15	30	4	0	49
Elderly Non-Family	10	45	20	0	0	75
Large Family	0	0	20	0	15	35
Small Family	20	0	45	40	90	195
Other	40	0	39	40	29	148
Total cost burdened households	70	60	154	84	134	502
% of households	93%	32%	66%	63%	9%	25%

Source: U.S. Department of Housing and Urban Development, Consolidated Housing Affordability Strategy (based on U.S. Census American Community Survey 5-Year Estimates, 2009-2013); BERK 2017

Table 10 and Table 11 estimate there are about 1,323 non-student cost burdened households in Ellensburg. The majority of these households are small families (59%) and elderly people living alone (31%).

The culmination of this data indicates that there is not enough housing stock to meet the needs of the existing population in 2016. At the current rate of production, the housing stock will not meet the demand of the expected growth of 11,757 more people over the next twenty years. Furthermore, the pressures between supply and demand have exacerbated the affordable housing challenges for Ellensburg residents. With these factors in mind, the City is committed to turning the tide and supporting innovative methods to meet the needs of its residents. The City recognizes the need to encourage and promote a higher rate of housing production, and the need to successfully implement important housings goals which will aid all economic segments of the community.

The following sections will describe opportunities identified for providing new housing, as well as a description of what success would look like for Ellensburg. This is followed by goals, policies and programs intended to guide future policy decisions, as well as a section pertaining to Action Items that can be pursued in the more immediate future.

Housing Opportunities

This Housing Chapter supports innovative methods to achieve important housing goals while maintaining flexibility to fulfill different priorities in different neighborhoods. This section describes some of the innovative housing types in Ellensburg and the context in which they may work well.

- **Mixed use housing**. Ellensburg encourages creative and innovative uses on commercial and mixed use land to increase housing supply. Mixing housing and commercial uses can enhance the vitality of commercial areas by encouraging foot traffic to support neighborhood shops, and to provide eyes on the street. Over time, areas of downtown and areas near the south and west freeway interchanges could become distinct mixed use neighborhoods.
- **Downtown housing**. Second and third story residential and mixed used buildings will provide housing for people who want to live in an urban setting where there is a higher concentration of jobs and services and a variety of transportation options.
- **Accessory dwelling units**. New housing opportunities may also be provided in well-established neighborhoods. City policies currently allow for a single-family property to be designed to include an independent residence, or accessory dwelling unit, which is either attached or detached to the existing home. Accessory dwelling units are subject to specific guidelines to protect the character of the single family neighborhood. Accessory dwelling units may provide affordable housing opportunities, help those with limited income keep their homes, and extend opportunities for aging in place.
- **Universal design and aging in place**. Housing opportunities are created when housing design and choice accommodates the ordinary changes that people experience over their lives due to aging and life circumstances. Ellensburg encourages housing options, programs, and services, that support independence and choices for those who want to remain in their homes or neighborhoods regardless of age or ability.
- **Planned unit development**. Utilization of Planned Unit Developments allows for variations in site design and density from the requirements of the Land Development Code in exchange for public review and design review to ensure compatibility with the setting. Clustering of housing within the planned unit developments may be encouraged to protect critical areas.

What does success look like?

Ellensburg maintains the vitality of existing neighborhoods and employs an array of housing tools to increase housing opportunities across the city. A broader range of housing choices serve residents at various income levels and help address emerging market demand, including housing for a varied workforce, for young adult workers and students, for seniors aging in place, and for those who desire to live in walkable neighborhoods. For a housing strategy to be considered successful, the following outcomes will be visible:

- All residents have fair and equal access to healthy and safe housing choices.
- Housing production is occurring in a manner consistent with housing targets.
- All households have access to affordable housing and diverse housing options that are equitably and rationally distributed.

GOALS, POLICIES, & PROGRAMS

These housing goals, policies, and programs contain steps that the City of Ellensburg can take in response to housing issues found within the community. These steps are intended to ensure the vitality of the existing residential stock, estimate current and future housing needs, and provide direction to implement programs that satisfy those needs.

Goal H-1: Preserve, protect, and strengthen the vitality and stability of existing neighborhoods.

Policy A **Encourage development of an appropriate mix of housing choices through innovative land use and well-crafted regulations.**

Program 1 Integrate new development, with consideration to design and scale that complements existing neighborhoods, and provides effective transitions between different uses and intensities.

Program 2 Encourage infill development on vacant and underused sites.

Policy B **Establish additional logical access routes outside of the existing street system for bicycle and pedestrian traffic.**

Program 1 Identify trail easements and develop an effective maintenance strategy.

Policy C **Protect and connect residential neighborhoods so they retain identity and character and provide amenities that enhance quality of life.**

Program 1 Encourage housing opportunities in mixed residential/commercial settings throughout the city.

Program 2 Provide increased residential density and improve infrastructure along arterials and transit routes through redevelopment and retrofitting, such as sidewalks and stormwater treatment.

Program 3 Assure that site, landscaping, building, and design regulations create effective transitions between different land uses and densities.

Policy D **Promote sense of place in neighborhoods.**

Program 1 Promote high quality design that is compatible with the overall style and character of established neighborhoods.

Program 2 Support the preservation of Ellensburg's historically-significant housing through the City's historic preservation program, which maintains a list of historic properties and districts, and provides education and incentives.

Program 3 Encourage the use of long-lived, low-maintenance building materials; high-efficiency energy systems; and low impact development techniques that reduce housing life-cycle costs and provide better environmental performance.

Program 4 Foster innovative housing and mixtures of housing types that preserve natural resources and consolidate open space.

Goal H-2 Allow and encourage and accommodate a variety of housing types and densities to meet housing needs of all economic segments of the community.

Policy A Review the Land Development Code to allow for a wider variety of housing types.

Program 1 Review barriers to the development of denser housing types such as duplexes, townhomes, and accessory dwelling units.

Policy B Encourage residential development in commercial and mixed use zones, especially those within proximity to transit.

Program 1 Expand the Multifamily Tax Exemption program beyond the downtown area to encourage multifamily housing in other areas where it is needed.

Program 2 Evaluate, review, revise, and publicize the density bonus incentive program.

Program 3 Work with Central Washington University and private developers to support on-campus housing for students and in transit-served mixed residential/commercial settings throughout the city.

Policy C Consider housing cost and supply implications of proposed regulations and procedures.

Program 1 Consider reducing parking requirements for mixed-use housing developments and affordable housing developments in close proximity to jobs and transit.

Policy D Create and preserve ADA accessible and affordable housing opportunities locally and with a regional perspective.

Program 1 Promote working partnerships with public, private, non-profit groups, and developers to plan and develop a range of housing choices.

Program 2 Evaluate other housing affordability programs utilized in other communities that could be incorporated into the Land Development Code.

Program 3 Support the preservation, maintenance, and improvements of older/historic housing and assistance to low income households who want to stay in their homes.

Policy E **Identify potential properties to allow for emergency housing, emergency shelters, and permanent supportive housing**.

Program 1 Develop a conditional use provision in the permitted use table in the land development code allowing for emergency housing, shelters, and permanent supportive housing in appropriate zones.

Goal H-3 Encourage and support a variety of housing opportunities for older adults and people with disabilities.

Policy A **Collaborate with other jurisdictions, organizations, and private developers to meet special housing needs that address a broad spectrum of solutions.**

Program 1 Promote accessible and affordable housing in areas that are close to services and the rest of the community.

Program 2 Coordinate with local organizations and agencies to provide sufficient and affordable home maintenance and support services.

Program 3 Promote the use of universal design principles for new development or redevelopment housing projects.

ACTION ITEMS

Allow for Planned Unit Developments

Incorporate planned unit developments as an allowable use as appropriate into the City's land development code.

Evaluate, review and revise density bonus program

The existing density bonus program provides density bonus incentives between 5 and 150% greater density for developments that incorporate a greater variety of housing types, affordable housing, green building, trails, and historic preservation. Since to date, none of these density bonuses have been taken advantage of, it is the City's goal to create a program that provides relevant incentives and an administration and implementation plan. This will include an evaluation of other jurisdictions' incentive programs including affordable housing mandates that have achieved the sought after results as well as outreach and engagement with the local development community.

Expand the Multifamily Tax Exemption Program

Expand the Multifamily Tax Exemption program into areas outside the Central Business District that have been prioritized for increased multifamily housing.

Review and revise land development code

Review and revise the land development code as necessary to allow for a wider variety of housing types; specifically review and identify potential barriers to small-scale multifamily developments, duplex, townhome, and accessory dwelling units.

Review barriers to missing middle housing types

Ellensburg needs increased housing production, particularly among missing middle formats such as duplexes, townhomes, tiny homes, and accessory dwelling units. Outreach to housing developers and to real estate professionals indicated there is a need for this housing, but that it may be difficult to produce under current conditions.

Review parking standards

Consider reducing parking requirements for new student-oriented housing or affordable housing near jobs and transit. Parking was identified as a significant cost barrier for building new multifamily housing, and as such additional residential parking and transit data should be collected and evaluated.

POLICY CONNECTIONS

The **Land Use** chapter includes policies and land use designations that support the development of many types of housing to ensure that people who live and work in Ellensburg have adequate housing choices.

The **Transportation** chapter includes goals and policies for establishing consistency and coordination between transit service and future housing and mixed use developments.

The **Economic Development** chapter includes goals and policies to encourage mixed-use areas and residential areas in close proximity to job opportunities and amenities.


CHAPTER 3 TRANSPORTATION

WHAT YOU WILL FIND IN THIS CHAPTER:

- Condition, trends, and challenges that describe all travel modes in the existing transportation system.
- Transportation goals that establish overarching priorities and policies that lay out specific actions.
- Details on the City's level of service standards.
- Evaluation of financial conditions over the next 20 years and guidance on plan implementation.
- A future transportation vision that introduces a layered network concept that forms the foundation of this plan to accommodate all modes of travel and create a complete transportation network in Ellensburg.

OVERVIEW

Ellensburg is a city rich in history and a premier destination for outdoor adventure. Home to Central Washington University, Ellensburg is a vibrant community with a range of cultural offerings.

This Transportation chapter aims to provide a 20-year vision for Ellensburg's transportation system which respects the community's history and character, supports anticipated growth in the city and Urban Growth Area, and builds on Ellensburg's momentum as an attractive community in which to live, work, and play by supporting safe and comfortable travel by all modes through 2037.

The overall vision for Ellensburg's Transportation chapter is to provide a safe, balanced, and efficient multi-modal transportation system that is consistent with the City's overall vision and adequately serves anticipated growth.

The transportation goals serve as the foundation for this plan: safe for all users, connected and efficient, multimodal, integrate transit, fund maintenance and preservation, and facilitate active partnerships.

BACKGROUND & CONTEXT

The Transportation Element sets a framework for understanding, prioritizing, measuring, and creating a transportation network to help Ellensburg achieve its vision. This element focuses on the City's vision and the projects and programs intended to meet that vision. Technical and supporting information are available in Appendices B-E.

Ellensburg's geography plays a role in the demands put on its transportation system. The transportation network is constrained by railroad crossings, river and creek crossings, and a limited number of connections to Interstate-90.

Ellensburg sits at the crossroads of Interstate-90 and Interstate-82, two important connections across the state, as well as into Oregon and Idaho. This brings travelers from all regions to Ellensburg looking for a variety of activities, including patronizing the highway-oriented services along Canyon Road, outdoor adventures, and downtown events such as the monthly art walk.

Interstate-90 is a major freight corridor for trucks, and Ellensburg sits on a rail corridor that moves more than five million tons of goods each year. This is an important aspect of Ellensburg's economic vitality, but it also poses transportation challenges.

The City must coordinate its transportation planning with a variety of jurisdictions and agencies, including Kittitas County, Central Washington University, and the State of Washington.

ROLE OF THE TRANSPORTATION CHAPTER

The Transportation chapter provides a framework that outlines the goals, policies, and action items necessary to implement the City's vision of future mobility in and throughout the City of Ellensburg. The Transportation Element also describes the financial environment for transportation investments out to 2037.

In essence, the Transportation chapter informs the development of the Capital Improvement Program by identifying the types of projects the City should undertake to support future travel trends. The chapter also evaluates how these projects coincide with the community's values and financial resources.

OTHER PLANS

As part of this planning process, several local, regional, and state plans and documents that influence transportation planning in the City of Ellensburg were reviewed. This section summarizes some of the key regional plans that were examined.

Kittitas County Comprehensive Plan

The City of Ellensburg consulted with Kittitas County as part of their Comprehensive Plan update, and the two entities will continue to work together on transportation projects and road standards, especially in Urban Growth Areas.

Ellensburg Nonmotorized Transportation Plan

The Ellensburg Nonmotorized Transportation Plan (NMTP) 2008, prepared by the City of Ellensburg, lays out the long term goals of the community for nonmotorized transportation.

The Plan identifies 11 goals for transportation in the region:

1. Plan a coordinated, continuous network of nonmotorized transportation facilities that effectively provide access to local and regional destinations.
2. Create a comprehensive system of multi-use off-road trails using alignments along public road rights-of-way, greenway belts, and open space areas, as well as cooperating private properties where appropriate.
3. Create a comprehensive system of marked, on-road bicycle routes for commuter, recreational, and touring enthusiasts using scenic, collector, and local road rights-of-way and alignments through and around Ellensburg.
4. Design a safe, attractive, accessible, and interconnected pedestrian environment.
5. Establish classification and design standards that facilitate safe and pleasant nonmotorized travel.
6. Prioritize nonmotorized transportation projects and identify funding sources for high priority projects.
7. Develop a system for maintenance of nonmotorized facilities.
8. Establish requirements for new developments to include facilities supporting nonmotorized transportation.
9. Promote safe nonmotorized transportation through education and law enforcement.
10. Increase the share of transportation that is nonmotorized through programs that encourage walking and bicycling in lieu of driving.
11. Coordinate implementation of this plan among city departments, county and other government agencies, businesses, and residents.

This plan was reviewed and key projects are included in the 20 year project list for this Transportation chapter.

Central Washington University Campus Master Plan

Central Washington University's Campus Master Plan guides their 10 year vision for student growth and capital projects. The university is a driving force in the community and changes to campus affect transportation in the whole region. Their current plan was updated in 2013 and provides insight into projected enrollment and changes to their built environment.

CWU did an in-depth parking analysis for their Campus Master Plan. This identifies key areas that are being over or underutilized and that may affect the surrounding neighborhoods. It also emphasizes the need for nonmotorized and transit connections to better serve the campus population.

Ellensburg Transit Feasibility Study

Published in 2016, the City of Ellensburg commissioned a Transit Feasibility Study to assess the options for a formal transit system in Ellensburg.

The Transit Feasibility Study found that there is strong support for transit but mixed opinions on how to fund the new system. It identified potential revenue sources as well as benefits for related projects such as the Nonmotorized Transportation Plan. It outlined gaps in service, new service lines, and capital expenditures that would be needed to make public transit a reality in Ellensburg.

In 2016, city voters approved of a sales tax measure with funds earmarked for transit. As of 2017, the City transitioned transit service in Ellensburg from a community services organization to the City with operations contracted out. Ellensburg is actively considering ways to enhance the service.

Kittitas Valley Event Center Master Plan

The Kittitas Valley Event Center is home to the annual County Fair and Rodeo. It sits on 21 acres in the center of Ellensburg and is jointly owned by Kittitas County and the Ellensburg Rodeo Association. As the number of attendees continues to grow each year it creates challenges for the transportation system. The Master Plan identifies multiple goals and objectives that will impact transportation and land use in the area, and includes the following:

- Update and increase the capacity of Fair and Rodeo facilities to meet current and growing attendance and user needs.
- Improve the north parking lots to increase capacity, provide direct, safe, and convenient access from University Way/Vantage Highway, and improve aesthetics.

Interstate-90 Snoqualmie Pass East Project

The Federal Highway Administration (FHWA) and WSDOT are making improvements to a 15-mile section of Interstate-90 east of Snoqualmie Pass. The corridor project will widen the freeway, build and replace bridges, minimize closures due to avalanches and rockslides, and address wildlife connectivity. Phase 1 addresses the first five miles of the corridor and will be completed in 2018. Phase 2 improves the next two miles and will be completed in 2019, and funding has been secured for the remaining eight-mile section. Completion of the project will result in a six-lane freeway with less avalanche closures, increased safety, and new pavement. The improved corridor will affect traffic coming to and from Ellensburg along Interstate-90.

DOWNTOWN PARKING

Ellensburg's on-street parking supply is currently available on a first-come, first-served basis, with time restrictions in some locations. Expected new growth in the downtown area will increase the demand for parking as this attracts additional employees, visitors, and retail shoppers.

Anticipated development and enrollment growth at CWU may also necessitate more active parking management in the future as demand for parking increases.

Monitoring parking use downtown and around CWU can help manage parking demand.

The City will be conducting a downtown parking study that will include management and zoning code strategies. These strategies will seek to maximize the study area's current parking resources, balance the needs of all users, and emphasize cost effective approaches.

Management strategies will consider elements such as:

- Parking regulations
- Optimization of existing and additional parking supply
- Shared parking agreements
- Advanced parking management technologies
- Communication and wayfinding strategies
- Operational and structural changes

Potential areas of focus for zoning code strategies include:

- Minimum and maximum parking requirements
- Mixed-use or shared parking requirements
- In-lieu parking fee strategies

CONDITIONS AND TRENDS

This chapter describes how people use Ellensburg's transportation network today, as well as how that may change over the next 20 years as the region grows. The way people travel is greatly influenced by the built environment, which includes land use and travel corridors, as well as the key destinations where people live, work, shop, and play. This chapter also describes trends in how people are traveling based on anticipated development patterns and travel mode data.

Land Uses and Key Destinations

The places where people live, work, and play are impacted by how a city and surrounding communities guide where development occurs. The Land Use chapter of this Comprehensive Plan provides the guidance mentioned here. The City of Ellensburg's zoning map guides the types of uses that are allowed in specific areas of the city. This zoning map leads to clustering of like uses, for example shopping and other commercial destinations in downtown and along major roadway corridors, with other areas of the city limited to primarily residential development. Changes to zoning can affect not only the land use, but also use of the surrounding transportation network. The 2017 zoning map for Ellensburg is shown in *Figure 10*. Key destinations in Ellensburg are mapped in *Figure 11* and described below.

The main commercial areas in Ellensburg are the Central Commercial zones, the Commercial Highway zones, and the Commercial Tourist zones. The Central Commercial zone is generally comprised of older buildings in the historic downtown core. Outside of the Central Commercial zone, areas of commercial development are largely auto-oriented with larger buildings and ample off-street parking lots. The Central Commercial II zone includes newer developments, like the Fred Meyer shopping center.

Newer developments are also located in pockets of Commercial Highway zones, mostly centered on Canyon Road near I-90, West University Way, Dolarway Road, and Vantage Highway. Tourist services such as restaurants, coffee shops, lodging, and gas stations are clustered in the Commercial Tourist zones around the two freeway interchanges in Ellensburg.

It is important to consider that areas of commercial, industrial, and dense residential land use tend to have more concentrated trips and can be supportive of alternative modes of travel such as transit, whereas areas of low density residential use tend to have dispersed trip patterns more conducive to trips made by personal vehicle.

Central Washington University

Central Washington University (CWU) is a major destination and sustaining economic driver in Ellensburg. The 380-acre campus is located northeast of historic downtown Ellensburg. The University has over 9,600 students enrolled on campus, of which over 3,000 live on campus. The campus has 16 residence halls and four apartment complexes. In addition to students, there are about 1,400 full-time faculty and staff members. The University has plans for continued growth in enrollment and campus facilities, particularly on the relatively undeveloped areas on the north end of campus. Growth at CWU was considered in future conditions analysis.

The majority of students, faculty and staff access campus via car. In the 2010-2011 academic year (the most recent available data) 5,462 parking permits were sold, including 3,791 student permits. At this time, enrollment was 8,400 students. Most parking for campus is located in the lots shown in *Figure 12*, but many park on-street along roadways bordering campus where parking is not restricted. The large concentration of students, faculty, and staff leads to university-specific transportation issues, such as clustering of arrivals and departures around class schedules, parking availability and pricing concerns, and how to accommodate students without access to personal vehicles.

Figure 10. 2017 Zoning Map

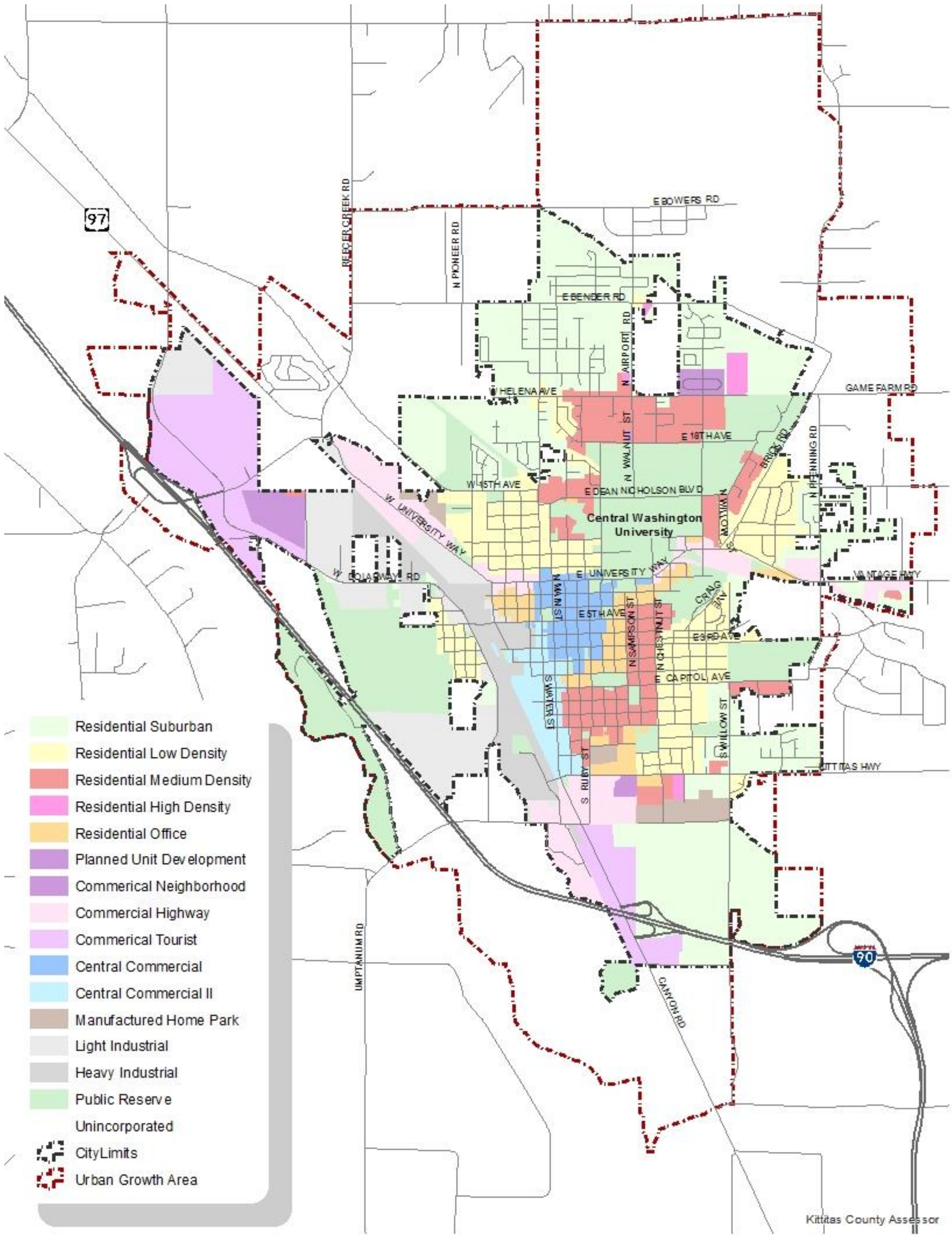
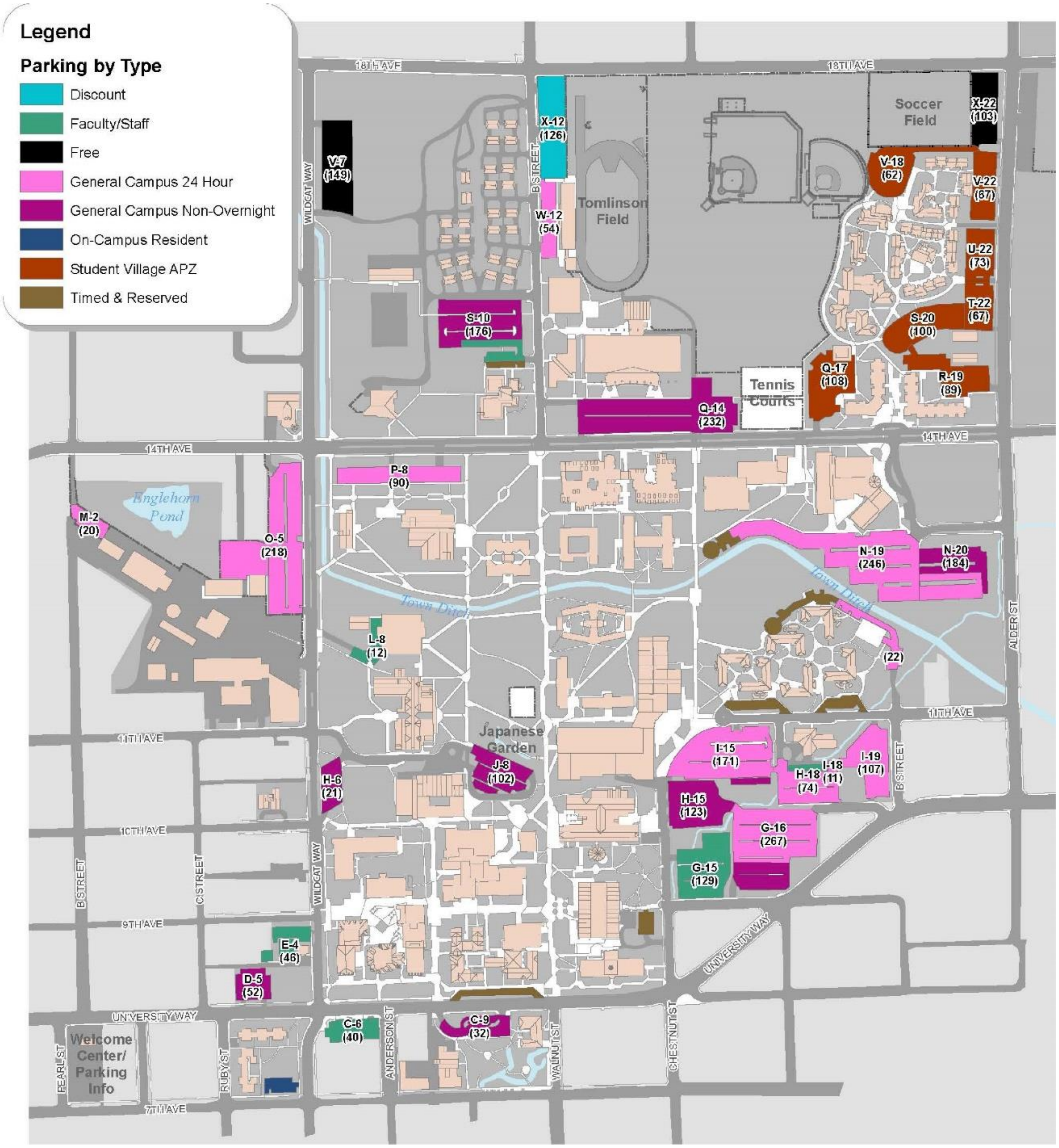


Figure 11. Key Destinations

*CWU is a key destination with many access points, See *Figure 12* for CWU parking lots

Figure 12. CWU Parking Lots



Schools

The Ellensburg School District serves almost 3,300 students (as of May 2016) and operates five K-12 schools that serve the community:

- Valley View Elementary
- Mount Stuart Elementary
- Lincoln Elementary
- Morgan Middle School
- Ellensburg High School

In addition to these public schools, Ellensburg Christian School is a private Kindergarten through Eighth grade school in the City. There are also several preschools and daycares throughout Ellensburg.

Transportation networks surrounding schools can become congested at start and end times each day. Students can arrive at school via walking, biking, being dropped off, driving a personal vehicle for older students, or via school bus. The combination of the various modes during a compressed timeframe can lead to safety concerns.

The City and school district work together to provide Safe Routes to School (SRTS) through engineering, and education. The goals of the program are to reduce injury and increase activity levels in children. Ellensburg has been successful in obtaining an SRTS grant to provide pedestrian improvements on Capitol Avenue adjacent to Lincoln Elementary School. Curb extensions were added to shorten crosswalk distance, increase pedestrian visibility, and prevent cars from parking in the crosswalk.

Parks and Recreation Areas

The City's park system includes 18 parks and five special use areas. These include athletic fields, walking trails, ponds, picnic shelters, playgrounds, a boat launch, a pool, a skate park, a youth center, access to the Yakima River, and more. Parks attract active transportation users such as walkers, bikers, and skateboarders. They also attract younger users, so safety in the transportation network surrounding parks is important.

Hospital

Kittitas Valley Healthcare Hospital serves Ellensburg and the surrounding areas. The hospital is a 25-bed inpatient facility, although outpatients make up 85 percent of the total usage. The hospital employs approximately 600 people in addition to other medical clinics on the same campus. The hospital is working on a new campus master plan that will potentially expand the footprint of the campus. The hospital currently has issues with parking availability during busier times and requires easy access for ambulances and other emergency medical needs.

Kittitas Valley Event Center

The Kittitas Valley Event Center is located in Central Ellensburg approximately bounded by East 8^{th} Avenue (north), Poplar Street (west), East 5^{th} Avenue (south), and Reed Park (east). The Event Center is a major draw on Labor Day weekend coinciding with the Kittitas County Fair and Rodeo, but is used throughout the year providing service to community organizations, trade shows, expositions, equestrian and livestock events, and other special events.

Retirement Communities

Ellensburg has a number of retirement communities, mostly located south of Mountain View Avenue. The retirement communities include Briarwood Commons Apartments, Pacifica Senior Living, Hearthstone Cottage, Meadows Place, Mountain View Meadows, and Rosewood Adult Living. Retirement communities often provide transportation services for those unable to drive, although some residents continue to drive. ADA accessible pedestrian infrastructure surrounding retirement communities should be in place for those that wish to walk.

Transportation Network Overview

Ellensburg's transportation network accommodates many modes of travel, including walking, bicycling, public transit, freight transport, and driving. Vehicular travel is the primary choice for most travelers in and around Ellensburg. City streets form the foundation of the transportation framework with roadways shaping how residents and visitors experience Ellensburg. The main travel corridors in Ellensburg are roadways with sidewalks. In addition, there are some off road trails, such as the Iron Horse Trail.

Auto and Freight Network Overview

The majority of Ellensburg is laid out on a grid system that is nominally oriented North-South and East-West. However, some newer areas of the city are not laid out on a grid and lack connectivity due to cul-de-sacs, dead ends, and other missing links.

Ellensburg's roadways are classified into principal and minor arterials, collectors, and local streets, as shown in *Figure 13* and *Table 12*. Examples of each roadway type are described in *Table 12*.

In recent years, grants have funded several safety and roadway improvement enhancements to Ellensburg's transportation network. These include updating all 21 of Ellensburg's traffic signals with new controllers, road widening and street improvements on Mountain View Avenue and Dolarway Road, widening a small section of 3^{rd} Avenue to provide parking and a middle turn lane as well as extending the road to eliminate a dead end and to provide a more complete collector road system, signalization of the intersection of Vantage Highway and Pfenning Road, LED street light illumination replacement, and asphalt overlay grants for projects that also improved ADA accessibility.

Table 12. Classification of Roadways

Roadway Type	Description / Purpose	Example	Photo
Interstate	Interstates primarily serve long distance travel between cities and carry high volumes. They provide only limited access via grade separation and access ramps.	**I-90**	
Principal Arterial	Principal arterials tend to carry the highest non-interstate volumes. They can potentially serve regional trips and connect Ellensburg with the rest of the region.	**University Way** **Canyon Road**	
Minor Arterial	Minor arterials are designed for higher volumes, but tend not to be major regional travel ways. Minor arterial streets provide inter-neighborhood connections.	**Dolarway Road** **5th Avenue**	
Collectors	Collectors distribute trips between local streets and arterials and serve as transition roadways to or from commercial and residential areas. Collectors have lower volumes than arterials, and must balance the needs of all modes.	**3rd Avenue** **Ruby Street**	
Local Streets	Local streets are the lowest functional classification, providing circulation and access within residential neighborhoods.	**Maple Street** **Pine Street**	

Figure 13. Roadway Functional Classifications

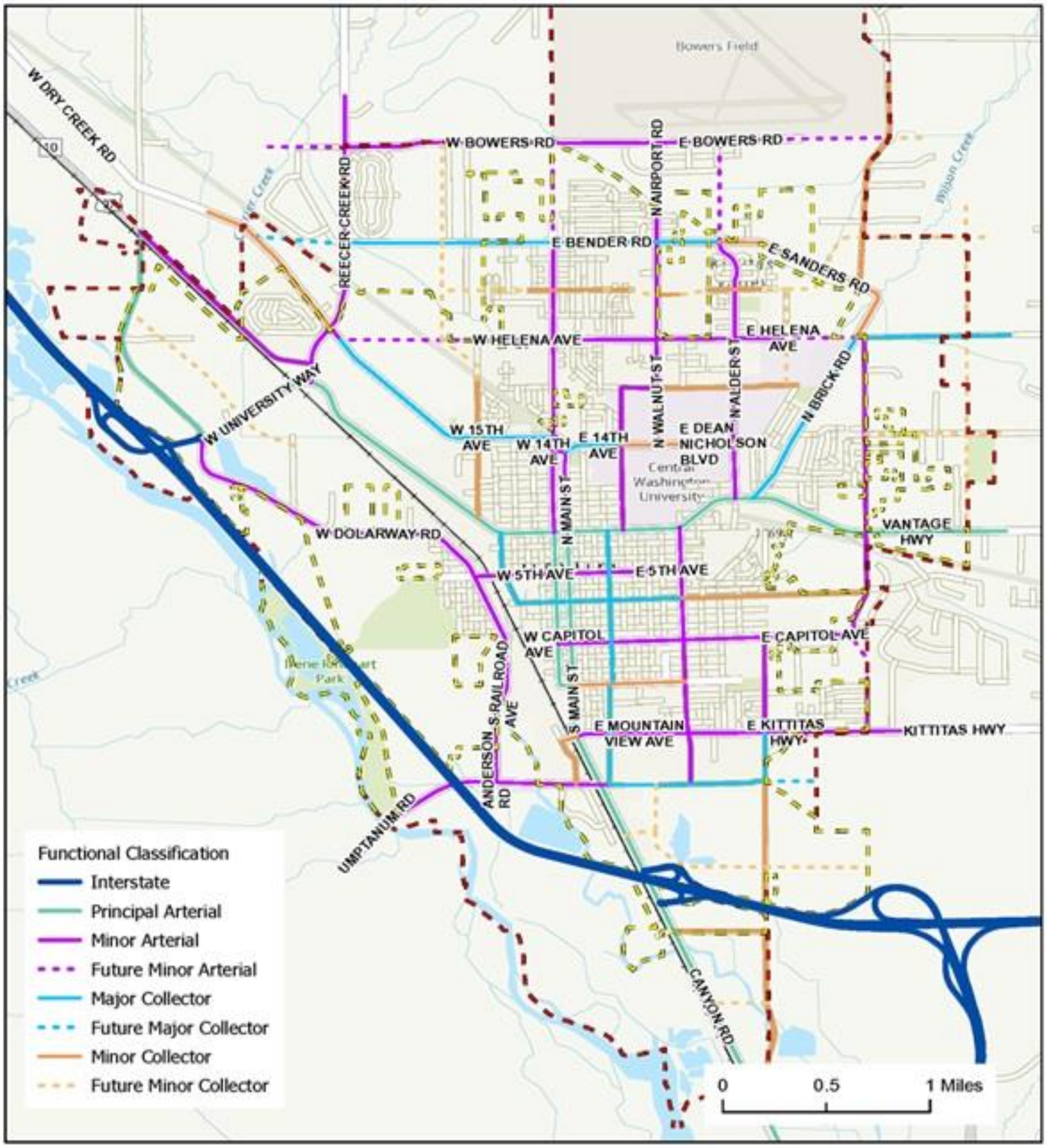
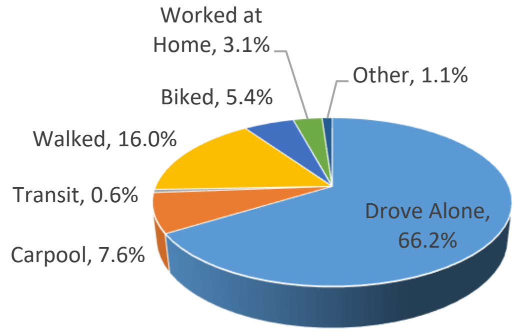


***Figure 13 (above) depicts the general location and connections of future roadways. The exact locations of future roadways will be determined based on topography, environmental conditions, and future development needs.*

Pedestrian and Bicycle Network

Figure 14. How Ellensburg Residents Travel Today (survey results)



Since every trip includes a segment that is made on foot or by bike, facilities for walking and biking are a critical component of the overall transportation network. The American Community Survey Travel to Work data, shown in *Figure 14*, indicates that 16 percent of Ellensburg residents walk to work, and 5 percent bike to work. The combined 21 percent of workers who use active transportation modes to travel to work, rely on safe sidewalks, pedestrian paths, and bicycle infrastructure. It is also important to note that Travel to Work Data historically undercounts the overall demand for walking and biking, since it does not consider how the network is also used by school children and recreational users. Ellensburg's current bicycle and sidewalk network is shown in *Figure 15*.

According to City of Ellensburg GIS data, the City has 8.3 miles of bike lanes, 1.3 miles of bike boulevards, 2.3 miles of shared use paths (serving both bicyclists and pedestrians), and 22.4 miles of designated bike routes without bike infrastructure. Another 2.1 miles are planned for future addition to the bike network.

Ellensburg has undertaken efforts to improve their bicycle facilities. The City is currently designated as a Silver-Level Bicycle Friendly Community by the League of American Bicyclists (LAB). According to the Report Card from LAB, 47 percent of arterial streets in Ellensburg have bike lanes and 27 percent of the total road network mileage also has bicycle infrastructure. The City has undertaken several projects to provide multi-use paths, bike lanes, and sharrows. Moreover, Ellensburg has set a goal of becoming a Gold-Level through a combination of engineering, enforcement, education, and encouragement.

The LAB report card for Ellensburg included several suggestions for attaining a Gold-Level designation:

- Implement a bicycle wayfinding system
- Maintain off-street infrastructure and address potholes and other hazards more swiftly
- Promote cycling with community events
- Celebrate Bike to Work Day
- Encourage CWU to become a LAB Bicycle Friendly University

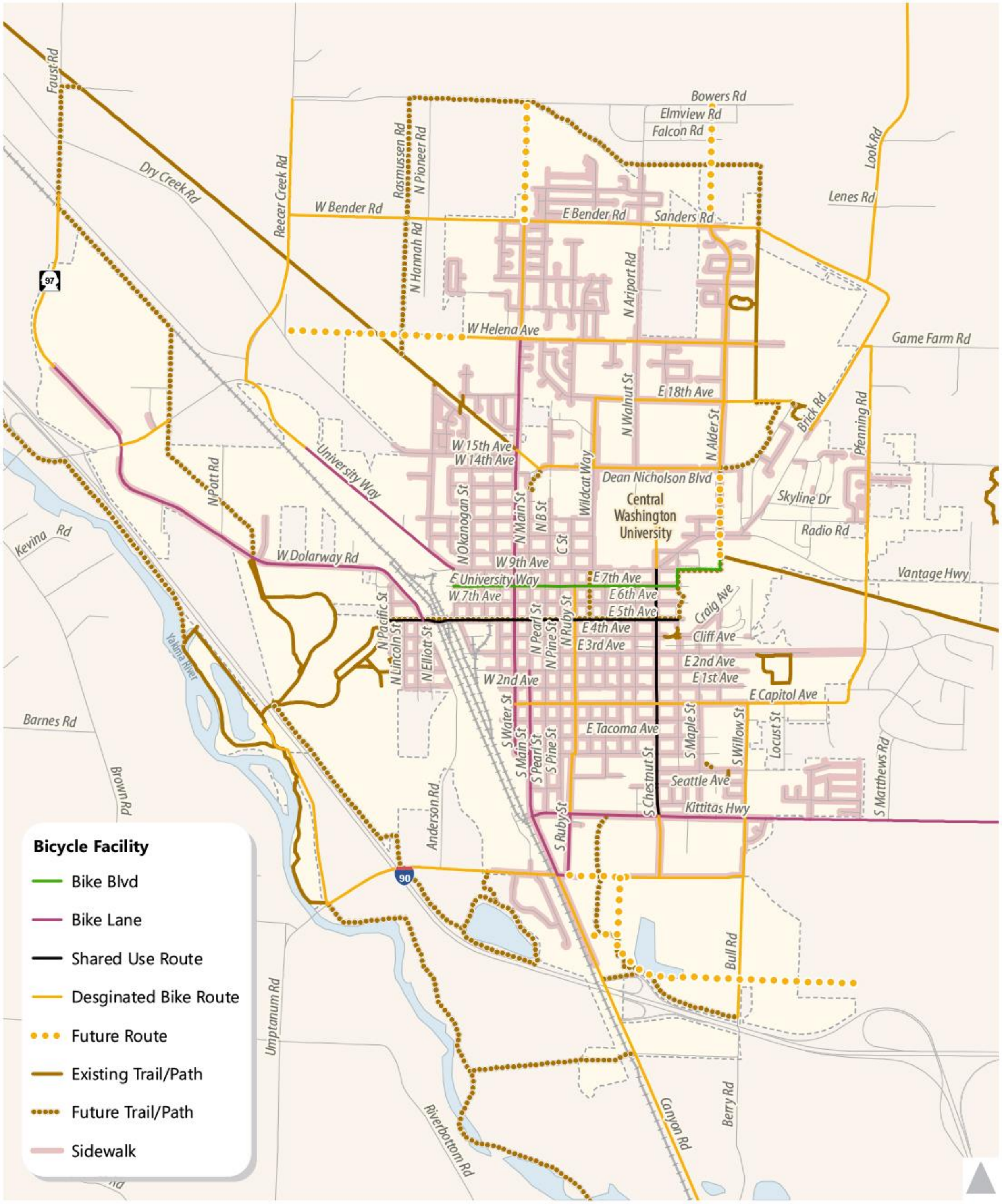
- Update the 2008 Nonmotorized Transportation Plan (NMTP) and include new forms of bicycle infrastructure as well as developing a vision statement and ambitious but attainable goals

- Offer bicycle skills training opportunities for adults

Ellensburg has recently made or planned several pedestrian and bike improvement projects using grant funding. These improvements include filling a missing sidewalk link on 5th Avenue in West Ellensburg, completion of the 7th Avenue bike boulevard, Interstate-90 trail undercrossing enhancements between Rotary Park and Irene Rinehart Riverfront Park, and continuing to build sections of the John Wayne Trail reconnection project. Since 2006, 6.9 miles of sidewalk and 5.2 miles of bike lanes have been installed.

As part of Ellensburg's continued efforts to improve infrastructure for all users, the City has several projects listed in the 2008 NMTP to improve the pedestrian and bicycling infrastructure. These existing, but not yet built, projects are included in the project list evaluated as part of this Comprehensive Plan Update.

Figure 15. Existing and Proposed Pedestrian and Bicycle Facilities



Transit Network

Ellensburg recently voted for a transit sales tax measure that partially funds transit service in the city. The existing Central Transit public transit service is a collaboration between the City, CWU, and HopeSource, a Community Action Agency in Ellensburg. With the new sales tax, Ellensburg has hired a full time transit manager and will continue to improve existing service. Route 1 and Route 2 are operated along the same route, but in opposite directions. The time between buses on each routes are currently one hour. Approximately 54,000 transit trips are taken annually on Central Transit. *Figure 16* shows existing transit routes in the City's transit network.

In addition to the Central Transit service, Ellensburg is also served by the Yakima-Ellensburg Commuter, operated by Yakima Transit through a financial agreement. The route does not provide local service but connects to Yakima and offers three stops in Ellensburg: at Super 1 Foods, Safeway, and CWU (*Figure 17*). There are a total of seven weekday trips in each direction (Yakima to Ellensburg and vice versa), and no weekend or holiday service.

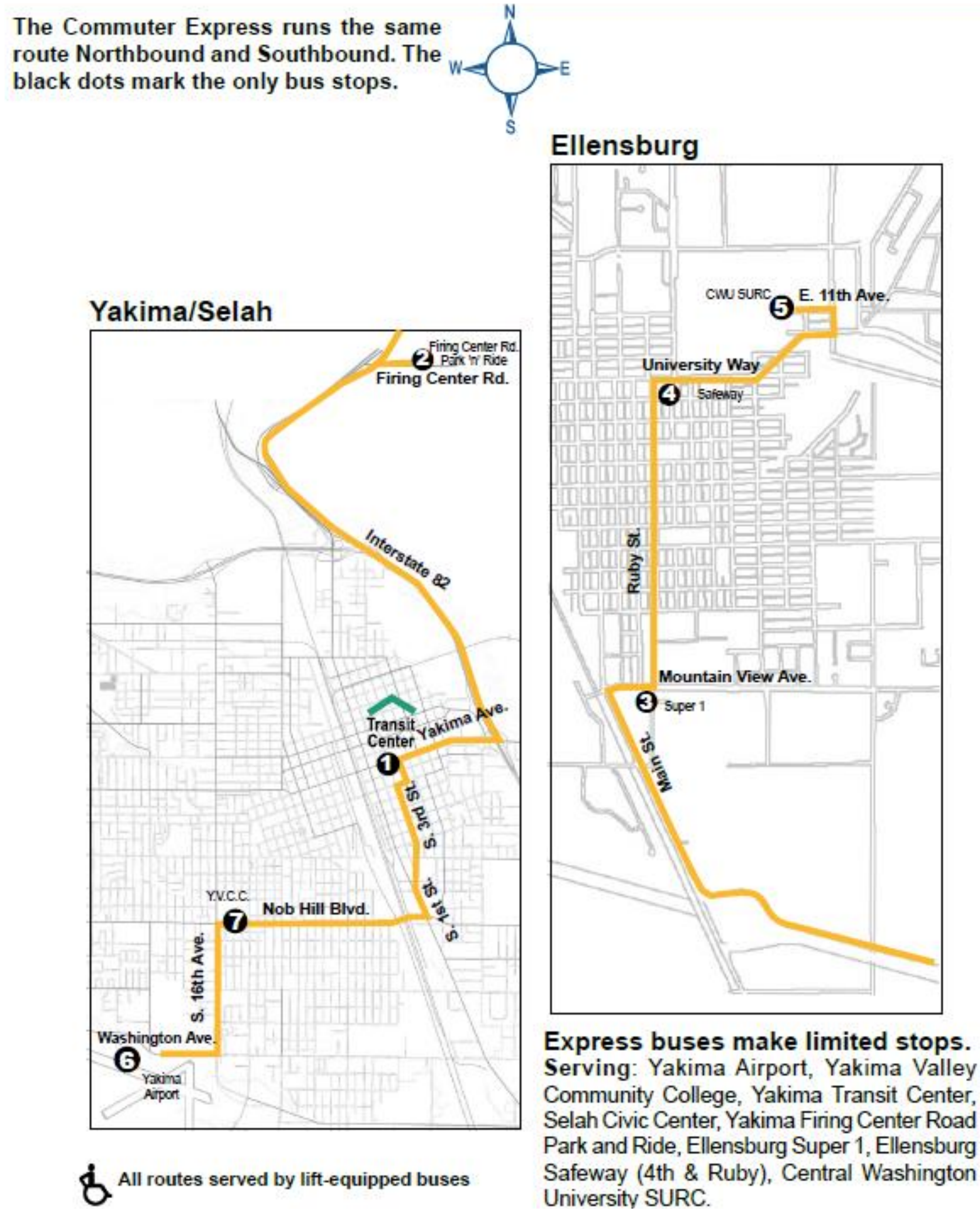
For connections outside of the County, the Greyhound bus offers a stop in Ellensburg, the Apple Line bus travels north into Chelan and Okanogan counties, and the Bellaire Airport Shuttle takes residents to and from the Seattle Airport.

Grant and Kittitas Counties were recently awarded a grant to create an express route from Ellensburg at CWU, to Moses Lake in Grant County. This project will facilitate travel between the counties along the I-90 corridor.

As part of this plan, the City will be looking for opportunities to enhance Ellensburg's local service to make transit a more appealing option to residents, as well as to better connect with regional service.

Figure 16. Existing Transit Routes

Figure 17. Yakima-Ellensburg Commuter Routes



Freight Network

Freight movement is essential in Ellensburg in order to bring goods to citizens, as well as to export products such as the world famous Timothy Hay grown in Kittitas County and exported through the state. Ellensburg has planned a truck route system that aims to avoid heavy truck traffic on lower volume streets. The North-South spines of this truck route are Canyon Road/Main Street, Water Street, and Railroad Avenue. In the East-West directions, Dolarway Road, Mountain View Avenue/Kittitas Highway, University Way, and Bender Road/Sanders Road are the spines. Reecer Creek Road, Look Road, and Bowers Road are truck routes outside

of city limits. This route map is shown in *Figure 18*.

Figure 18. Existing Truck Routes

Auto Network

With many Ellensburg residents and employees relying on vehicles as their primary mode of transportation, the City's street network is critical to the transportation system. Growth within the region has increased traffic congestion along some of Ellensburg's roadways.

Analyses were conducted at 48 intersections throughout Ellensburg and the surrounding UGA. This included all signalized intersections and the busiest stop sign controlled intersections in the study area. Intersection operations were evaluated and assigned a level of service (LOS) value based on their operations in terms of vehicle delay. *Figure 19* shows the locations of the intersections analyzed.

Table 13 and Table 14 describe the Level of Service definitions from the Highway Capacity Manual (HCM), which is a standard methodology for measuring the performance of intersections.

Table 13. Level of Service Definitions for Signalized Intersections

Facility Type	Description	Control Delay (seconds/vehicle)
A	Free-flowing conditions.	≤10
B	Stable Flow (slight delays)	>10-20
C	Stable Flow (acceptable delays)	>20-35
D	Approaching Unstable Flow (tolerable delay)	>35-55
E	Unstable Flow (intolerable delay)	>55-80
F	Forced Flow (congested and queues fail to clear)	>80

Table 14. Level of Service Definitions for Unsignalized Intersections

Facility Type	Control Delay (seconds/vehicle)
A	0-10
B	>10-15
C	>15-25
D	>25-35
E	>35-50
F	>50

In Ellensburg, the LOS standard for intersections depends on the highest classification of the roadways intersecting. The standard adopted in both the 1995 and the 2006 Comprehensive Plan is LOS B for local streets, LOS C for arterials and collectors, and LOS D for arterials at the interchanges with I-90.

Of the 48 intersections analyzed, all currently meet the City's LOS standard (*Figure 19*). Detailed reports of existing intersection operations are available in Appendix D. However, given the growth anticipated in Ellensburg and surrounding Kittitas County, capacity enhancements will be needed in the future to maintain the City's LOS standard through 2037. *Figure 20* represents

LOS standards without the implementation of capital improvement projects and *Figure 21* represent LOS standards with the implementation of capital improvement projects.

Figure 19. Intersections and 2017 Level of Service

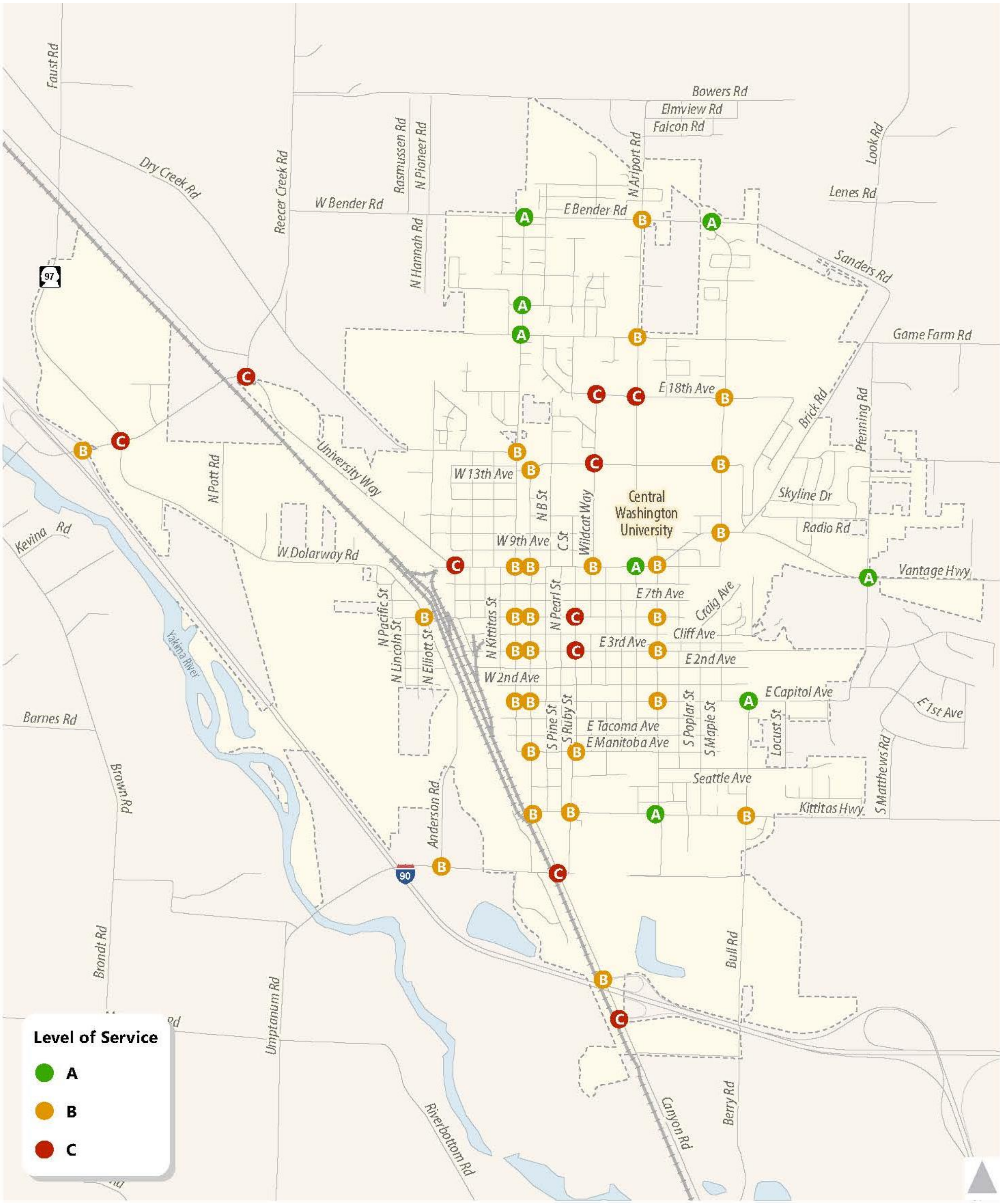


Figure 20. Intersections and Projected 2037 Level of Service – without Capital Improvement Projects

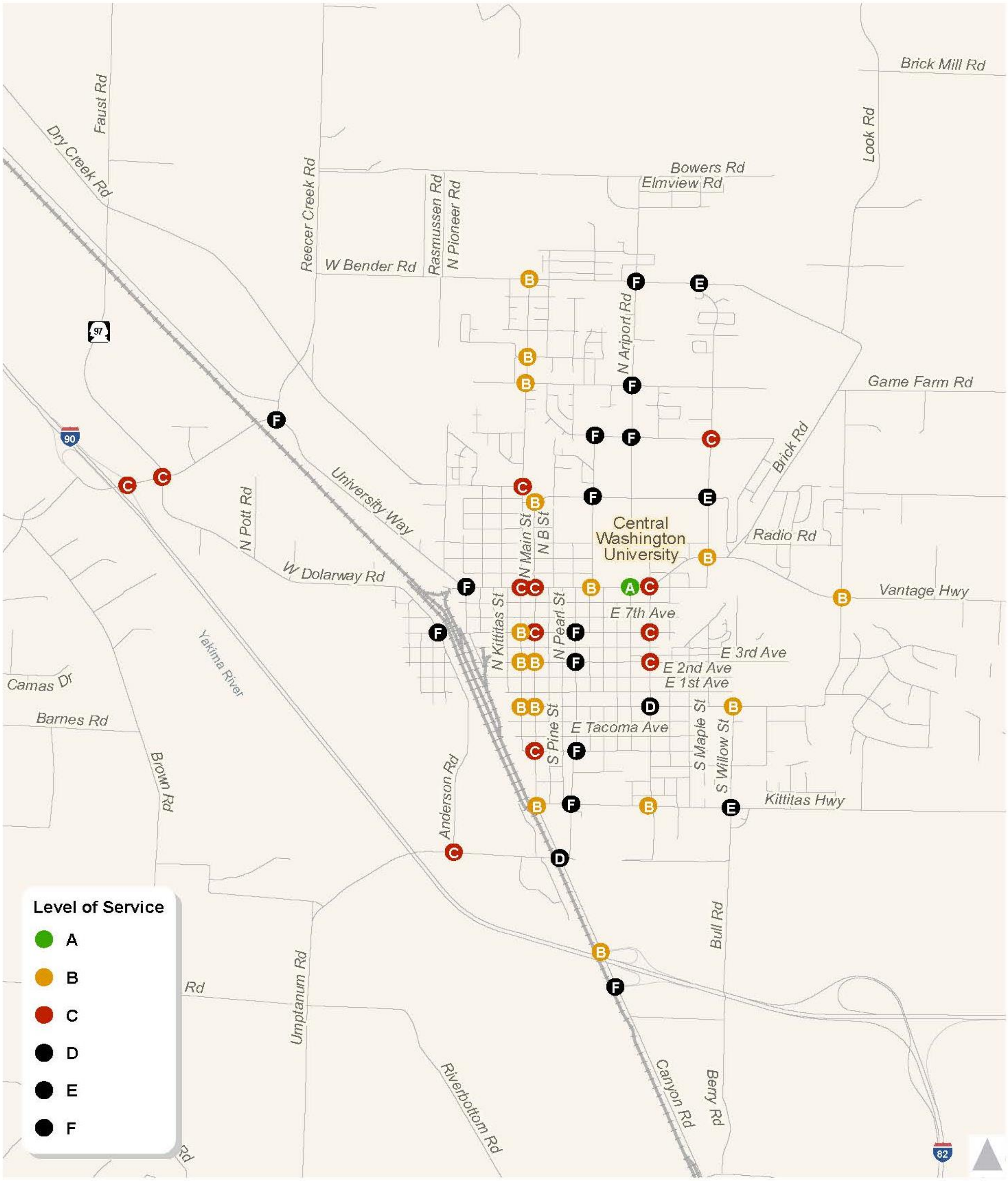
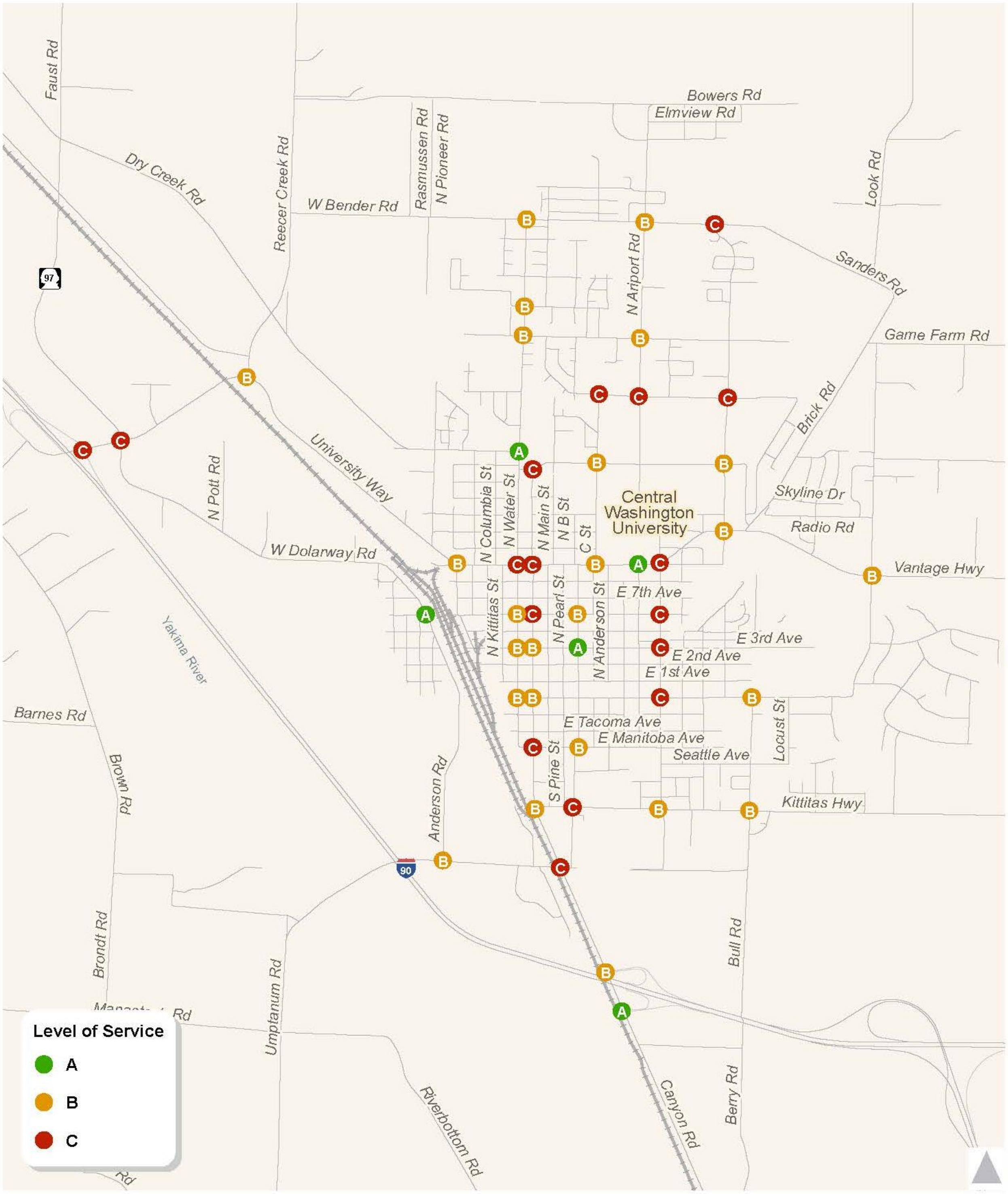


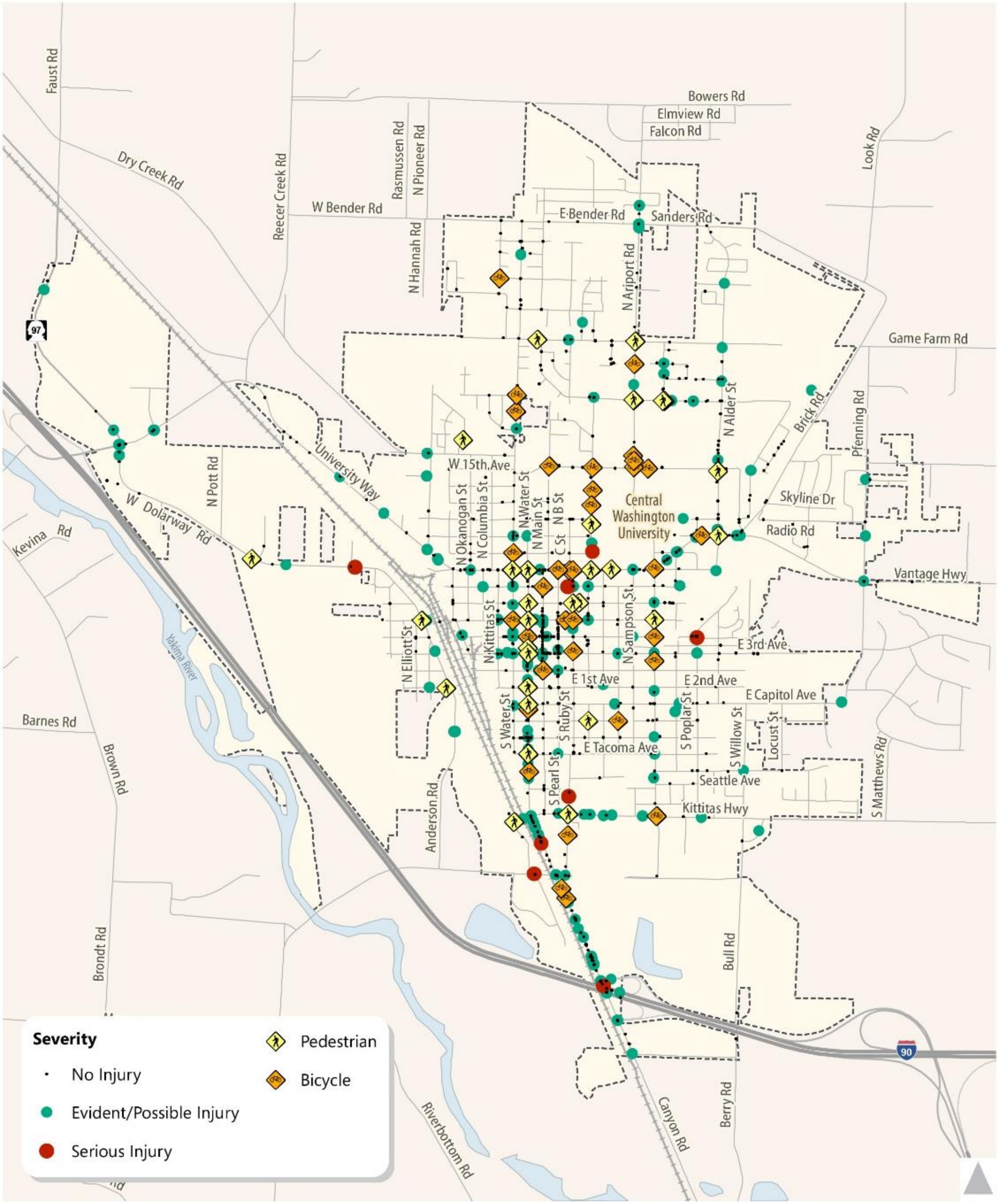
Figure 21. Intersections and Projected 2037 Level of Service – with Capital Improvement Projects



Safety

Collision data was obtained from WSDOT to analyze safety hotspots and overall trends in Ellensburg. Data was analyzed for the time period between January 2010 and September 2016, the most recent data available. In total, 1,546 collisions occurred, an average of approximately 230 crashes each year. A total of 460 injuries were reported, 34 of the collisions involved pedestrians, and 53 involved bicyclists. No fatalities were recorded. As expected, more collisions occurred on higher volume facilities, such as Canyon Road, University Way, Water Street, and Main Street. All collisions are shown in *Figure 22*.

Figure 22. Collisions in Ellensburg (2010-2016)



OPPORTUNITIES AND CHALLENGES

The City of Ellensburg has several important challenges to face as it prepares for future growth and development over the next twenty years. While pedestrians and cyclists make up a sizeable percentage of mode share, vehicle travel still dominates the transportation network in parts of the City. Ellensburg is working to improve transit and nonmotorized access, increase mobility, and prepare for growth.

Network Connectivity

Barriers to Mobility

Ellensburg faces several barriers that increase congestion and can lead to chokepoints in the transportation network. These barriers include the low number of alternative routes from central and northern portions of Ellensburg to the interstate and retail areas in the southern portion of the city, limited railroad crossings and stream crossings, and areas where the grid system is non-existent or is missing links. This chapter seeks to **support commerce through efficient connections**. Projects that add route options and reduce chokepoints/barriers to mobility should be prioritized.

Pedestrian and Bicycle Infrastructure

Sidewalks are available in central Ellensburg and in subdivision areas, although there are some missing links and often no sidewalks in outlying areas. The City's existing bicycle network is growing and is relatively connected, however, the network does not provide much in the way of separation between modes and does contain some missing links. These limitations can inhibit the mobility of citizens and lead to increased vehicle use when a walking or biking trip would otherwise be preferable. The project list includes projects that **offer complete and user friendly connections for walking and biking.**

Transit

Ellensburg's citizens and City staff are working to improve transit in Ellensburg with increased funding. The current system is infrequent (one hour between buses) and cannot serve all destinations and users. The City is looking to **integrate transit into the Citywide and regional transportation network**. Service that is coordinated with Yakima Transit, as well as more frequent service with a larger coverage area could increase usage of the transit system and improve mobility.

ELLENSBURG TRAVEL DEMAND FORECASTING

The Growth Management Act (GMA) requires that the Transportation Element support the land uses envisioned in the Comprehensive Plan. Thus, an important component of this plan is forecasting how the future land uses envisioned in the City, as well as regional growth, would influence demand on Ellensburg's transportation network. A description of the travel demand modeling process is provided below with more detail about land use assumptions in Appendix C.

The Tool. As a part of previous planning efforts, Kittitas County created a travel model with the Visum software package (Appendix E). This model forecasts traffic volumes during the evening commute (4-6pm) along Ellensburg's key streets and intersections. This tool provides a reasonable foundation for developing year 2037 forecasts, as the underlying land use assumptions have been updated to match the land use forecasts for the 2017 Comprehensive Plan.

- **Estimate Land Use Growth in the City.** The City is planning for growth in population and employment over the next 20 years through 2037. Based on growth estimates from Kittitas County Council of Governments and review by City staff, Ellensburg is preparing for 11,757 new residents and 6,998 new workers by 2037. The City will accommodate growth throughout Ellensburg based on adopted zoning, observed development patterns, and other city policies.
- **Capture Regional Growth Patterns.** Other communities throughout the region are going through this very same process. Since travel does not stop at a jurisdiction's borders, it is important to capture how regional growth could influence travel patterns on Ellensburg's streets.

Translating Land Uses into Trips. The next step is evaluating how the City and regional growth assumptions described above translate into walking, biking, transit, and auto trips. The travel model represents the number of housing units and employees in spatial units called traffic analysis zones (TAZs). TAZs can be as small as a few street blocks to as large as an entire neighborhood. They provide a simplified means to represent trip making rather than modeling individual parcels. The travel model estimates trips generated from each TAZ (both inside and outside of the City) using established relationships between different land use types with trip making. These trips are then assigned onto the roadway network to estimate how much traffic would be on each street during the evening commute hour.

Regional Growth

Growth in population, mostly in the northern portion of Ellensburg, the UGA, and the surrounding area will place more demands on the entire transportation network. This growth will add traffic to arterials and impact the quality of life for Ellensburg residents. To maintain and improve mobility throughout the city, Ellensburg must **facilitate active partnerships** with regional partners and stakeholders such as Kittitas County, WSDOT, Yakima Transit, CWU, Ellensburg School District, and BNSF Railroad. This coordination will ensure that Ellensburg residents, employees, and visitors continue to have a good experience on the transportation network.

Safety

Ellensburg has had no traffic collision fatalities and only sixteen serious injury collisions since 2010. However, there is always room for improvement in safety. Pedestrian and bicycle collisions are of particular cause for concern as they are more vulnerable users.

This plan includes as its number one goal to **provide safe connections for all users**. Implementation of countermeasures should be considered, as appropriate, at locations with high incidence of more severe collisions, as well as those that include a pedestrian or cyclist.

Funding

Ellensburg, as with all jurisdictions, faces issues with how to fund improvements to the transportation network. Alternative sources of funding, such as grants and private dollars, should be explored to augment system funds and increase investment in transportation infrastructure. Moreover, this plan includes a goal to **reliably fund system maintenance and preservation**. Capital project expenditures should consider projects' full lifecycle costs and also be balanced with the need to maintain the current system.

TRANSPORTATION VISION

Ellensburg envisions a future transportation system that serves all users and modes of travel by offering a safe and robust network of walkways, bicycle facilities, roadways, and complementary transit options. This transportation system is well-linked with the built environment, since the way people travel is greatly influenced by the key destinations where people live, work, shop, and recreate.

As identified in this plan, most of the improvements are focused on the development of a 'layered' transportation network, which emphasizes providing complete accommodation for all modes of travel. While some of the projects identified in this Transportation chapter are needed to meet the City's vehicular Level of Service (LOS) standard, many of the future improvements focus on providing safer and more complete facilities for walking, bicycling, and riding transit in order to improve access and mobility for all road users.

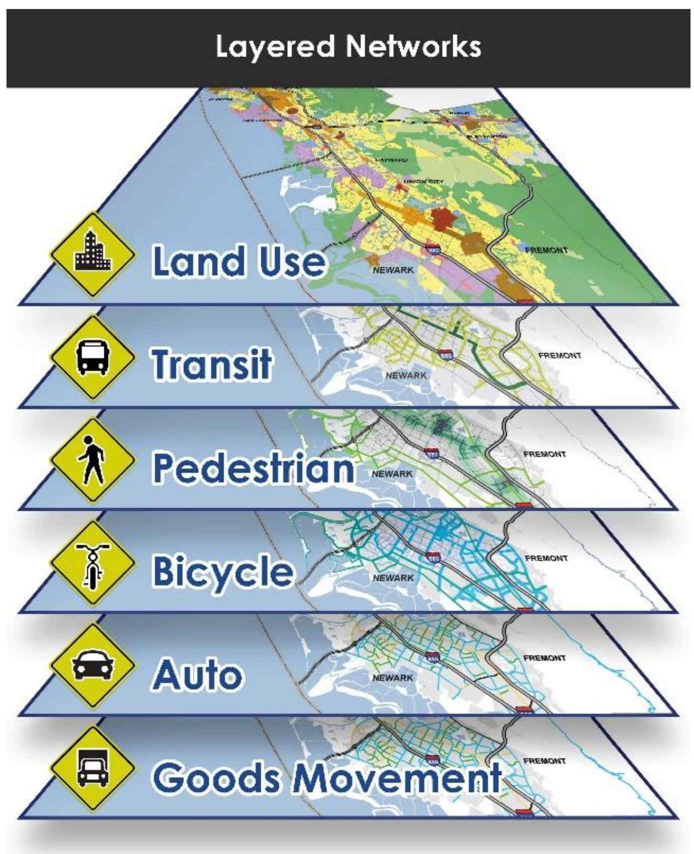
Introduction to the Layered Network

It can be a challenge for a single roadway to meet the demands and expectations of all modes at any given time. This is also generally not desirable from a user or a planning perspective.

In response to this challenge, the City of Ellensburg has adopted a layered network approach that focuses on how the City's transportation network can function as a system to meet the needs of all users. In such a system, different facilities are identified for different travel needs to ensure that everyone has complete accommodation throughout the overall network. *Figure 23* illustrates the concept of a layered network.

The City will implement this layered network through a system of modal networks that define each street's user priorities and associated infrastructure needs.

Figure 23. Layered Network



Modal Networks

Streets in Ellensburg serve different travel purposes, and the modal networks therefore prioritize a different balance of users on each corridor. Determining how the entire transportation network fits together in Ellensburg requires identifying desirable streets for each mode, combining them to locate overlaps, and then identifying infrastructure enhancements to ensure safe and complete facilities for all modes. The following sections review the priority networks for each mode and establish their level of service standards.

Walking

Walking is the most fundamental transportation mode of all since all trips include a walking component. Effective pedestrian facilities enable community building and social equity. Dense areas with commercial land uses and streets that serve schools, parks, and churches are particularly important as they support more pedestrians and may have a larger portion of vulnerable users than other streets. Measures such as increased separation from moving vehicles, marked crosswalks, bulb-out curbing, and sidewalks at crossings can keep pedestrians safer.

Figure 24 highlights the Pedestrian Priority Network, which specifies where pedestrian infrastructure should be provided in the long term. Sidewalks on the Pedestrian Priority Network should provide both comfort and safe travel space whenever possible.

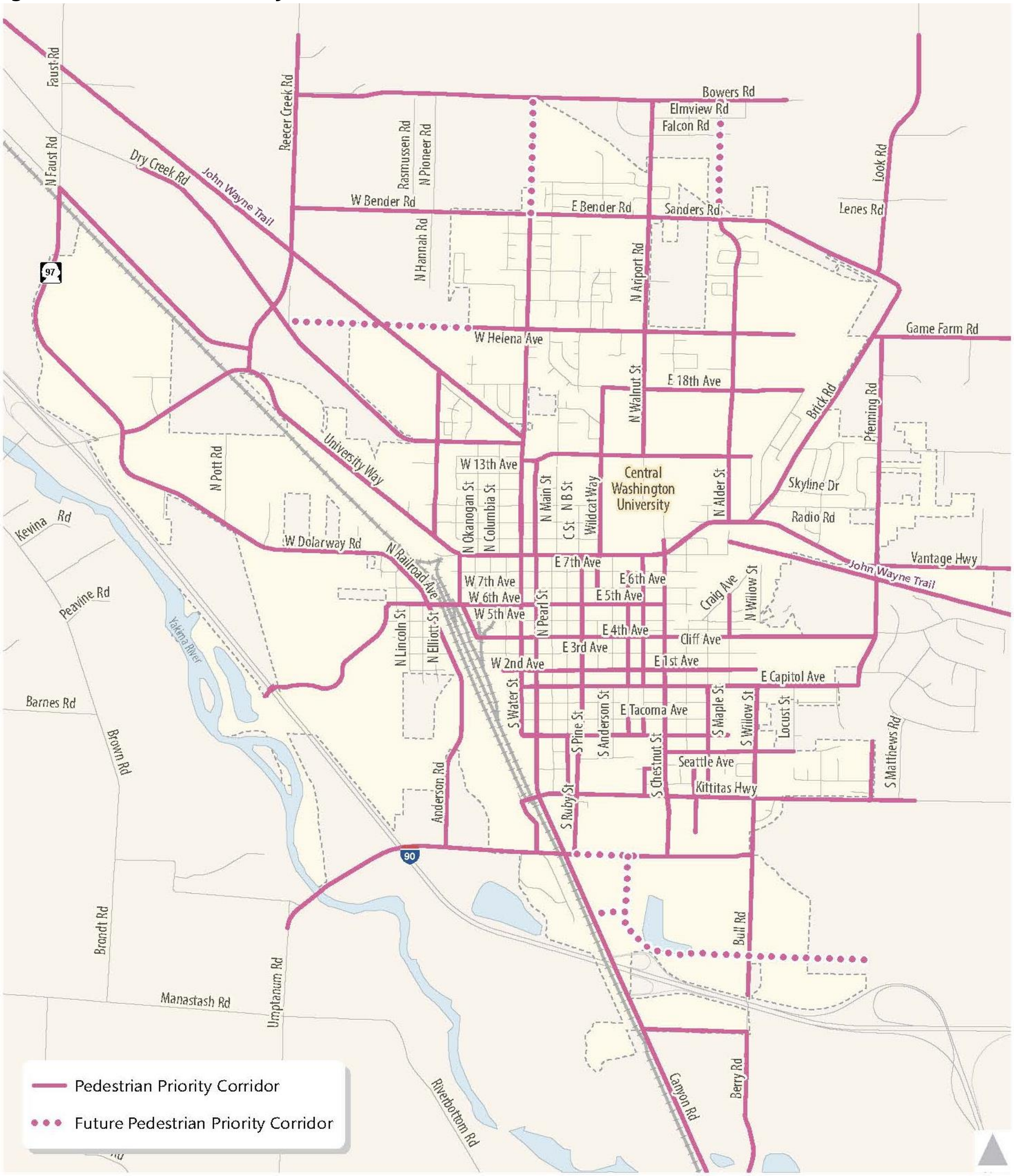
Building on the Pedestrian Priority Network, *Table 15* establishes levels of pedestrian infrastructure that will be used as a tool to identify and prioritize gaps in the City's pedestrian infrastructure. The highest level of accommodation for walking, indicated in the green row, would provide facilities identified in the Pedestrian Priority Network. The long-term goal is for all City streets to be at the green level, and with few exceptions all new development requires the construction of sidewalks on both sides of the street. The yellow level of accommodation is seen as an interim measure or condition that would make strong progress in building out the Pedestrian Priority Network by filling sidewalk gaps to ensure that a sidewalk is provided on at least one side of the street. Incomplete or missing pedestrian facilities would fall into the red category and not satisfy the City's goals for accommodating pedestrians. Identification of existing yellow and red areas is a tool for the City to prioritize filling in pedestrian infrastructure gaps in the Pedestrian Priority Network.

Table 15. Levels of Pedestrian Infrastructure

Within Pedestrian Priority Network	
(green)	Pedestrian facility* where indicated in Pedestrian Priority Network
(yellow)	Pedestrian facility* provided on one side of the street
(red)	No pedestrian facility

*Pedestrian facility includes sidewalks and shoulders protected by a raised curb

Figure 24. Pedestrian Priority Network



Bicycling

Ellensburg already offers great recreational bicycling options on the multiple waterfront trails along the Yakima River, as well as the John Wayne Trail sections to the east and west of the city. The presence of the University campus also leads to significant bicycle activity in the City.

Connecting to these routes from other areas of the City can be challenging, however, due to the lack of bicycle infrastructure. Key mobility corridors for bicyclists, such as Water Street, North Alder Street, South Chestnut Street, and West Helena Street would be best served with on-street bike lanes while existing facilities would suffice on quieter streets.

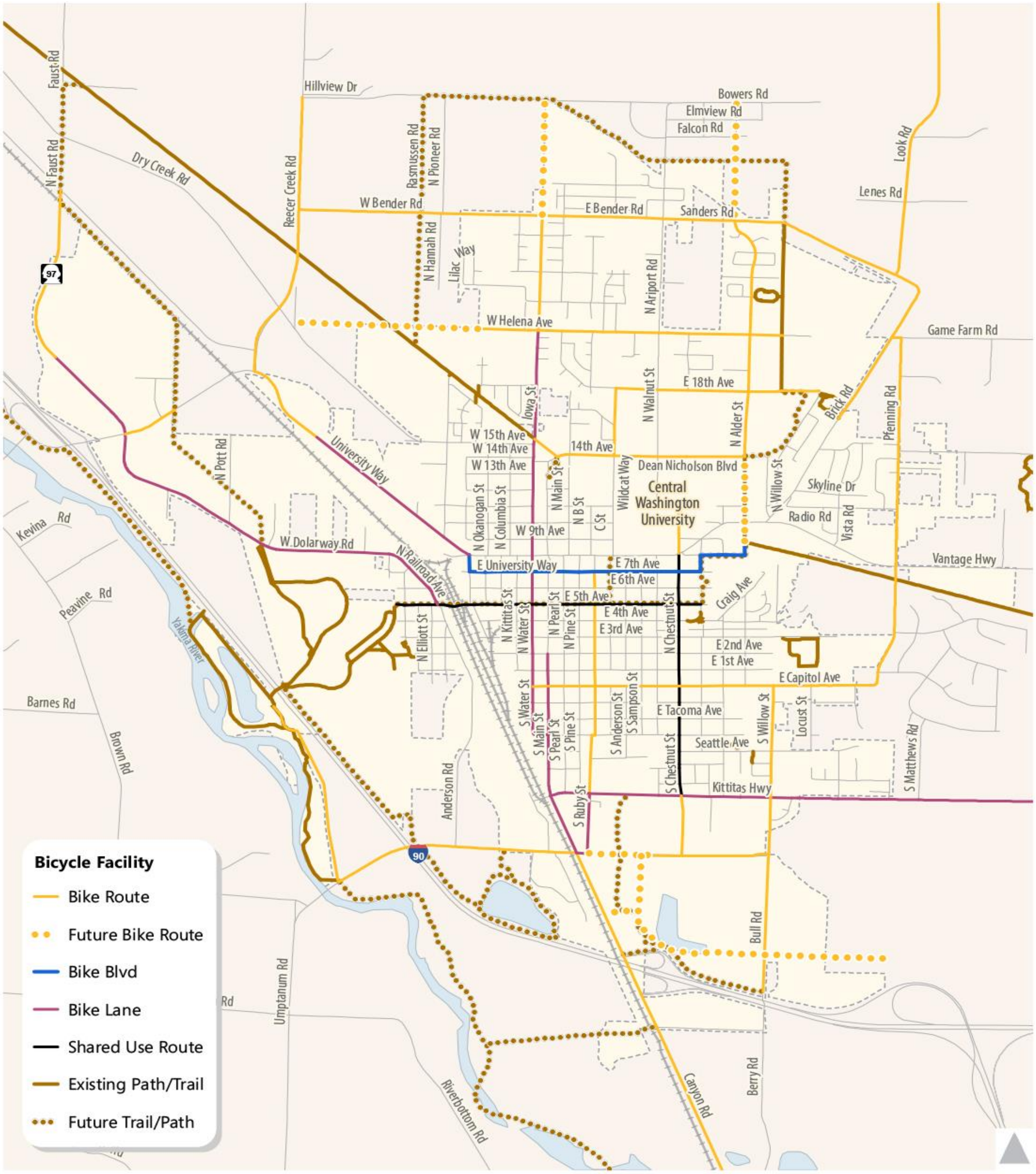
Figure 25 highlights the Bicycle Priority Network, which specifies where bicycle infrastructure should be provided in the long term.

The City of Ellensburg can strive for the green level of accommodation for bicycling by installing the bicycle facilities depicted in the Bicycle Priority Network or a facility that offers more separation from vehicle traffic. At a minimum, the City should build a marked shared use facility throughout the Bicycle Priority Network, as depicted in the yellow level of accommodation. Incomplete or missing bicycle facilities would not meet the City's desired level of accommodation in the Bicycle Priority Network as shown in *Table 16*. Identification of existing yellow and red areas is a tool for the City to prioritize filling in bicycle infrastructure gaps in the Bicycle Priority Network.

Table 16. Levels of Bicycle Accommodation

Within Bicycle Priority Network	
🟢	Provides bike lanes, trails, or pathways, as shown within Bicycle Priority Network
🟡	Provides a marked shared use facility
🔴	No bicycle facility

Figure 25. Bicycle Priority Network



TRANSIT

Transit operations recently came under the direct control of the City after a successful ballot initiative for a transit sales tax. Ellensburg will create an environment that is welcoming to transit by offering:

- Street lighting
- Pedestrian and bicycle facilities for connecting to transit stops
- High-amenity bus stops

Ellensburg's level of transit accommodation is defined based on the amenities discussed below.

The City can reach the highest level of accommodation (green) by providing a high level of transit-supportive amenities such as benches, shelters, garbage cans, and lighting, in addition to providing amenities that support pedestrian access such as sidewalks and marked crosswalks at all stops.

As a minimum target, the City can strive to provide the transit stop amenities depicted in yellow in *Table 17* as well as pedestrian access improvements such as sidewalks and marked crosswalks near stops where feasible. Little to no amenities and a lack of crosswalks would mean a facility would fall into the red category and not satisfy the City's goals for the transit system.

Table 17. Transit Accommodations - Stop Amenities, Pedestrian Access, and Frequency of Service

LOS	Transit Stop Amenities	Pedestrian Access	Frequency of Service
	High level	Sidewalks and marked crosswalks serving stops	Plan for future service and accommodate any transit service expansion.
	Some amenities	Sidewalks and marked crosswalks serving some stops	Maintain existing transit service.
	Little or no amenities	General lack of sidewalks and marked crosswalks	Removal of transit service or failure to serve dependent transit riders.

Freight and Auto

Most trips in Ellensburg occur along its street network, which serves as the backbone for accessing homes, jobs, and other destinations. Many of these streets are local streets, however, and do not see significant traffic volumes throughout the day. Similarly, goods movement and delivery vehicles use some corridors frequently while other streets see only the occasional local delivery.

Figure 13 calls out the functional classification of each of Ellensburg's streets, distinguishing whether it is an arterial, collector, or local street. These classes indicate the level of priority of each street for automobiles, specifically in terms of facilitating vehicle and freight mobility as well as other modes. The figure also shows potential future street extensions, which may be completed over time as development occurs.

Figure 18 specifies the WSDOT freight classification of Ellensburg's major streets that support goods movement. These classifications indicate the annual weight of goods that travel a corridor, whether via large trailer loads or smaller delivery vehicles. The functional classification and freight class of a street should guide future investments in streetscape to ensure that streets can carry appropriate freight loads.

Ellensburg will maintain its current LOS standards of LOS B for local streets, LOS C for arterials and collectors, and LOS D for arterials at the interchanges with I-90. Of the 48 intersections analyzed, all currently meet the City's LOS standard.

Appendix D summarizes existing and future forecast delay at intersections in the City. The capital list provided in Appendix B includes future roadway projects that would maintain the City's LOS standard through 2037.

GOALS AND POLICIES

Ellensburg has established six goals to accomplish its overall vision for transportation in the future. The goals establish overarching priorities that serve the vision of this Transportation chapter while policies lay out specific actions. Together, the goals and policies lay the foundation for the remainder of this chapter, including the proposed action items and ongoing implementation of the chapter.

Goal T-1: Create a transportation networks that provides safe and comfortable connections for all users to key destinations.

Policy A Every project considers all users in a complete streets context, including pedestrians, bicyclists, transit, motorists, and freight.

Policy B Increase pedestrian and bicyclist safety along arterial streets or provide alternative routes.

Policy C Prioritize safety improvements as part of every project, including maintenance tasks when possible.

Policy D Reduce auto demand on local and arterial streets by encouraging alternative modes of transportation, such as walking, biking, and transit.

Policy E Implement calming measures to slow traffic on non-arterial streets.

Policy F Where possible provide higher comfort pedestrian facilities, and accommodate on-street parking in commercial districts.

Policy G In planning facilities for active modes, when feasible choose lower stress parallel bicycle and pedestrian routes in order to increase safety by separating auto and active transportation modes.

Policy H Improve pedestrian use while maintaining automobile access to the Central Commercial zones by enhancing pedestrian access throughout the Central Commercial zones.

Policy I Consider aligning streets to take advantage of views of landmarks when designing subdivisions.

Policy J Make progress in building transportation facilities that are consistent with the City’s adopted plans, including function classification and street standards, nonmotorized plan, and downtown plan.

Goal T-2 Prioritize connections with state highway routes and removal of bottlenecks that delay the movement of people and goods.

Policy A Maintain interconnectedness and high levels of access through a well-developed grid network and high quality connections between the walking, biking, auto, freight, and transit networks.

Policy B Design of new streets in the city shall use a street grid system at an interval of 1/2 mile for arterial streets. Within the 1/2 mile sections, attempt to maintain a 1/4 mile connection for auto circulation, with 200 to 600 foot pedestrian connections, depending on zone density.

Policy C For all undeveloped areas of the city and UGA, prepare maps of future street alignments, especially for arterials, considering existing development patterns and physical barriers such as streams and steep slopes.

Policy D Establish LOS B as the standard for local streets, LOS C for collectors and arterials, and LOS D for the I-90 interchanges.

Policy E Wherever possible, seek to increase route options through strategic additions to the transportation system that fill gaps and add alternative routes.

Policy F Maintain and enforce truck routes through the city and ensure connection to freeway interchanges.

Policy G Focus industrial growth along specific transportation corridors that are designed to accommodate heavy vehicles and other industrial users.

Policy H Concentrate land uses that generate long-haul truck traffic nearby the City's freeway interchange areas.

Policy I Ensure development regulations and street standards are current with contemporary truck design criteria, particularly as they apply to those areas near the freeway interchanges.

Goal T-3 Fill gaps in the system to accommodate safe, enjoyable, and energy efficient travel by those of all abilities choosing to walk, bike, or use transit.

Policy A Prioritize building streets, trails, linear parks, and pathways to connect neighborhoods, schools, parks, and commercial areas so that walking and biking are viable modes for both recreation and transportation purposes.

Policy B Establish bicycle and pedestrian priority networks that highlight the most critical facilities to accommodate those modes.

Policy C Use the following LOS indicators to identify and prioritize filling in the gaps of the pedestrian infrastructure in *Figure 24*, the Pedestrian Priority Network:

LOS	LOS Within Pedestrian Priority Network
	Pedestrian facility* where indicated in Pedestrian Priority Network
	Pedestrian facility* provided on one side of the street
	No pedestrian facility

*Pedestrian facility includes sidewalks and shoulders protected by a raised curb

Policy D Establish LOS standards for bicycle networks according to *Figure 25* Bicycle Priority Network:

LOS	Within Bicycle Priority Network
	Provides bike lanes, trails, or pathways, as shown within Bicycle Priority Network
	Provides a shared use facility
	No Facility

Policy E Identify critical rights-of-way and important pedestrian corridors accessing the Central Commercial zones, CWU, and local schools and linking these areas to the west and south interchanges.

Policy F Whenever possible, establish additional logical access routes outside of the established street system for bicycle and foot traffic.

Policy G Identify trail easements.

Policy H Minimize the use of cul-de-sacs.

Policy I Whenever possible, retrofit existing streets to include pedestrian and bicycle facilities.

Policy J Develop, design, and construct standards for walkways and bikeways that emphasize connectivity and reduce operations and maintenance costs.

Policy K Enhance the appearance of the public rights-of-way to make traveling through Ellensburg more enjoyable, in particular for people travelling on foot.

Goal T-4 The City will take an active role to ensure that transit is a community asset, offering convenient routes, serving key destinations, and coordinating with other regional transit operators.

Policy A Provide a consistent level of reliable, public transportation to medical, governmental, financial, retail and cultural locations throughout the community through a locally supported public transportation system with the following LOS standards:

LOS	Transit Stop Amenities	Pedestrian Access	Frequency of Service
	High level	Sidewalks and marked crosswalks serving stops	Plan for future service and accommodate any transit service expansion.
	Some amenities	Sidewalks and marked crosswalks serving some stops	Maintain existing transit service.
	Little or no amenities	General lack of sidewalks and marked crosswalks	Removal of transit service and failure to serve dependent transit riders.

Policy B As a regional transit leader, build partnerships with the County and smaller communities to develop interconnected transit systems.

Policy C Design higher density projects to be compatible with future public transportation service.

Policy D Coordinate with transit operators in the design of streets to ensure that street cross-sections and offered amenities meet the needs of transit.

Policy E Work with local and regional transit providers to integrate service and create a multimodal transit system.

Policy F Build active partnerships with local non-profits and businesses to develop future in-city transit options.

Policy G Explore potential locations for a future transit center.

Goal T-5 Plan for a system that is financially viable, including consideration of full lifecycle costs in infrastructure investments and leveraging funds to maximize community benefits.

Policy A Prioritize the cost-effective maintenance and preservation of the existing transportation system over system expansion.

Policy B Develop an effective maintenance strategy, including identification of reliable sources of funding for maintenance.

Policy C Create a street fund to finance the City's share of matching grants and Local Improvement Districts, and to complete motorized and nonmotorized transportation systems.

Policy D Explore grant opportunities and other funding sources for street improvement projects, maintenance, and operation needs.

Policy E Minimize street widths to reduce maintenance needs.

Policy F Develop an emergency fund to address unanticipated events.

Policy G Review parking requirements for institutional uses and reduce them where appropriate.

Policy H Create storm water runoff designs and strategies that minimize the amount of land necessary to treat runoff from parking areas.

Goal T-6 Actively coordinate with a broad range of groups to develop and operate the transportation system.

Policy A Continue to collaborate with Kittitas County regarding the design and preservation of transportation corridors and defining street intervals in the UGA and develop and adopt an interlocal agreement.

Policy B Continue to identify, evaluate and acquire major arterial corridors leading from the established community through the UGA.

Policy C Review and comment on plans that affect Ellensburg, including development proposals in the UGA, County land use actions and transportation improvement programs, and street and highway project designs from the County and WSDOT.

Policy D Coordinate with WSDOT on project design and opportunities for innovation.

Policy E Facilitate long-range planning between CWU, the Ellensburg School District, and the downtown organizations to address transportation needs in Ellensburg.

Policy F Coordinate with the County on airport master plan implementation to ensure air travel is integrated with the rest of the transportation network.

Policy G Adopt an interlocal agreement with the County to align rights-of-way in a manner that helps conserve prime farmland.

Policy H Collaborate with CWU to overcome University Way's function as a divider between CWU and the Central Commercial zones.

Policy I Circulate the Comprehensive Plan and other transportation plans to the County and WSDOT for comment.

Policy J Collaborate with Ellensburg School District to minimize traffic impacts around schools and their adjacent neighborhoods, and provide Safe Routes to School through engineering and education.

Policy K Ensure that the Ellensburg School District is involved in projects that will affect school students.

ACTION ITEMS

Citywide Transit Master Plan

Develop a citywide transit master plan to identify ways that the transit service can better connect citywide destinations, including CWU, downtown, and the interchange areas, as well as to regional destinations. This transit master plan should also address how staff and equipment resources will need to grow to provide more service in the future.

Monitor Parking Demand

Monitor parking demand in the Central Commercial zones and around CWU, as appropriate, and consider strategies to address parking-related issues as they arise.

Monitor Street Design Standards and Parking Standards

Monitor the implementation of street design and parking standards in achieving the following results:

- Increase separation of pedestrians from travel ways by the use of curb and gutter or offset sidewalks
- Mixing of residential and commercial uses
- Accommodation of on-street parking in commercial districts

Nonmotorized Transportation Plan

Implement and update the Nonmotorized Transportation Plan.

Review Parking Requirements

Review parking requirements and prepare studies as necessary for the following:

- Central Commercial zones; including where parking facilities should be located, how to implement them, and possible adjustment of requirements
- Updated standards that recognize the ability to share parking supply among complementary uses
- Parking for Downtown Historic District residents
- Parking on the southern and western periphery of Downtown Historic District
- Multifamily housing near jobs and transit

Study rail impacts

Study rail impacts with respect to container handling and local industrial uses.

Study University Way pedestrian crossings

Study ways to improve safety on University Way pedestrian crossings.

POLICY CONNECTIONS

The **Land Use** chapter is key to understanding the integration between land use and the city's multi-modal transportation system to ensure that transportation facilities and services support the city's growth strategy.

Trails are a component of both recreation and transportation and are discussed in the **Parks and Recreation** chapter.


CHAPTER 4 CAPITAL FACILITIES AND UTILITIES

WHAT YOU WILL FIND IN THIS CHAPTER

- Inventory of public facilities including locations and capacities.
- Forecasts of future needs for public facilities and utilities.
- Goals, policies, and programs that will help to ensure safety, efficiency, and affordability of city facilities and utilities.

OVERVIEW

The City of Ellensburg is a full-service municipality, offering water, wastewater, natural gas, electric and telecommunications utilities, storm water drainage, a street transportation system, law enforcement, a public library, a parks and recreation system, and administrative services that keep it all running.

In addition, the Ellensburg School District, Kittitas Valley Healthcare, Fairpoint Communications, Charter Communications, Waste Management, Puget Sound Energy, Kittitas County Public Utility District, and Kittitas County also provide services to Ellensburg residents and to land within Ellensburg's Urban Growth Area (UGA).

Ellensburg is served by an extensive system of publicly funded and operated facilities, from schools and parks to utility systems and transportation facilities. Many of these facilities, such as water towers and roads, help meet the basic needs of residents. Others, such as fire stations, make the community safer. Community resources like schools and libraries foster learning and educational development, which make the city a better place.

The community benefits from these investments on a daily basis. In order to sustain and improve on the benefits the community currently enjoys, the City must identify how it can best maintain existing facilities and create new facilities to serve the needs and desires of local residents and future development.

BACKGROUND & CONTEXT

This section addresses existing capital facilities and utilities owned and largely managed by the City of Ellensburg, including water, wastewater, stormwater, electric, natural gas, telecommunications, library services, and police.

Demand for Ellensburg's capital facilities is likely to grow over the next 20 years. New demand can be accommodated through new capacity and through managing demand. Demand management can be accomplished in a variety of ways, depending on the service or facility. For example, encouraging consumers to use less electricity during peak hours can decrease the need for future investments to meet peak demands.

Each capital facility system has its own functional plan, which includes a list of needed capital facilities. Facility needs are determined through Level of Service standards, operating criteria, or performance standards.

A key feature of the capital facilities planning process is asset management, which continually monitors the condition of existing facilities and infrastructure, identifies levels of maintenance needed, and determines when facilities need to be replaced. The City's capital facilities policies ensure that the city plans in advance for maintenance and infrastructure replacement to maintain Levels of Service. These policies also tie capital facilities planning to land use, making sure that assumptions about future growth are consistent.

WHY CAPITAL FACILITY PLANNING?

The Growth Management Act gives jurisdictions direction on capital facilities through its Public Facilities Goal: *"Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards."*

Kittitas County Countywide Planning Policies ensure jurisdictions' plans for growth are consistent with their Capital Improvement Program, and that urban areas have adequate public facilities and services to meet growth targets.

The Ellensburg Capital Facilities Chapter demonstrates how the City will provide adequate facilities to anticipate growth needs, achieve acceptable levels of service, efficiently use fiscal resources, and meet realistic timelines.

Capital Facilities Inventory

Most city-owned and operated capital facility systems are governed by a dedicated functional plan. These plans contain detailed inventories of existing facilities and infrastructure as well as planned improvements. In addition to the facilities covered by functional plans, the City of Ellensburg maintains and uses a number of other facilities to perform administrative functions. *Table 18* contains a list of both types of facilities, a description, and a reference to the functional plan, if applicable.

A list of capital facility improvements and projected costs for the next six years is included in Appendix A: Capital Improvement Program, and is updated annually. The functional plans listed in *Table 18* identify facility inventories, potential funding sources, and implementation strategies. For each relevant utility functional plan there are specific strategies that proactively address energy efficiency and water conservation.

Table 18. Inventory of City-Owned Capital Facilities

Facility Type	Description	Functional Plan
Ellensburg City Hall	City departments, council chambers, and city shop facilities	N/A
Ellensburg City Shop and Warehouse	Building, vehicle, and equipment maintenance, and storage	N/A
Ellensburg Library and Hal Holmes Center	Public library and meeting space	2009 Level of Service Standards and Library Goals and Objectives
Parks and Recreation	Parks and community facilities, including 26 parks, adult activity center, Memorial pool, youth center, and Racquet Center	Parks, Recreation, and Open Space Plan
Ellensburg Police Department	Police headquarters	Annual reports
Water	Infrastructure for providing potable and fire response water including water storage tanks	Water System Plan
Wastewater	Facilities that convey wastewater to the city treatment plant	Wastewater Treatment Facility Report
Stormwater	Infrastructure that conveys and manages storm and surface water	Stormwater Management Plan
Electric	Infrastructure for meeting community electricity needs	Electric System Plan
Natural Gas	Infrastructure for the natural gas distribution system	Natural Gas System Plan
Telecommunications	Infrastructure providing a fiber optic network to 50 locations throughout Ellensburg	Telecommunications Strategic Plan

Water

The City updated its Water System Plan in 2014. The plan examines water source, storage, delivery, and quality and is the strategic plan for the management and operations of Ellensburg's water system. This chapter will provide a summary of the City's water system, and establish a general policy context within which the water system plan will operate.

The water division of the City of Ellensburg operates and maintains 108 miles of underground water distribution piping, two above ground reservoirs, eight groundwater wells, one booster, and one transfer station. This extensive piping system serves over 4,800 residential and 700 non-residential customers by distributing safe, clean, and reliable water.

The water division provides constant monitoring, testing, and system maintenance to ensure the highest quality of clean water is delivered to the community.

The City has sufficient water rights to accommodate the projected 20-year growth. These water rights will allow for additional municipal wells to be added to the system as the City's water users increase.

The City will continue to verify that all capital and private development projects are designed and constructed to ensure all appropriate fire flows are met for each prospective project.

The Capital Improvement Plan for the water utility is anticipated to be primarily funded through a combination of ending fund balance, revenue generated through rates, and revenue bonds. Grants are not typically available for water utility capital improvements. At the end of 2016, the ending fund balance available for the water utility capital improvement plan was approximately $3.2 million.

The debt to total assets ratio can be used to assess the utility's leverage for bonding. At the end of 2016, debt as a percentage of total assets for the water utility was 31.8%. Based on industry standards and accepted debt ratios in the current market, the water utility indicates sufficient leverage to bond for capital improvement projects that will accommodate the projected 20 year growth.

Wastewater

The City of Ellensburg operates a wastewater division that includes operation and maintenance of 79 miles of underground sewer pipe. This extensive piping system serves approximately 5,100 residential and almost 500 non-residential customers by managing wastewater flows from sinks, showers, bathing, dish and clothes washers, toilets, and industrial processes. Wastewater flows from homes and businesses through sewer pipes that lead to the Wastewater Treatment Plant. The Wastewater Treatment Plan processes an average of 3.85 million gallons of wastewater each day.

In 2015 Ellensburg completed a 20-year plan for upgrading the City's Wastewater Treatment Facility and collection system. This chapter adopts the Wastewater Treatment Facility Engineering Report by reference, using general system information in this document to outline a policy context for the more detailed sewer plan.

The 2015 report projects the Ellensburg population to grow at 1.8%per year during the next 20 years. This is under the 2.0% growth rate projected through this comprehensive planning process. However, the existing design has a maximum treatment capacity that is greater than the growth prediction and any improvements identified for the Wastewater Treatment Facility are recommended in the 2015 report to be designed to provide a capacity equal to or greater than the existing design capacity of a population of 31,000. This recommendation is consistent to meet the 2.0% population growth and projected Ellensburg population of 32,540 by 2037.

The Capital Improvement Plan for the wastewater utility is anticipated to be primarily funded through a combination of ending fund balance, revenue generated through rates, and revenue bonds. Grants are not typically available for water utility capital improvements. At the end of 2016, the ending fund balance available for the wastewater utility capital improvement plan was approximately $2.6 million.

The debt to total assets ratio can be used to assess the utility's leverage for bonding. At the end of 2016, debt as a percentage of total assets for the wastewater utility was 28.3%. Based on industry standards and accepted debt ratios in the current market, the wastewater utility indicates sufficient leverage to bond for capital improvement projects that will accommodate the projected 20 year growth.

Stormwater

The City of Ellensburg stormwater division maintains approximately 2,500 catch basins and manholes in the public right-of-way, is comprised of 50 miles of underground pipe, and discharges to ninety outfalls in local streams. In newer parts of the city bio-swales capture, slow velocity of, and treat stormwater prior to discharging into the city's stormwater system. The City of Ellensburg operates a stormwater utility whose revenues are used to comply with the stormwater permit, including such activities as the Illicit Discharge Elimination Program, and providing public education on the effects of stormwater on water in our rivers and streams.

Refer to Environmental chapter for goals, policies, and program related to the stormwater system.

Electric

The City of Ellensburg was the first municipality in Washington State to have its own electrical distribution system, which was installed in 1891. The city's electric utility serves approximately 9,200 customers using over 50 miles of overhead conductor and 38 miles of underground cable. All new growth within the system is built with long-life, underground cable in conduit, and includes loop-feed capability wherever possible. The existing aerial facilities are in excellent condition due to continuous maintenance work over the years.

The electric utility offers a variety of services to the public. These services include assistance with applying or altering a service, as well as advising developers so they know what is required when applying for an electrical system for a sub-division, plat, or multi-family project. All requirements are based on existing city policies and standards, as well as national, state, and local electrical codes. The City's electric utility has an enviable safety record and has been recognized by the Northwest Public Power Association for its commitment to safety for many years.

The electric utility currently purchases the majority of its power from Bonneville Power Administration which delivers power to the city's four electrical substations. The 2015 Fuel Mix Disclosure showed that the City is about 97% carbon free (87% hydropower and 10% nuclear) for the fuel that was used to generate the power.

The current capacity of the electrical distribution system is such that the city is able to almost double existing peak loads. The newest substation on the north end of town was energized

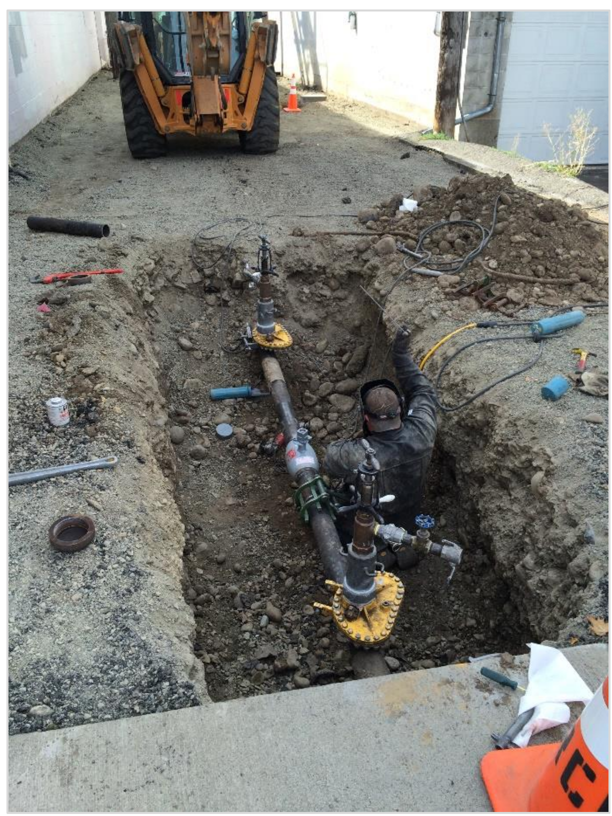
December of 2015 to meet growing demand, assist loop-feed capability, and to continue the high level of reliability city electrical customers have enjoyed. The 6-year Electric System Plan (2017-2022) incorporated the 2% population growth and projected Ellensburg population of 32,540 by 2037 into its system model, and another substation at the south end of the City will be needed within the next 20-years to meet this projected demand.

The utility has a renewable energy park that hosts solar generation facilities that were constructed between 2006 and 2013 with the most recent expansion in 2016. The utility has a long history of promoting energy conservation and encourages our customers to take advantage of all the programs the City offers to assist them in using energy efficiently.

The Capital Improvement Plan for the electric utility is anticipated to be primarily funded through a combination of ending fund balance, revenue generated through rates, and revenue bonds. Grants are not typically available for electric utility capital improvements. At the end of 2016, the ending fund balance available for the electric utility capital improvement plan was approximately $2.7 million.

The debt to total assets ratio can be used to assess the utility's leverage for bonding. At the end of 2016, debt as a percentage of total assets for the electric utility was 42%. Based on industry standards and accepted debt ratios in the current market, the electric utility indicates sufficient leverage to bond for capital improvement projects that will accommodate the projected 20 year growth.

Natural gas



The City of Ellensburg was the first municipality west of the Mississippi River to have its own natural gas distribution system, installed in 1956/1957. Today, the City has over 115 miles of distribution mains and over 5,000 customers both in the City and Kittitas County. Unlike other City utilities, the natural gas utility has a service territory defined by the Washington Utility and Transportation Commission that is not confined to the City or Urban Growth Area.

The City receives all of its natural gas from the Williams Pipeline which feeds a single measuring station from which it distributes natural gas to customers. The natural gas utility installs and maintains all of its distribution system with its own City employees. The City's natural gas utility also has an enviable safety record and has been recognized by the American Public Gas Association for its commitment to safety for many years. The natural gas utility issues safety-related information throughout the year for the general public.

The natural gas utility offers a variety of services to the public, including assistance with applying for a service, with altering a service, or for developers so that they know what information is required when applying for a natural gas system for a subdivision or plat.

In an effort to mitigate higher wholesale electricity rates, the natural gas utility provides many incentives for adding gas service lines and switching to natural gas appliances for both homeowners and developers.

The 6-year Natural Gas System Plan (2015-2020) estimated that the current contractual natural gas supply limit of the natural gas distribution system was such that the City would increase existing peak loads by 20%. Although there is a relationship between population growth and peak loads, the increase to peak load will depend on the future natural gas appliances that are installed (e.g. water heaters and stoves/ranges that have daily loads, compared to furnaces and fireplaces that contribute to peak loads). The City anticipates that incorporating the 2.0% population growth and projected Ellensburg population of 32,540 by 2037 into its next system model to be completed in 2021 will result in the current contractual natural gas supply limit could be reached within the next 20 years. The City will seek additional pipeline capacity as the natural gas utility approaches the current contractual natural gas supply limit.

The Capital Improvement Plan for the natural gas utility is anticipated to be primarily funded through a combination of ending fund balance, revenue generated through rates and revenue bonds. Grants are not typically available for natural gas utility capital improvements. At the end of 2016 the ending fund balance for the natural gas capital improvement plan was approximately $2.3 million.

The debt to total assets ratio can be used to assess the utility's leverage for bonding. At the end of 2016, debt as a percentage of total assets for the natural gas utility was 26.3%. Based on industry standards and accepted debt ratios in the current market, the natural gas utility indicates sufficient leverage to bond for capital improvement projects that will accommodate the projected 20 year growth.

Telecommunications

The City of Ellensburg is the most recent municipality in Washington State to have a City-owned telecommunications system, which was constructed in 2015. The City created a telecommunications utility in 2014 that currently services 50 locations with over 25 miles of overhead fiber optic cable and two miles of underground fiber optic cable. There is currently excess capacity in the telecommunications system, and if all fiber optic strands are eventually utilized the city would be able to replace the network hardware as necessary to gain additional capacity. The City lights the network with City-owned equipment. Operation and management of the network has been ongoing since 1999 under prior lease arrangements. In 2016 the City began to contract with Northwest Open Access Network for wholesale telecommunications services.

The City provides telecommunications services to customers, the municipality, public agencies, and telecommunications service companies. The City provides network services, internet access services, dark fiber services, and others.

Unlike other City owned and operated utilities that serve residents and businesses, the telecommunications utility has no obligation to serve all City customers. The 3-year Telecommunications Strategic Plan (2015-2017) evaluated the costs, benefits, competitive risks, and community support to expand the City's 27 mile fiber optic network to reach all residents and businesses. Based on the outcome of the strategic plan and to minimize competitive risks, City Council decided to extend the network to reach customers that are willing to pay for their costs for service extensions. The City Council considered, but did not choose to proceed with a citywide fiber to the premise project due to the projected $22 million capital investment, unrealistic high customer rates that would need to be achieved to remain solvent, competitive risks with other service providers, and a lack of community support at that time.

The Capital Improvement Plan for the telecommunications utility is anticipated to be primarily funded through a combination of revenue generated through rates, grants, and revenue bonds. Typically the telecommunications utility has been successful at receiving grants for telecommunications utility capital improvements that focus on economic development. The 2016 grant revenue for the telecommunications facility was approximately $343,000. As a relatively new utility the City has used general obligation funds to bond telecommunication capital improvements.

Library

The City of Ellensburg operates a public library, founded in 1907 in partnership with Andrew Carnegie by the Women's Municipal Movement Society of Ellensburg. The Society donated two lots on the corner of 3rd Avenue and Ruby Street and opened the library in 1910. The library has maintained a historically and socially important location in Ellensburg's downtown core, and continues to serve as the heart of the city, providing services to residents throughout the region.

The library's mission is:

> *"…to provide a safe and welcoming place where patrons can develop an appreciation for reading and learning; find information about their community and its opportunities; and investigate or explore a wide range of topics relevant to their work, school, and personal lives."*

All Kittitas County residents are welcome to use the Ellensburg Public Library and the Hal Holmes Community Center. Kittitas County annually contributes general tax funds in support of the Ellensburg Library operations and the City maintains reciprocal agreements with all other Kittitas County municipalities' libraries. The Hal Holmes Community Center was completed in 1982 and is the City's multipurpose facility providing space for community events and activities that contribute to the public good; such as performing and visual arts, and educational events. The Hal Holmes Center's public meeting spaces benefits the programming space needs of both the library and the greater community.

The library contains a large local history collection that represents the community's great interest in the City's past. The collection is partially housed in the main library and is accessible to the public, but much of the collection is inaccessible in basement archives. An adequate ventilation system and an elevator are necessary improvements to be made to the Hal Holmes basement area in order to allow public use of the archives. These improvements would allow space for public research and exploration of local history documents and photographs, as well as provide workspace to maintain and organize the collection as it grows over time.

The 2003 expansion of library facilities, and purchase of property on the east side of Pine Street between 1st and 2nd Avenues, was intended to serve Ellensburg and the region well into the future. The expansion resulted in an additional 2,350 square feet and greatly expanded the children's staff and circulation areas of the library. The expansion brought the Library and Hal Holmes Center under one roof with a shared lobby, public, and staff restrooms, and resulted in additional off-street parking located across the street from Hal

Holmes Center. However, the projected countywide growth, upward trends in library visits, and increased circulation of materials indicate there will be increased demand for space, services, and materials beyond what the current facility can provide.

The City of Ellensburg's 2003 purchase of the property on the east side of Pine Street between 1st and 2nd Avenues allows for further expansion of the library on the same block it currently occupies, moving parking to the new property across the street. Presently, the majority of the parking serving the library is on-street parking. The small off-street parking lot on the south side of the Hal Holmes Center may be taken up with any future expansion needs of the library. As the community continues to grow and other conference and meeting spaces are constructed, the Center's meeting room space may be available to meet the expanded need for library functions. This built-in room for expansion will enable the library to maintain its historically and socially important place in the downtown core.

In addition to projected countywide growth, unique factors affect the physical space needs and the services offered at the Ellensburg Public Library. These needs are driven by the need to keep up with changing technology and by the desire to improve library services and programs for all ages, with an emphasis on children and young adult programs and services that meet the needs of an aging population. Foreseeable service and space needs include: increased mobile services, expansion of the library's website and electronic resources, additional meeting space and study rooms, quiet shared reading spaces, and retention of existing off-street parking.

The Ellensburg Public Library goals and objectives and Level of Service Standards are hereby adopted into this Comprehensive Plan by reference. The goals, policies, and programs in this chapter provide the broad overall framework of Ellensburg Public Library services. Please refer to the Library goals and objectives and/or Level of Service Standards for more detail.

Police

The Ellensburg Police Department provides law enforcement services to the City of Ellensburg with 29 sworn officers working in three divisions: patrol, motors, and investigations. The Department and its personnel are expected to respond to and effectively handle a variety of criminal, societal, technological, and international type events that impact our community. In addition, the Ellensburg Police Department provides many community oriented programs such as: a school resource officer working in partnership with the Ellensburg School District; volunteer reserve officer program; code enforcement; Serving the Standard program that works with local liquor licensed establishments; National Night Out; Cop on Top fundraising campaign; and the Citizen's Academy. In 2016 the Department went through reaccreditation by the Washington Association of Sheriffs and Police Chiefs. Currently the Ellensburg Police Department is one of 60 accredited state, county, and local agencies in the state. Accreditation topics cover 134 standards that include topics such as: management of personnel, finances, use of force, code of conduct, evidence, and recruitment.

Department offices are located in the public safety building near the Central Business District. The public safety building was constructed in 1955 and remodeled in 1977 and again in 1991. The Police Department is currently moving into space within the public safety building that was vacated by the Kittitas Valley Fire and Rescue in 2016. The expansion of the Department's existing space will offer some relief to its space limitations. However, it is not a permanent solution. Options for additional space that fits the structural needs of the Police Department will need to be pursued to address existing and future demand for department services.

The goals and policies in this chapter outline the broad framework of the Ellensburg Police Department; strategic planning and annual reports provide more detailed information regarding services offered and department statistics.

Animal Shelter

The Ellensburg Animal Shelter was constructed in 1974. Since its inception, it has become a regional facility providing services to other municipalities and unincorporated areas in Kittitas County. The shelter is open to the public 6 days a week. Care for the animals housed at the shelter require care and maintenance 7 days a week. The shelter takes in stray, neglected, abandoned, law enforcement impounds, and as space allows - owner surrendered animals. The majority of adoptable animals are transferred to organizations that have behavioral and medical resources. Since 2012, education and referrals have led to a steady reduction in the amount of animals needing shelter housing. Other services provided by shelter staff include investigating cases of animal cruelty, looking into a variety of nuisance complaints, working with Kittitas Valley Healthcare and Kittitas County Public Health to address animals that pose a public health risk, and maintaining an active volunteer program. As future City and regional needs increase, a staff and facility needs assessment will be necessary to plan for the expansion and modernization of shelter facilities.

Fire/Emergency Management Services

Ellensburg previously operated a fire department with 20 paid staff and more than 20 volunteer firefighters. Fire and Emergency Medical Service responsibility is now shifted to the Fire Protection District #2 which merged with the City's fire department to become Kittitas Valley Fire and Rescue (KVFR). KVFR now employs 30 career firefighters, 70 volunteers, 12 reserves, and 9 residents. The community has a fire insurance rating of four, one step above the previous rating of five, significantly reducing insurance rates in the city. KVFR also provides emergency medical services at the Advanced Life Support and Basic Life Support providers.

The headquarters station, station 29 is located on Mountain View Avenue, one of the City's main arterials. Station 29 responds to emergency calls in the South and West sections of the district. Station 21 is located on the East side of Ellensburg and covers emergency calls in the North and East sections of the district. Volunteer stations located in the rural areas of the district respond to calls in their areas. All stations can cover one another in times of heavy call volume or larger incidents.

Growth in Ellensburg's population to the north, and the increasing traffic on the community's arterial streets, are increasing pressure to develop a remote fire station to serve the northern areas.

General Growth Projections

According to growth projections, which provide the foundation for the Comprehensive Plan, the city could experience an increase of up to 11,757 additional people or about 5,300 households over the next 20 years. This projection is based on the population target allocated to the City by Kittitas County (see Land Use chapter for additional discussion).

For capital facilities planning purposes, the projected growth expected over the 20-year period was allocated on an average basis, rather than based on a year-by-year projection that tries to factor in anticipated growth cycles. Growth will undoubtedly not occur precisely as projected over the next 6-year or even the 20-year period. For this reason, the GMA requires that the Capital Improvement Plan be updated at least every 6 years. This provides local governments the opportunity to re-evaluate their forecast in light of the actual growth experiences, revise their forecast if necessary, and adjust the number and/or timing of capital facilities that are needed.

The Capital Improvement Plan (Appendix A) is updated annually as part of the City's budget process, thereby ensuring that the plan reflects the most current statistics related to growth in Ellensburg, and that city-managed facilities and utilities are slated for upgrade in accordance with both the level of service standards and concurrency standards.

Level of Service

Level of Service is a term that describes the amount, type, or quality of facilities that are needed to serve the community at a desired and measured standard. This standard varies, based not only on the type of service that is being provided, but also the quality of services desired by the community. A community can decide to lower, raise, or maintain the existing Levels of Service for each type of capital facility and service. This decision will affect both the quality of service provided, as well as the amount of new investment or facilities that are, or will be needed in the future to serve the community.

Level of service standards state the quality of service the community desires and for which service providers should plan. The adoption of level of service standards indicates that a community will ensure those standards are met, or can be met, at the time development occurs. If such standards cannot be met, the community may decide to decrease the standards, determine how the needed improvements will be paid for, or deny the development. The Growth Management Act requires communities adopt level of service standards for transportation facilities (see Transportation chapter); Ellensburg has also opted to establish service standards for the following City-managed capital facilities.

Table 19. Level of Service Standards

Service/Facility	LOS Standard
Fire Protection	Follow the guidelines from the National Fire Protection Association #1720
Emergency Medical Service	Basic Life Support at 5 minutes/90% of the time Advanced Life Support at 9 minutes/90% of the time
Water Utility	Provide water meeting all requirements of Federal Safe Drinking Water Act and Washington State Department of Health to all customers desiring service that lies within the City's water service area
Sewer Utility	Provide a collection system capable of conveying all wastewater discharges from residential, commercial, and industrial customers within the City limits and UGA
Stormwater System	Provide a public collection system capable of conveying a storm event with a 25-year return frequency without flooding or damage to structures. Meet the requirements of the City's Stormwater Discharge Permit
Natural Gas Utility	Provide minimum gas pressure of 20 psi at the customer's meter
Solid Waste Management	Weekly curbside refuse collection
Library Service	2009 Level of service document incorporated into Comprehensive Plan by reference
Broadband Internet	150/150Mbps for all residences and businesses, 1/1 Gbps for all anchor institutions (i.e. schools, hospitals, libraries, and government buildings).

Adequacy and Concurrency

According to the Growth Management Act, public facilities and services shall be adequate to serve the development at the time the development is first occupied, without decreasing the Level of Service described in the Comprehensive Plan. Adequate public facilities and services, such as water, sewer, power, and surface water management, are required in order to serve development. Additionally, the GMA mandates concurrency for transportation services to ensure that transportation improvements or strategies are in place at the time of development, or that a financial commitment is made to complete the improvement within 6 years.

The City's water, sewer, telecommunications, electric, and gas utilities have the ability to meet the current demand at the service levels established in the Comprehensive Plan. The City uses the most current Department of Ecology stormwater manual to ensure that new development meets the established standards for surface water management and requirements of the National Pollutant Discharge Elimination System permit. If the City determines that any of the facilities or utilities will not be able to meet these city services, the City could choose to:

- Modify the Land Use Map through an amendment to the Comprehensive Plan;
- Modify the Level of Service standards through an amendment to the Comprehensive Plan; or
- Restrict development until service can be provided at the established level of service standards.

Other services such as police, fire, parks, and schools, are extremely important, and may be generally available at the time of occupancy; however, upgrades may be needed to provide services to new development at the same level or rate as other parts of the community. In these situations, it may take a few years for these improvements to come on-line.

GOALS, POLICIES, & PROGRAMS

The following capital facility and utility goals, policies, and programs are designed to work with the other elements to ensure that capital facilities and utilities are provided in a safe, reliable, and affordable manner, while keeping pace with projected growth in the City of Ellensburg.

Goal CFU-1: Ensure that system services are delivered in a safe and reliable manner and are in compliance with regulatory requirements.

Policy A **Ensure that public facilities, utilities, and streets are designed, constructed, and maintained to efficiently and effectively meet the needs of the community and meet applicable state and federal requirements.**

Program 1 Coordinate major capital facilities investments to implement the comprehensive plan.

Program 2 Continue to practice co-location of new public and private utility distribution facilities in shared trenches when reasonable and feasible, and coordinate construction timing to minimize construction-related disruptions and reduce the cost of utility delivery.

Program 3 Seek co-location opportunities in the UGA and service areas.

Program 4 Purchase land as needed for the location of capital and utility facilities.

Program 5 Maintain capital facility renewals and replacements in consideration of rising rates.

Policy B **Provide services concurrently with, or in advance of, demand.**

Program 1 If probable funding falls short of meeting existing needs the land use element will be reassessed to ensure that the land use element, capital facilities element, and financing plan within the capital facilities element are coordinated and consistent.

Program 2 Continue to collect system development charges for water and sewer services as a financing tool to help fund needed infrastructure for new development.

Program 3 Any changes to electric, water, and sewer service areas should be based on expansion of the UGA.

Program 4 Purchase or produce commodities such as power, natural gas, and water supply concurrently with, or in advance of, demand.

Program 5 In response to future growth, expand the gas utility into the gas service territory as set by the Washington Utilities and Transportation Commission.

Program 6 Implement low-cost investments, such as conduits, piping, and joint-utility extensions when opportunities with possible delayed benefits present themselves that would be unaffordable or otherwise inaccessible in the future.

Policy C **Continue to follow and enforce existing city standards for public facilities and services.**

Program 1 Continue policy of providing water, sewer, and storm drainage services with highest priority given to improving services in those areas where it already exists, next highest priority to infilling areas surrounded by utility service, and lowest priority to extension of services into unserved areas.

Program 2 Protect and conserve existing water rights and pursue opportunities for new water rights as necessary to support growth.

Program 3 Continue to coordinate affordable and reliable collection of solid waste and recycling collection services that meets the needs of city residents.

Program 4 Facilitate a culture of safety through education and certification programs for utility service workers.

Goal CFU-2 Maintain cost effective rates for providing utility and capital services while ensuring adequate system maintenance.

Policy A **Emphasize compact growth, including the infill of vacant or undeveloped land to allow for the efficient provision of services.**

Program 1 Utilize and encourage the use of existing utility systems for new developments.

Program 2 Encourage and provide City utility services to UGA residents who sign necessary agreements for utility connection.

Program 3 Use utility extension agreements for the cost of extensions for water, sewer, and electricity, as a financing tool to help fund necessary infrastructure for new development.

Policy B **Manage expansion of the electrical utility into the UGA in response to future growth based on the following approaches:**

Program 1 Purchase existing assets from other utilities, recognizing that the cost will be incurred by customer/developer.

Program 2 Upon annexation, after the required seven-year period purchase the assets from existing electric providers in the UGA or build new assets.

Program 3 Upon request and sufficient power supply, develop agreements with existing electric providers in the UGA for shared assets (wheeling) to serve customers/developers.

Program 4 Continue to require developers to provide assets within developments.

Policy C **Maintain affordable rates by continuing to require annexation to the City, or approval of a utility extension agreement with the City to receive any city water, sewer, or electric service.**

Program 1 Continue to require a standard outside utility agreement concerning provision of water, sewer, and electric services.

Goal CFU-3 Develop facilities and encourage use of services in an environmentally sensitive manner.

Policy A Promote water and energy efficiency and alternative energy sources.

Program 1 Promote the use of solar technology within the community.

Program 2 Assist citizens with upgrading energy efficiency in homes and businesses through weatherization, and improvements to mechanical and lighting systems.

Program 3 Promote the use of Energy Star and green building practices in new construction.

Program 4 Promote efficient use of lighting to preserve our night skies.

Program 5 Continue to comply with City water use efficiency standards.

Program 6 Continue to support the County’s operation of composting and recycling facilities in the City.

Program 7 Work with state and regional air quality agencies, and Kittitas County Public Health to provide outreach and education to Ellensburg residents on energy efficient wood stoves, incentive programs, and burn bans.

Policy B **Design, construct, and maintain facilities to minimize their impact on surrounding neighborhoods and the environment.**

Program 1 Promote the undergrounding of new and existing utility lines, where physically and financially feasible, as streets are improved and/or areas are redeveloped in coordination with other utilities and capital facility systems.

Goal CFU-4 Support the use of data and technology to meet residents' needs and improve efficiency of services.

Policy A **Support information and communication technology that allows city officials to interact directly with the community and the city's infrastructure.**

Program 1 Consider metering technology migration from the City's legacy automatic meter reading (AMR) to advance metering infrastructure (AMI) for electric, natural gas, and water utilities.

Program 2 Use information and communication technology to monitor infrastructure and efficiency of services.

Policy B **Encourage new and cost-effective information and telecommunications technologies that would benefit residents and improve services.**

Program 1 Facilitate communication technology deployments for next generation wireless services, such as the use of City utility poles, streetlight poles, traffic signals, and other City assets for small cell deployment.

Program 2 Encourage public-private partnerships to take advantage of the city's fiber optic network to facilitate innovation, and expand service delivery.

Program 3 Leverage existing city telecommunications assets and utility service experience to deliver the fiber optic broadband service to businesses and residents that provide a similar level of customer service and reliability as the City's other utilities, in a manner that meets the state and federal goals for speed and equitable deployment, and is supported to address business concerns with service outage restoration.

Goal CFU-5 Maintain consistent countywide planning policies for siting of essential public facilities.

Policy A **Continue to support and work with the Kittitas County Conference of Governments (COG) to establish a process for siting essential public facilities that are of a countywide or statewide nature as set forth in the countywide planning policies.**

Program 1 Maintain an inventory of existing essential public facilities in the City of Ellensburg and its UGA.

Program 2 Apply the siting process outlined by the Kittitas County Countywide Planning Policies to all essential public facilities identified by the City, the County, regional agreement, or by State or federal government when such facilities are proposed within the City or the UGA.

Program 3 Maintain regulations that ensure essential public facility siting is consistent with all adopted City ordinances and the adopted City comprehensive plan.

Program 4 Coordinate with Kittitas County and other public entities to establish an official map identifying precise arterial corridors, public parks and open spaces, and other public facility locations for current and future dedication and/or acquisition.

Program 5 Assist in coordinating the construction of a public safety broadband network, utilizing City telecommunications utility assets if necessary and appropriate.

Goal CFU-6 Provide quality library materials and services to fulfill the current and projected educational, information, cultural, and recreational needs of the entire community in a location and environment that is welcoming and accessible.

Policy A Maintain and enhance the library collection to meet the lifelong learning needs and recreational interests of the entire community.

Policy B Seek funding to meet and maintain the Level of Service Standards for our growing population.

Policy C Maintain sufficient facilities to provide a range of library services that meet current and projected community needs.

Policy D Maintain current programming and community space at the Hal Holmes Center for Library and community use.

Goal CFU-7 Uphold law and order while maintaining peace and safety for citizens and police officers by providing the best in public safety services.

Policy A Maintain accreditation through the Washington Association of Sheriffs and Police Chiefs.

Policy B Maintain sufficient facilities to provide public safety services that meet current and projected community needs.

Policy C Continue to seek and provide innovative training opportunities for staff and volunteers.

Policy D Use social networking and other data sharing opportunities, as appropriate, to provide information and education to create better citizen understanding of Ellensburg Police Department services.

Policy E Continue to provide citizen engagement opportunities and events that enable community interaction with the Ellensburg Police Department.

Policy F Seek proactive approaches to address public safety issues.

ACTION ITEMS

Annual Updates of Facility Plans

Annually update facility plans within projected funding capacities and provide summary of probable funding sources.

Establish Official Map of Public Facility Locations

Coordinate with Kittitas County and other public entities to establish an official map identifying precise arterial corridors, public parks and open spaces, and other public facility locations for current and future dedication and/or acquisition.

Inventory of Essential Public Facilities

Update and maintain an inventory of essential public facilities in the City of Ellensburg and its UGA.

Update Telecommunications Utility System Plan

Ensure a Functional Plan is regularly updated to identify facility inventories, potential funding sources, and implementation strategies for the Telecommunications Utility.

Reduce barriers and costs to telecommunications utility infrastructure extension

Coordinate with stakeholders and pursue “Dig Once” or pavement moratorium policies to encourage cost effective utility infrastructure development and extend the service life of city transportation assets, and One Touch Make Ready (OTMR) or “Climb Once” policies to simplify telecommunications infrastructure deployment.

Develop Digital Inclusion Plan

Convene partners to develop a digital inclusion plan to guide decision-making on telecommunications infrastructure and measure progress toward digital equity.

POLICY CONNECTIONS

Utilities and capital facilities must keep pace with growth, the **Land Use** chapter includes policies and information about Ellensburg’s projected growth.

The **Economic Development** chapter includes guidance on telecommunications utility infrastructure to support economic development.

The **Transportation** chapter provides information for Ellensburg’s transportation system including streets, non-motorized facilities, and public transit facilities.

The **Parks and Recreation** chapter includes goals that create a framework for future parks, recreation, and open space decisions. More specific guidance is provided in the 2016 Parks, Recreation, and Open Space Plan.

The **Environment** chapter addresses the stewardship of natural resources including ground and surface water.

CHAPTER 5 PARKS AND RECREATION

WHAT YOU WILL FIND IN THIS CHAPTER:

- Background information on the development of the Parks and Recreation System Plan (PRSP).
- General overview of Ellensburg's parks and recreation department.
- Incorporation of the PRSP into the Comprehensive Plan by reference.
- Summary of PRSP Goals.

OVERVIEW

The Ellensburg Parks and Recreation Department has six program divisions: youth programs, adult senior services, athletics, aquatics, fitness and recreation, and park maintenance.

In 2016, Ellensburg updated and adopted a Parks and Recreation System Plan (PRSP) that provides guidance on the management and development of Ellensburg's parklands, recreation programs, trails, and open spaces.

The PRSP also serves to unite the system into a coordinated network that reflects the needs and recommended priorities for the benefit of city residents, the surrounding community, and visitors.

The PRSP is on a six-year update cycle, in alignment with the requirements of the Washington State Recreation and Conservation Office to maintain eligibility for state and federal grant programs, and is an important tool for meeting Growth Management Act requirements.

BACKGROUND & CONTEXT

Ellensburg maintains a parks and recreation system that includes a wide variety of facilities and activities for Ellensburg and Kittitas County residents.

The 2016 Parks and Recreation System Plan (PRSP) provides a detailed description of Ellensburg's important natural features and an inventory of existing parks, facilities, and programs that make up Ellensburg's parks and recreation system. The PRSP provides detailed descriptions of each area that includes: existing conditions, current inventory of facilities, and recommended capital needs. In addition, the City Parks and Recreation Department maintains and operates four indoor year-round facilities including an adult senior center, municipal pool/fitness center, youth center, and racquet and recreation center.

The PRSP combines technical analysis with input from the community to set a direction for the future of the park and recreation system. The PRSP represents the needs, desires, and recommended priorities of the community in relation to parks and recreation.

The PRSP includes an action plan that includes specific measures for the park and recreation system and park master plans for Kiwanis Park, Irene Rinehart Riverfront Park, Veterans Memorial Park, Lions Mountain View Park, and Reed Park that address current and future community needs and recommendations. The action plan includes the necessary steps to address the goals, policies, guidelines, and standards adopted in the PRSP.

In 2016 the City, Ellensburg Business Development Authority, Ellensburg Downtown Association, and the Kittitas County Chamber of Commerce jointly contracted

ELLENSBURG PARK CLASSIFICATIONS

Pocket parks – 8

- Craig's Hill Triangles
- Catherine Park (undeveloped)
- Entry Park
- Friendship Park
- Jennison-Repp
- Kleinberg Park
- Rotary Pavilion
- Wippel Park

Neighborhood parks – 6

- Kiwanis Park
- Lions Mountain View Park
- McElroy Park
- North Alder Street Park
- Veteran Memorial Park
- West Ellensburg Park

Community parks – 2

- Paul Rogers Wildlife Park
- Reed Community Park

Regional parks – 2

- Irene Rinehart Riverfront Park
- Rotary Park

with Arnett Muldrow and Associates to prepare a Downtown Market Study and Economic Development Plan. Findings from this study included a recommendation to develop a public gathering space in or near the City Central Business District. In addition to the action plan in the PRSP, action to acquire property and develop a downtown public space is anticipated. By purchasing property, the City, with community and user-group input, would design and develop a space that meets the current and future park needs in downtown Ellensburg. Through partnerships with various local organizations, the City will be able to host and co-sponsor events held throughout the year in downtown Ellensburg.

The needs identified in the PRSP are based on population projections consistent with the growth anticipated during the planning period of this comprehensive plan. It is the intention to implement the PRSP through existing and future partnerships, pursuing grant-funding opportunities, and including parks projects in the annual capital improvement plan as appropriate.

Existing funding sources for implementation of the Parks and Recreation Capital Improvement Plan include the City's general obligation fund, growth impact fees, and capital funding. The 2015-2016 general fund budget for Parks and Recreation was about $2.2 million with a 25% increase from the previous year. The City has collected park impact fees since 1994 per single family home, new multifamily residential unit, and manufactured home space or lot. Under the City's adopted State Environmental Policy Act (SEPA) ordinance park impacts may also be collected for new commercial, industrial, and institutional uses based on the impact the project will have on such facilities.

According to the City's PRSP, the cost of meeting future park and recreation needs could exceed current anticipated financial capabilities which might require additional funding sources.

The PRSP is hereby adopted by reference into this Comprehensive Plan.

ELLENSBURG PARK CLASSIFICATIONS

Natural open space – 3

- Naneum Watershed (city owned)
- Naneum Watershed (leased from DNR)
- Reecer Creek Restoration

Special use areas – 5

- Adult Activity Center
- Memorial Pool/Fitness
- Skate Park
- Youth Center

Trails and connections - 15

Beautification areas

GOALS, POLICIES, & PROGRAMS

The following goals are directly from the PRSP. For the full list of objectives that pertain to each of the following goals refer to Chapter 2: Goals and Objectives in the Parks and Recreation System Plan hereby adopted by reference.

Goal PR-1 Administrative

Goal PR 1.1: **Sustainable resources and coordinated management:** Create effective and efficient methods of acquiring, developing, operating, and maintaining facilities and programs that accurately distribute costs and benefits to public and private interests.

Goal PR-2 Recreation facilities and programs

Goal PR 2.1 **Citywide programs and services:** Develop high quality recreational programs and services that meet all community and group needs.

Goal PR 2.2 **Recreational facilities:** Develop a high quality, diversified recreation system that provides for all age and interest groups.

Goal PR 2.3 **Design and access standards:** Design and develop facilities that are accessible, safe, and easy to maintain with life cycle features that account for long-term costs and benefits.

Goal PR-3 Special historical and cultural resources/special use areas

Goal PR 3.1 **Historical resources:** Develop a high quality, diversified park system that preserves historical opportunity areas and features.

Goal PR 3.2 **Manmade environments and features:** Incorporate interesting manmade environments, structures, activities, and areas into the park system to preserve these features and provide a balanced park, recreation and open space experience – such as the Northern Pacific Railroad Depot, Cascade and Town Canals.

Goal PR 3.3 **Cultural arts programs and resources:** Develop high quality, diversified cultural arts facilities and programs that increase community awareness, attendance, and participation opportunities.

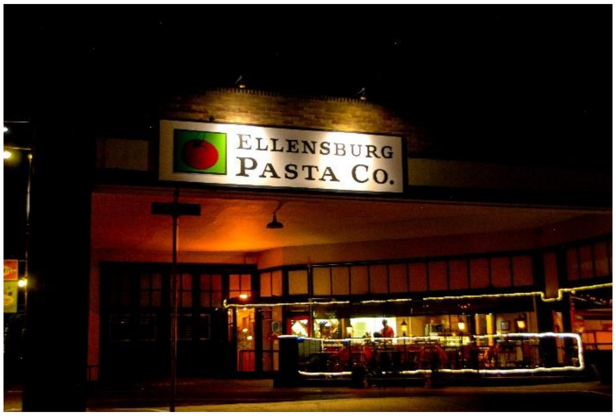
ACTION ITEMS

Action items are included as objectives in the 2016 Park, Recreation, and System Plan adopted by reference into this Comprehensive Plan.

POLICY CONNECTIONS

The **Transportation** element contains a set of policies on active modes of transportation and ways to improve streets and trails, and neighborhood connectivity.

The **Land Use** element establish land use patterns that promote walking and biking and policies that locate new higher density housing near existing parks.



CHAPTER 6 ECONOMIC DEVELOPMENT

WHAT YOU WILL FIND IN THIS CHAPTER

- Information about the local economy, including statistics on population, employment, businesses, and employment sectors.
- Policies and programs that seek to help Ellensburg build a promising economic future.
- Policies that provide a framework for leveraging tourism and promoting Ellensburg as a destination.
- Policies that seek to maintain a qualified workforce and promote living wage jobs.

OVERVIEW

This chapter contains goals, policies, and programs to define Ellensburg's role in economic development, and to help the City build a healthy economy. While economic activity exists at all levels, both public and private, local government's role is to establish parameters for private markets, provide vital services, and ensure development enhances the quality of life in Ellensburg.

A healthy economy adds to all aspects of the community, from jobs to infrastructure to community services. A healthy local economy can strengthen the community's position as a unique and attractive place to work, live, play, and visit.

The goals, policies, and programs contained in this chapter aim to guide the City of Ellensburg in developing a supportive business environment for new and existing businesses with the intent of providing a range of employment opportunities for residents, and a strong tax base for the City.

BACKGROUND & CONTEXT

With a population of just about 21,000 as of 2023, Ellensburg is the center of commerce and government for Kittitas County. It offers services for local residents, and the financial, religious, and educational institutions that serve an area much larger than what is within city limits. Ellensburg is a central gathering place for the regional community, and hosts a diversity of activities, events, and services that serve more people than those within the city limits of Ellensburg. Ellensburg is known as the home of Central Washington University and the annual Ellensburg Fair and Rodeo that attracts national attention.

The quality of life in Ellensburg is characterized by a clean environment, vibrant downtown, and outstanding outdoor recreational activities, all of which are important factors in nurturing economic growth. Businesses provide property, sales, lodging tax and other revenues that support public infrastructure and maintain quality of life. As local and national economies and lifestyles evolve, it will become more important for Ellensburg to maintain and enhance its livability through smart urban design that reflects the values and choices of the community. The Ellensburg community is challenged with the availability of living wage jobs, and with the City's ability to continue providing services that foster business development and increase economic opportunities. Residents want employment, retail, and social opportunities that allow them the ability to live, work, and play in the community.

Ellensburg's economic base has been relatively narrow since its settlement in the late 1800s. While Ellensburg still enjoys a strong agricultural economy, the community as a whole has become less dependent on natural and agricultural resources. Today Central Washington University, Kittitas Valley Healthcare, state and local government, and food and retail services are strong economic drivers in the community. Ellensburg has also experienced an increasing number of residents commuting to Yakima County and to the greater Puget Sound region for employment opportunities.

As of 2022, the top five employers in Ellensburg are: Central Washington University, Kittitas Valley Healthcare, Ellensburg School District, Kittitas County, and Anderson Hay and Grain. Tourism and retail industries are also key employers.

The growth in metropolitan areas near Ellensburg—King County in particular—is changing the community's economic position. The US Census Bureau named Kittitas County the 10th fastest growing county by percentage in the United States in 2015 to 2016 with a 4.2 percent growth rate. Kittitas County was the only county in Washington on the list. The same report cited the City as the third-fastest growing micropolitan area in the country.

Transportation congestion and high home prices in urban areas are pushing people into rural Kittitas County for a more relaxed and affordable place to live. The lack of congestion and ubiquitous changes in technology makes commuting and remote work a reasonable alternative to living and working in urban areas. An increasing number of residents are working in Yakima County and the greater Puget Sound region. According to the 2016 Kittitas County Population Projection Review and Analysis, in 2013 46 percent of working Kittitas County residents worked outside of Kittitas County, with 16 percent of those commuting to King County.

Equitable Economic Development

While the overall goal for economic development in Ellensburg is to promote the wellbeing, vitality, and quality of life for residents, not all residents have equal access to education, housing, job opportunities, and therefore, the same quality of life. As the community invests in the future, it is with the commitment to work together to provide tangible solutions to create an equitable economy. This work includes examining existing policies and procedures, outlining economic development goals with an equity lens, and inviting more diversity within leadership roles in the community.

Working with community partners, priorities would include educational opportunities, workforce development, business attraction, retention and expansion, and affordable housing.

Economic Sectors

The following is a brief synopsis of the economic drivers in the City of Ellensburg. More information on each of these drivers, as it pertains to land use, is provided in the Land Use Element.

Impact of the Covid-19 Pandemic

Like many rural communities around the state, the long-term impact of the global pandemic Covid-19 is still being measured. Small businesses within Ellensburg faced many challenges and state, county, and local governments stepped in to help our community with additional resources to get through unprecedented times. As we move into a post-pandemic economy, the direct impact on our community is still unknown, however, we continue to be challenged by instability throughout the supply chain, the growing cost of goods, expanded need for community assistance and resources, and a growing need for affordable housing.

As a result of the acceptance of remote work opportunities, coupled with the rising cost of housing prices in neighboring counties, the demand for new homes in Ellensburg has increased, driving up the average home price. This has created a higher demand for affordable housing, as the median income has not kept pace with the rising housing market.

Ellensburg will continue to monitor the effects of the global pandemic and seek innovative measures to strengthen the region and create a stronger, more resilient economy for the community.

Commercial and Industrial

Ellensburg's early industrial development focused along the railroad tracks to the west of downtown. Over time, land use designations and zoning patterns have continued this pattern, with the bulk of Ellensburg's industrial land located along a narrow strip paralleling the Burlington Northern Santa Fe (BNSF) railroad tracks. Most of this land is in the 100-year floodplain. Commercial and industrial development has expanded along Dolarway Road to connect to the area surrounding the west I-90 freeway interchange. Additionally, the northernmost portion of Ellensburg's UGA surrounding Bowers Field is designated for light industrial use to attract and accommodate business innovation and family-wage jobs, with more light industrial uses in a variety of existing zones, along with inventive ideas to mitigate industrial development in the floodplain areas.

A 2016 Downtown Market Study and Economic Development Plan indicates that local shoppers are traveling outside of Ellensburg to purchase daily goods and services. The nearest large commercial center is Yakima, 35 minutes to the south, which is a popular destination for various kinds of retail shopping.

Three key highways meet at Ellensburg. Interstate 90 is the state's primary east-west route; Interstate 82 carries traffic through south central Washington to population centers in Yakima and the Tri-Cities. State Route 97 moves traffic north to Wenatchee. These highway interchanges provide substantial opportunity for commercial development. The south interchange at Canyon Road is currently the more developed of the two existing interchange areas, offering lodging, dining, and gasoline sales. The west (I-90/SR 97) interchange provides similar services, but not at the same intensity. Both interchange areas have been identified for regional retail commercial development, at a scale that serves the City of Ellensburg, as well as the surrounding region. As new development of big-box stores and shopping centers slow on a national level, however, a variety of commercial and public-service uses for these commercial and industrial sites are being explored, including distribution warehousing.

Downtown Commercial

The development of commercial areas outside the downtown core has distributed business activity beyond the traditional range of downtown. The community's passion for downtown Ellensburg is evident, as shown in its commitment to preserving historic buildings while staying on the cutting edge of reuse and revitalization.

As a result, downtown Ellensburg has experienced a renaissance over the last decade with many buildings undergoing restoration; upper floors of long-shuttered historic buildings have opened, expanding residential, commercial, and civic space. A new boutique hotel, the redevelopment of a downtown city center park, and expansion of residential, artistic, and commercial offerings have added to the high quality of life for Ellensburg's City Center. A Certified Main Street community, the thriving downtown is on the National Register of Historic Places, named a Dozen Distinctive Destinations by the National Trust for Historic Preservation in 2007 and a Great American Main Street Award finalist by the National Main Street Center in 2018.

Healthcare

Kittitas Valley Healthcare operates KVH Hospital, an accredited Critical Access Hospital and the state of the art, Medical Arts Center along with multiple clinics that include primary care, internal medicine, occupational medicine, orthopedics, surgical, and women's health services. The Emergency Department at KVH Hospital is designated as a Level IV trauma service by the State of Washington Department of Health and is staffed 24-hours-a-day team of emergency personnel.

KVH is the second largest employer in Ellensburg, with over 600 employees. The hospital is working on a new campus master plan that will expand the footprint of the campus. In anticipation of the projected growth in Ellensburg's 65 or older population, KVH is expected to remain a key part of Ellensburg's economic growth over the next 20 years.

Central Washington University

Central Washington University is an important and vital force in the community. CWU's campus occupies more than 380 acres and employees approximately 1,800 people. The $113 million annual payroll supports retail, housing, and entertainment businesses; CWU spends nearly $15 million in the area with vendors for everything from catering to furniture. Construction spending of nearly $500 million since 2010 has supported employment throughout the region and built one of the most beautiful and modern campuses in the state.

The Central Washington University Strategic Plan calls for continued public service and community engagement, with emphasis on the level of collaboration between the University and local communities to contribute to the education, social, and economic progress of Washington communities.

Under new leadership in 2021, Central Washington University is committed to working with the City of Ellensburg to expand community engagement, collaborative partnerships, and regional economic development. It will be important to understand enrollment trends in the post-pandemic era as the University—like other higher education institutions nationwide—have experienced a decline. Historically, students have been a significant portion (nearly 40%) of the City's population which drives housing and other public services.

Tourism

Tourism is one of the five top economic drivers for Ellensburg, with year-round events such as Dachshunds on Parade, Ellensburg Music Festival, Buskers in the Burg, Winter Hop Brewfest, First Friday Art Walks, and many others providing entertainment for thousands of locals and visitors. Many events are held in the historic city center, with Central Washington University also offering a full calendar of music, conferences, and sports related activities. Outdoor recreation, event and performance centers, conferences, and youth sports provide growth potential for the local tourism industry. Ellensburg's creative industry, that includes tourism, has the potential to help drive Ellensburg's overall economic growth.

Lodging tax continues to grow steadily with 2018 recording $530,000, 2019 recorded at $578,000, while 2020 experienced a drop due to the global pandemic. However, post Covid-19, a strong year-over-year rebound was realized in 2022 recording revenues of $675,000. These funds benefit the community in a number of ways through increased tourism, event and project grants, and capital improvements for civil facilities and parks.

Ellensburg is home of the Kittitas County Event Center which hosts the Kittitas County Fair and Ellensburg Rodeo. The Fair and Rodeo is held each Labor Day weekend and the rodeo is continuously ranked in the top 10 rodeos in the nation with over 25,000 visitors attending from outside the community.

The Event Center is located on 21 acres just South of Central Washington University. The Event Center hosts more than 1,500 events throughout the year for community organizations, trade shows, expositions, equestrian and livestock events, and other special events. The Center includes conference and event spaces, an indoor arena, stock pens, barns, RV hookups, and on-site parking.

With some structures built over 90 years ago, the Kittitas Valley Event Center is listed on both the Washington State and National Register of Historic Places, offering both cultural and economic opportunities for Ellensburg and the surrounding region.

Technology

While the technology sector is not yet a significant portion of Ellensburg's current economy, there is a drive to expand and develop this throughout the region utilizing multi-county partnerships that elevate and promote the Central Washington Region as a whole. The technology sector tends to offer well-paying jobs and is attracted to good schools, high quality of life, and recreational amenities. Ellensburg embodies these characteristics while offering the City of Ellensburg's growing telecommunications utility (see Capital Facilities and Utilities chapter) as well as the proximity to Seattle, one of the top tech hubs in the nation. CWU has state-of-the-art computer science facilities along with technology programs in the Departments of Information Technology Administrative Management (ITAM), Computer Sciences, and Advance Industrial Sciences that support areas of future economic expansion and digital transformation of industry.

Arts and Culture

The arts play an important role in the economy in Ellensburg; home to many artists, designers, creative entrepreneurs, and art nonprofits that may be classified under other categories of business activity. Nonprofit arts organizations serve as regular economic contributors to tourism and local job base. For example, the Laughing Horse Arts Foundation (LHAF) gives operational support for a sponsor for several performing arts organizations under the LHAF foundational umbrella. Long standing festivals and organizations such as Ellensburg Music Festival (formerly Jazz in the Valley) and Valley Theatre Company, have brought people from all over the state to celebrate the arts. Central Washington University is home to a top-rated academic music program that is dedicated to achieving the highest standards of musical knowledge, performance, and teaching. In addition to sponsoring remarkable student performances, the department brings in world-class musicians throughout the year. A growing campus public art and sculpture collection and degree programs in art, multi-cultural and diversity studies, film and theatre, craft brewing and wine studies program add to the richness of the creative sector in Ellensburg.

The Creative Industry is a vital component of a healthy regional economy and the arts play an important role in the economic development of Ellensburg. The creative sector is a $29 million economic driver that will increase tourism, bring new and innovative job creation, and expand opportunities throughout Ellensburg. Home to many artists, designers, creative entrepreneurs, artesian spirits, and artistic nonprofits, Ellensburg has become a central regional hub with a flourishing art and cultural community.

In 2016, the City Council designated 10 percent of construction sales tax revenue to community art, with an annual floor of $25,000 and a ceiling of $50,000. As stewards of these funds, the Ellensburg Arts Commission develops strategies, procedures, and goals that reflect the best usage to further the impact of the arts community. Events and programs such as First Friday Art Walk, the Ellensburg Poet Laureate, Project Grant Program, the Ellensburg Music Festival, Buskers in the Burg, The Bite of the Burg, and Moments to Remember generating income for artists and increase revenue for businesses annually.

In 2021 the Ellensburg Arts and Cultural Alliance was established, uniting artists, artistic nonprofits, foundations, economic development organizations, municipalities, Central Washington University, and community leaders with the purpose of positioning the arts to thrive in Ellensburg and drive economic growth for our community. With a robust strategic plan and strong community participation, growth within the creative sector can bolster the overall economy of Ellensburg.

Opportunity Zones

Both industrial and downtown retail areas lie largely within "Opportunity Zones," a community development program established by Congress in the Tax Cuts and Jobs Act of 2017. The zones are intended to encourage long-term investments in low-income urban and rural communities nationwide. The Opportunity Zones program provides a tax incentive for investors to re-invest their unrealized capital gains into Qualified Opportunity Funds (QOF) that are dedicated to investing into Opportunity Zones designated by each state.

Ellensburg's two Opportunity Zones comprise more than 6,120 acres. Of that, 22 percent is designated for commercial or industrial use; 2,540 acres of vacant land are ready for development.

- Census tract 5303797-5600 includes portions of Central Washington University, the Historic District and Main Street to I-90. The tract includes the city's warehouse district and is bisected by the BNSF railroad line. Sixty percent of the tract lies within the incorporated city, with the remaining 40 percent within the Urban Growth Area. The tract comprises over 2,000 acres with 44 percent designated as areas that are development-ready with direct access to Interstate 90, rail, and city utilities. Zoning allows for a broad mix of developments: Residential Suburban, Central Commercial, Commercial Highway, Central Commercial II and Light Industrial.
- Census tract 5303797-5500 lies north and west of tract 5600. It runs in a southeast-northwest direction with I-90 as the southwestern border and the Palouse to Cascades Trail acting as the northeastern border. Fifty percent of the tract lies within the incorporated city or Urban Growth Area, with the remaining sited on county land. Zoning allows for diverse applications: Light industrial, urban residential, general commercial, residential suburban, residential office, and commercial tourist.

Foreign Trade Zones

In 2010, the Port of Moses Lake established a 90-mile radius of a Foreign Trade Zone (FTZ) that included all of Kittitas County. A FTZ allows companies to store goods duty-free, delay tax and customs payments, and lower inventory costs. By establishing a FTZ, companies compete more efficiently and cost effectively in the marketplace. Merchandise may be moved into these zones for operations, including storage, exhibition, assembly, manufacturing, and processing. The standard customs entry procedures and payments of duties are not required on the foreign merchandise unless and until it enters the US Custom's territory, at which point the importer generally has the product. Domestic goods moved into the zone for export may be considered exported upon admission to the zone for the purposes of excise tax rebates and drawback. As part of the county-wide strategic plan, the City of Ellensburg, the Kittitas County Chamber of Commerce, and CenterFuse are developing tactics to encourage businesses to utilize this benefit.

Business Development

Working collaboratively, multiple organizations enhance the community's quality of life through business development.

The City of Ellensburg offers a unique and streamlined approach for businesses to start and grow. From business incentives to a comprehensive review of proposed projects in a Pre-Application Meeting that includes representatives and staff from all the required entities to begin a project. Because the City owns and operates electric, natural gas, water, wastewater, stormwater, and telecommunications utilities, project review is conducted by a single entity at one location which provides increased certainty for development in terms of process, timelines, and requirements for a successful project. Additionally, the City of Ellensburg has invested in staffing and talent in key roles like Community Development and Economic Development to enhance the overall economic success of the City.

Many organizations throughout Ellensburg work to build the economy and enhance the community's quality of life. Three organizations in particular are directly involved in business development in Ellensburg.

CenterFuse is a Public Development Authority, authorized by RCW 35.21.730 and created by the City of Ellensburg in 1994. CenterFuse recruits, supports, and connects businesses with the resources they need to start, grow, and prosper.

The Kittitas County Chamber of Commerce partners with CenterFuse, the City of Ellensburg, and the County's Downtown Associations on business development, in addition to overseeing tourism, events, and services as the designated County Associated Development Organization (ADO).

The Ellensburg Downtown Association (EDA) is a Certified Main Street Organization through the Washinton Main Street Program and the Department of Archeology and Historic Preservation and follows the designated Main Street Approach for downtown revitalization.

Household Income

In 2022, the median household income for households residing in the City of Ellensburg was $47,407 , compared to $64,134 for Kittitas County and $82,400 for Washington state respectively. Ellensburg's median family household income is 58 percent of the median income of Washington State, and about 74 percent of the median income of Kittitas County.

Table 20 compares the demographics and family household income of Ellensburg with Kittitas County, and with Washington state.

Table 20. Demographics and Household Income as of 2022

	Ellensburg	Kittitas County	Washington State
2022 population	20,940	47,200	7,864,400
Median age	23.7	33.0	37.4
Labor force population (age 18-64), percent of total	65.6%	62.4%	63.7%
65 years and over, percent of total population	9.7%	18.3%	16.8%
Median household income	$47,407	$64,134	$82,400

Washington Office of Financial Management, United States Census, American Community Survey 5-Year Estimates, 2010-2014 and 2011-2015

The median age in Ellensburg is influenced by the population of college students that attend Central Washington University. In the fall of 2019, student attendance on the Ellensburg campus was 9,988, over half of the population of Ellensburg, and a significant portion of population of Kittitas County. The university had projected incoming on-campus freshman enrollment to grow by about 2% each year for the next 10 years, however CWU, like many other campuses across the country, has seen a decline in enrollment from incoming freshman students.

Currently about 18% of Kittitas County's population is 65 years and over. Washington State Office of Financial Management demographers project that this population share will increase to about 20% by 2030, as today's baby boomers enter their 70s and 80s. As the center for medical and other services, Ellensburg could expect to see growth in residents 65 years and over, and an increase in demand for services and senior and/or assisted living facilities.

Employment Overview

In Kittitas County the average annual employment growth rate from 2000 to 2021 was 1.1%. The County has had two distinct periods of job loss attributed to larger national economic collapse, during the recession beginning in 2009 and again in 2020, during the global pandemic. After the Covid-19 global pandemic, the labor market maintained a year over year recovery from 2021 to 2022 and rebounded in 2022 with a 6.7% increase, providing 1,060 new jobs.

The Washington State Employment Security Department notes that construction, local government, retail trades, and health services accounted for over three-fourths of the jobs added to Kittitas County from 20112-2022.

Within the City of Ellensburg, 56.9% of individuals are employed by private companies, with 28.6% employed by local, state, and federal government. The employment rate in Ellensburg in 2022 was 61.4% compared to 61.1% statewide.

TOP EMPLOYERS IN ELLENSBURG

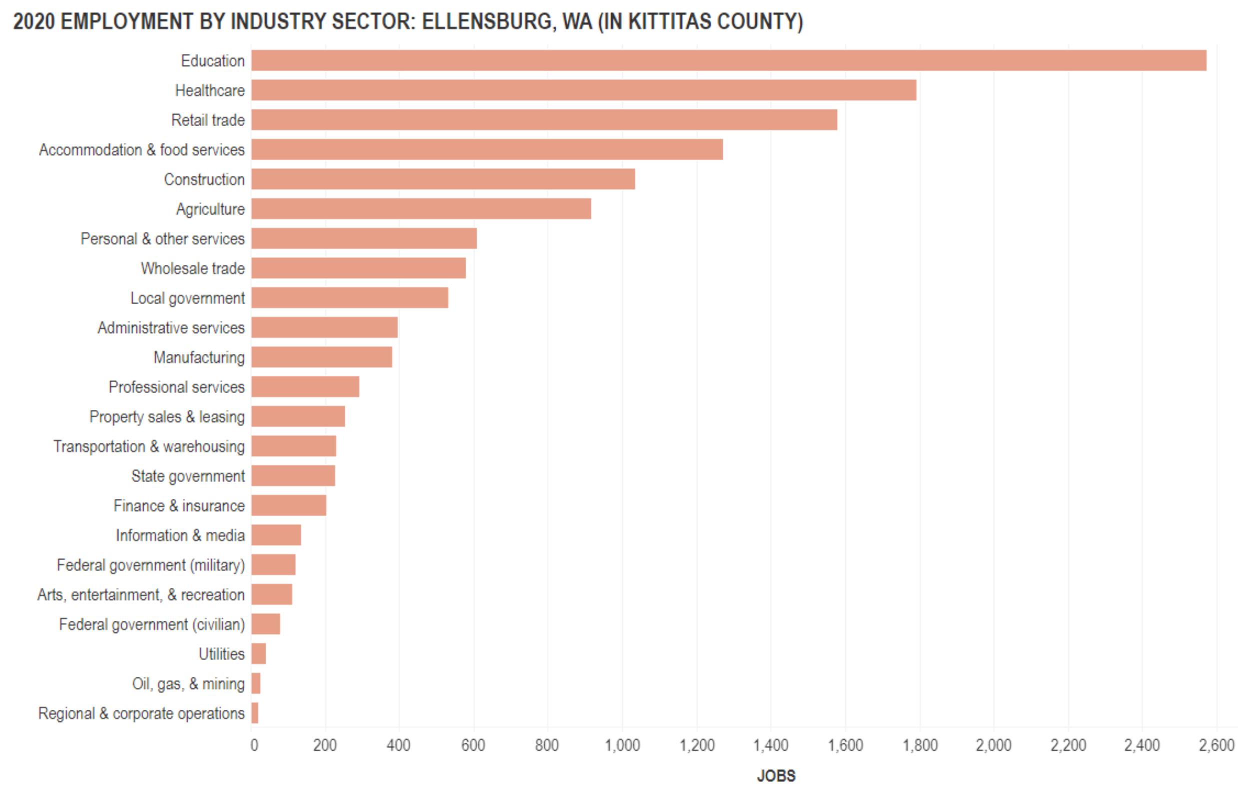
- Central Washington University
- Kittitas Valley Healthcare
- Ellensburg School District
- Kittitas County
- Anderson Hay and Grain
- Elmview
- Fred Meyer
- City of Ellensburg
- Twin City Foods, Inc.
- Super 1 Foods

Employment Post Covid-19

Overall employment (2023) within Kittitas County averaged 16,830 jobs, down 4.2 percent from pre-Covid employment, indicating that employment rates, while increasing, are still recovering three years after the pandemic.

The employment market in Kittitas County is limited in diversification. Per the Employment Security Department, approximately 62.6 percent of all jobs in Kittitas County are from five specific industry sectors: local government, accommodation/food services, construction, retail trade, and state government. Of these five, local and state governments were the top two industries in terms of payroll. The construction industry is the largest private sector and has seen significant growth in a post-Covid 19 economy, however, trends indicate that the housing market was experiencing increase in demand prior to the pandemic. For example, county-wide in 2015 there were 295 housing permits compared to 545 permits in 2021.

Additional Covid-19 influences on employment in Ellensburg and Kittitas County include the wide acceptance of remote work, coupled with the proximity of Ellensburg to the Seattle region, the difficulty in recruiting new employees for the retail and service industry, potentially linked to the decline in college enrollment, and the challenges recruiting skilled professional workers due to the rising cost of homes prices and cost of living in Kittitas County in relation to scale of pay for those professional positions in the region.



The City of Ellensburg along with county-wide partners are working together to diversify the overall job market, recruiting new industries around key targeted sectors that will bring new training opportunities, family wage jobs, and strengthen the local economy.

While unemployment was unprecedented during the Covid-19 pandemic of 2020, Kittitas County has seen unemployment decrease year over year since. As of July 2023, per Washington State Employment Security Department, 22,786 of the available labor force in Kittitas County, 21,950 were employed, leaving 836 individuals unemployed.

Employment Forecasts

The employment target is the amount of job growth the jurisdiction should plan to accommodate during the 2017-2037 planning period. Ellensburg's employment target for this period is 6,998 additional jobs.

The Kittitas County Conference of Governments countywide employment projection is a 2 percent average annual growth rate; with 80 percent of employment growth projected to occur in incorporated areas and their Urban Growth Areas, and 20 percent projected to occur in rural areas outside of urban growth areas. The allocation method is based on current shares of employment growth by sector based on each incorporated areas baseline (2013) share of total employment in that sector. See Table 22 below. For additional detail on employment forecasts please see the Community Profile and Land Use chapters.

Table 22. City of Ellensburg Employment Allocation

Jurisdiction	2015 Employment	20-year employment allocation	2037 Employment
Ellensburg	11,490	6,998	18,488
Total	19,362	11,155	30,517

Estimated employment in 2015 for Ellensburg and its urban growth area is approximately 11,490 jobs, which equates to about 1.4 jobs per household, and about 59 percent of jobs countywide. Between 2002 and 2013 Ellensburg experienced about 29 percent of the countywide employment growth. According to the US Bureau of Labor Statistics, in 2020, Ellensburg had 13,423 total jobs and Kittitas County reported 17,563 jobs.

Previously, the 20-year employment allocation for the City of Ellensburg was projected to result in a total of 18,488 jobs, and about 1.3 jobs per household. The employment allocation is based upon Ellensburg and each of the incorporated areas in Kittitas County maintaining their current share of employment. Population was allocated using a similar method, and therefore projects that jobs per household would also be maintained over the next 20 years.

Based on a countywide land capacity analysis the employment allocation is within what Ellensburg can accommodate, based on the current zoning and land use regulations. The Land Use chapter contains descriptions and locations of future land use designations that will accommodate employment in the form of mixed-use areas, neighborhood commercial activities, regional commercial uses, and industrial areas.

GOALS, POLICIES, & PROGRAMS

These economic development goals, policies, and programs are designed to work with the other elements to help stimulate economic growth and focus on areas that take into account Ellensburg's unique characteristics and opportunities for growth.

Goal ED-1: Strengthen city partnerships throughout the county and expand resources to support economic opportunities that benefit all.

Policy A **Continue to implement and regularly update a strategic economic development plan with representatives from the following sectors: industrial, transportation, agriculture, tourism, healthcare, education technology, advance manufacturing (Industry 4.0), government, and public safety.**

Program 1 Coordinate with regional economic development groups to create, promote, and recruit brand new businesses.

Program 2 Strengthen collaboration among the business community, economic development stakeholders, Central Washington University, healthcare organizations, workforce agencies, local governments, tourism organizations, and other regional economic development organization partners and higher education institutions.

Program 3 Partner with regional organizations to establish and extend training, funding, and business development opportunities for small businesses.

Program 4 Develop, refine, and implement economic monitoring to help advance the City's economic development policies and programs with a focus on equitable business retention and growth.

Program 5 Ensure strong partnerships with local school district to encourage enhanced K-12 educational opportunities and training.

Program 6 Support programs that increase availability of affordable housing and public transportation.

Program 7 Support efforts to continue the I-90 Snoqualmie Pass East project beyond Easton to Cle Elum, and ultimately to Ellensburg, to address safety, freight, and business mobility, and other issues related to chronic traffic congestion.

Policy B **Integrate economic strategies into community planning activities.**

Program 1 When evaluating future locations for particular land use districts and zoning designations, consider local and regional market needs (i.e., trip counts, visibility, etc.) of the types of businesses likely to locate in those areas.

Program 2 Work with county partners, Community Development, and Public Works to evaluate infrastructure needs to support business recruitment and a growing regional economy.

Program 3 Direct capital improvements, including fiber/telecommunications network, to key areas to create a sense of place for all and to expand and attract businesses and commerce.

Goal ED-2: Stimulate and diversify Ellensburg's economy.

Policy A **Encourage diversified growth that will provide and expand goods and services to the local and regional community.**

Program 1 Market to a variety of business – both large and small – that provide goods and services to local and regional populations.

Program 2 Promote economic activity that diversifies sources of revenue and expand the employment base.

Policy B **Promote the retention and expansion of existing businesses as well as the development of new businesses.**

Program 1 Solicit comments and feedback from local businesses on things that the City could change to better support local businesses.

Program 2 Establish incentives and development flexibility to retain existing businesses, attract new businesses, and encourage quality development.

Program 3 Partner with economic development groups to inventory and share information regarding vacant building and lot space.

Program 4 Promote development of vacant lots and infill within Ellensburg's urban core.

Program 5 Continue to provide high quality and cost-efficient city services and facilities and promote these as one of Ellensburg's economic development assets.

Program 6 Identify segments of existing businesses and develop strategies and programs to remove barriers for growth and expansion.

Program 7 Expand key partnerships in collaboration with Central Washington University, Kittitas County, economic development organizations, and work force development to support new businesses and expand existing businesses.

Program 8 Identify opportunities for innovation through residents and Central Washington University to open avenues for new business start-ups and foster their development.

Program 9 Utilizing the community's assets of location, workforce, and quality of life, develop and launch a pro-active, equitable business recruitment strategy that directly pitches the City as a place to do business to outside community prospects for relocation or expansion of additional locations.

Program 10 Market the Opportunity Zones and work with the regional ports to identify existing businesses that could take advantage of Kittitas County's Foreign Trade Zone status and development marketing strategies to promote and utilize status for new development.

Policy C **Develop and maintain an effective and predictable regulatory environment.**

Program 1 Provide efficient, predictable, and customer-service oriented permitting processes.

Program 2 Consider streamlining permitting by establishing a one-stop permit center for all permits.

Program 3 Encourage the use of the pre-application process as a means of identifying potential obstacles to the development of a particular site.

Program 4 Establish predictable processing times and consistent review processes, and post timelines on the City's website.

Policy 5 Work with regional economic development organizations to create "How to" guide for new businesses, investors, and developers to work with the city on new business creation, land development, and building redevelopment.

Policy D **Encourage development of light industrial uses within the City of Ellensburg.**

Program 1 Work collaboratively with education, workforce development, and business to identify and grow industry clusters aligned with regional values to create a resilient economy.

Program 2 Continue to partner with Kittitas County on development of Bowers Business Park at the airport.

Program 3 Work with economic development organizations to identify strategic locations for light industrial land use and zoning changes to encourage innovation and job creation.

Goal ED-3 Grow and sustain a qualified workforce.

Policy A Coordinate with local high schools, higher education institutions, workforce development, vocational rehabilitation, and local businesses to train a diverse workforce that is prepared for emerging job markets.

Program 1 Consider public/private sponsorship of entrepreneurial education.

Program 2 Encourage organizational partnerships that focus resources toward increasing the employability of all people.

Program 3 Work collaboratively with K-12, workforce development, technical skills training, and higher education institutions to create stackable educational pathways for a flexible future workforce.

Program 4 Diversify and expand the city’s job base, with focus on attracting living-wage jobs, to allow people to work and live in the community.

Goal ED-4 Emphasize equity-focused economic development of downtown as an economic, tourist, retail, art, and event destination.

Policy A Promote access from Interstate 90 and create a desire to stop within the central business area of Ellensburg.

Program 1 Establish land uses that recognize Canyon Road, Main Street, University Way, Vantage Highway, and Dolarway as entrances to our city.

Program 2 Expand and enhance the wayfinding system to local businesses, city parking, tourist facilities and attractions, and pedestrian paths.

Program 3 Encourage and support diverse cultural activities and the arts and recognize their contributions to the local economy.

Program 4 Partner with the Kittitas County Chamber of Commerce and the Ellensburg Downtown Association to develop incubators and incentives for development in the downtown area.

Program 5 Work with all economic development organizations, including Central Washington University, to identify key buildings for development of technology and creative sector jobs.

Program 6 Collaborate with creative sector organizations to achieve Creative District designation and expand creative sector through implementation of the Creative Industry Strategic Plan.

Program 7 *Be proactive in re*-evaluating policies and strategies for downtown parking as the downtown evolves, referencing the 2019 Nelson/Nygaard Parking Study.

Policy B **Partner with regional EDOs and community organizations to implement the downtown economic development plan.**

Program 1 Encourage mixed uses in the downtown area to support increased commercial and tourist activity, walkability, and diverse housing options.

Program 2 Provide enhanced public gathering places downtown to encourage a sense of place and community.

Goal ED-5 Embrace tourism as an economic development tool.

Policy A **Market Ellensburg's tourism opportunities by developing a marketing strategy to address all tourism segments of the region.**

Program 1 Advertise to targeted interests at the regional, national, and international level.

Program 2 Keep detailed and updated content management platforms such as websites and mobile applications.

Program 3 Support visitor information centers and kiosks.

Program 4 Explore future development of visitor information services near freeway interchanges.

Program 5 Promote Ellensburg's role as a destination to regional recreation and cultural activities.

Program 6 Create community gateway sign to attract visitors into business core.

Program 7 Support destination marketing organizations through lodging tax funds.

Policy B **Market Ellensburg's central location for conventions, business meetings, recreation, sports tournaments, cultural events, and other activities.**

Program 1 Inventory and manage data about where regional tourism-based enterprises can meet and use community spaces and resources.

Program 2 Coordinate and promote a central booking location for public/private regional facilities.

Program 3 Provide a consistent level of reliable public transportation between public and private local facilities and accommodations.

Program 4 Leverage lodging tax funding to support events and promotions and development of government-owned facilities and parks for tourism related markets.

Policy C **Support and expand opportunities for tourism-based investments.**

Program 1 Identify appropriate zoning districts to allow for short-term rental property.

Program 2 Identify appropriate zoning districts to allow for ancillary tourism activities.

Goal ED-6 Foster economic development through energy innovation and use of renewable energy.

*Policies and programs on renewable energy and promotion of energy efficiencies are addressed in the Capital Facilities and Utilities Chapter.

ACTION ITEMS

Airport master plan implementation

Collaborate with Kittitas County to ensure the implementation of the airport's master plan and Bowers Business Park contributes to the overall economic growth in the region, and that Ellensburg's land use plans are compatible with continuing airport and airport-related uses.

Economic development vision and strategic plan

Collaborate with local economic development organizations to activate and implement an economic development vision and strategy for Ellensburg, which identifies the types of land use designations and the relative priorities of capital investment necessary to foster economic development and promote living wage jobs in Ellensburg.

An updated Kittitas County Economic Development Strategic Plan was created in partnership with a county-wide coalition of jurisdictions and economic development organizations. The plan consists of a five-point strategy focused on:

1. Collaboration: Unite upper and lower County government and organizations in shared goals and action that benefit the County as a whole.

2. Economic Resilience: Provide residents with tools and resources to access jobs and opportunities in the area, including entrepreneurship.

3. Balanced Growth: Direct and manage the growth of the County to build a dynamic community that remains an attractive and affordable place to live.

4. Community Investment: Develop the County's infrastructure to meet its current and future needs and position it to amplify the advantage of its central location.

5. Preservation: Preserve the legacy of the County, valuing its assets and resources to turn them into opportunities for future generations.

The county-wide coalition began implementation activities of the strategic plan in 2023.

Increase usable industrial-zoned property

Review the industrial land inventory and identify and implement steps within the City's control to make more light industrial land available in less constrained areas.

Kittitas Valley Event Center Master Plan

Encourage an updated long-term plan for the Kittitas County Event Center to facilitate long-term growth and best land use. Collaborate with the Kittitas County Event Center as a major cultural site and economic generator in Ellensburg.

Streamline/automate permitting process

Review land use permitting processes and make adjustments as necessary to streamline approval processes while still ensuring projects enhance Ellensburg's economic vitality and community character.

POLICY CONNECTIONS

Policies and programs that address energy efficiencies and renewable energy are addressed in the **Capital Facilities and Utilities** and **Environmental** chapter.

The **Transportation** and **Capital Facilities and Utilities** chapters address policies and programs regarding the development of infrastructure for economic development including roadways, transit facilities, telecommunications and other utilities.

Goals, policies, and programs that address commercial and industrial land use designations are addressed in the **Land Use** chapter.

Policies and programs that address affordable and diverse housing options are in the **Housing** Chapter.

CHAPTER 7 ENVIRONMENT

WHAT YOU WILL FIND IN THIS CHAPTER

- Information about the health of Ellensburg's natural environment.
- Policies and programs that seek to protect and enhance natural resources such as critical areas, aquatic resources, and tree canopy.
- Policies that provide a framework for reducing vehicle dependency and air pollution.
- Policies that address minimizing our impacts on the environment through green building and decreasing waste.

OVERVIEW

Ellensburg's environment is comprised of both natural and built features. Views of the Stuart Mountain range, the Yakima River, and healthy air and water are just some aspects of the natural environment that the Ellensburg community values.

The relationships between these features, development, and natural processes have profound impacts on the quality of life in Ellensburg. Preserving the quality of the environment depends on government, business, and individuals working together to protect and improve this amazing area in which we live, work, and raise families. Coordinated positive actions can minimize adverse impacts that can occur during development and redevelopment, or because of previous practices.

This element contains goals, policies, and programs to support the City's role in protecting the natural environment and building an eco-friendly sustainable future. As growth and development occurs, Ellensburg is working to build a healthier, greener, and more viable future for generations to come.

BACKGROUND & CONTEXT

Bordered by the Yakima River to the west, Ellensburg includes unique, environmentally sensitive wetlands and stream corridors that provide amenities for residents and key habitat corridors for wildlife. Ellensburg is also the county seat with a vibrant downtown and University campus. Protecting and enhancing this urban ecosystem requires coordinated efforts by government, businesses, and individuals.

Ellensburg has long embraced and maintained progressive environmental policies, such as promoting and accommodating a variety of transportation methods, and clean industries and development, innovative stormwater and building practices that promote low impact development, land uses to encourage commercial development that provides jobs and services to neighborhoods, and protecting and retaining natural systems.

Ellensburg is a city that cares about trees and in 1983 became the first community in the State of Washington to be designated as a Tree City USA. Ellensburg has maintained its Tree City USA status and today has over 5,600 street trees. Ellensburg has promoted solar energy starting as far back as 2000, and in 2006 installed a 36-kilowatt community solar system, the first of its kind in the nation. As part of the adoption of the 2013 Land Development Code, the City adopted outdoor lighting regulations that help to reduce light pollution and incorporated many strategies from the Energy Efficiency and Conservation Strategy (EECS). There are many environmental benefits to energy efficiency and conservation strategies. These strategies provide environmental benefits to our natural and built environment. However, the primary focus of the EECS was to provide guidance on achieving, measuring, and reporting energy efficiency and conservation.

City operations are only one component in Ellensburg's overall impact on the environment. If the community is to make a significant difference in their impact on local and global systems, it will be because of constructive individual and household choices.

Climate change

The International Panel on Climate Change (IPCC) and University of Washington Climate Impact Group have done extensive research and confirmed that Washington's climate is changing, and the impacts of these projected changes will be far reaching. Although Washington State is working to significantly reduce its contributions to climate change, some changes are likely inevitable. However, there is not clear consensus about what exactly those changes will be. One potential scenario for areas east of the Cascade Mountains could result in warmer, wetter winters with increasing rainfall and rain intensity and increases in extreme weather events. Impacts may include declines in snowpack, increasing stream temperatures, and more frequent summer water shortages in basins such as the Yakima River.

Water quality and quantity

Among Ellensburg's natural resources are the many streams that flow through the City, which are generally confined, channelized, and culverted but most still support fish and other naturally-occurring aquatic life. Water quality is very important in sustaining the community's aquatic resources. With the City's interest in protecting the community's natural resources, a great effort has taken place to enforce stormwater regulations, build and maintain stormwater facilities, and provide education and knowledge to community members about what they can do to protect and improve water quality.

The best way to control pollutants and discharge rates is at the source. The most effective way to achieve that is through best management practices such as those found in the state's Stormwater Management Manual for Eastern Washington. The Washington State Department of Ecology continues to revise the list of best management practices to improve their effectiveness in protecting water quality in order to meet state standards with recent emphasis on low impact development.

Low impact development is a stormwater management strategy that emphasizes the use of existing natural features integrated with small-scale stormwater controls to more closely mimic natural hydrologic patterns with a focus on infiltration. Low impact development techniques include preserving native vegetation, designing development to fit site characteristics, minimizing impervious surfaces, and infiltrating stormwater on site.

Air quality

Ellensburg's geographic position creates optimal conditions for long periods of high pressure that can result in lengthy air inversions during the winter months when wood stoves are commonly used for heating. This is especially concerning during high heating season, when any smoke emitted into the lower atmosphere becomes trapped until changing conditions allow for cleaner air to pass through, exposing residents to unhealthy air. During the winter high heating season, air quality readings from the Washington State Department of Ecology monitoring station in Ellensburg reports one of the highest levels of fine particulate matter ($PM_{2.5}$) in the state. Washington State Department of Ecology issues restrictions on the use of uncertified stoves and fireplaces to help address air pollution from wood smoke that lead to high levels of $PM_{2.5}$.

FINE PARTICULATE MATTER ($PM_{2.5}$)

$PM_{2.5}$ are tiny particles in the air that reduce visibility and are a concern for people's health when levels in the air are high. Outdoor $PM_{2.5}$ levels are most likely to be elevated on days with little or no wind or air mixing. Outside fine particles come from vehicle emissions, burning of fuels, and natural sources such as forest or grass fires.

According to a 2014 Kittitas County Air Quality Survey, for the past several years, Ellensburg's number of days with unhealthy fine particle pollution levels has risen. According to the Environmental Protection Agency's National Ambient Air Quality Standards Review, Kittitas County is a high-risk community that is in danger of violating the federal air quality standards. If this trend continues, Kittitas County could become an area of non-attainment which would result in costly and demanding federal interventions.

Washington State Department of Ecology and Kittitas County Public Health provide educational resources related to air quality and wood burning stoves. In addition, HopeSource offers a discount on the purchase and installation of a new wood, pellet, or gas device or a ductless mini-split system, when old stoves or inserts are replaced.

Promoting sustainable growth and development and partnering with local organizations and agencies is essential if the City is to improve air quality and maintain compliance with federal air quality standards over the long term. Land use policies that promote a decreased reliance on single-occupancy vehicles, planning practices that place greater emphasis on multimodal transportation options, natural resource conservation practices that reduce the urban heat island effect, and green building practices that increase resource efficiency make clean air easier to achieve.

Critical areas

Ellensburg's critical areas provide a variety of functions and values that are important to the sustainability of Ellensburg's quality of life through the use of critical areas regulations which establish a regulatory framework for critical areas and their buffers. Ellensburg's critical areas regulations extend protection to the following critical areas: wetlands, frequently flooded areas, fish and habitat conservation areas, critical aquifer recharge areas, and geologic hazard areas.

Ellensburg's critical areas provide valuable habitat, protect and enhance water quality, facilitate stormwater conveyance, enhance local aesthetics, and offer recreation, cultural resources, and education opportunities. Ellensburg recognizes the importance of preserving and protecting the functions and values of various environmental features, and recognizes that once destroyed such functions are difficult to replicate or replace.

Critical areas that are within shoreline jurisdiction are regulated by the Shoreline Master Program; those that are not in shoreline jurisdiction are regulated by the City's critical areas regulations. These regulations are periodically reviewed and updated in accordance with state mandates.

WHAT ARE CRITICAL AREAS?

The Growth Management Act requires incorporated areas and counties to adopt regulations for the protection of environmentally critical areas, which include wetlands, aquifer recharge areas, fish and wildlife habitat conservation areas, areas of frequent flooding, and geologically hazardous areas. Critical areas may not be suitable for development, either because they are environmentally sensitive, or it is not safe to build near them.

Wetlands

Wetlands are integral to Ellensburg's urban landscape and the local hydrologic cycle. They reduce floods, contribute to stream flows, and improve water quality. Each wetland provides various beneficial functions, but not all wetlands perform all functions, nor do they perform all functions equally well. Large wetlands and wetlands hydrologically associated with lakes and streams, have a relatively more important function in the watershed than small, isolated wetlands.

Urbanization in the watershed diminishes the function of individual wetlands by increasing stormwater volume, reducing runoff quality, isolating wetlands from other habitats, and decreasing vegetation. Undeveloped land adjacent to a wetland provides a buffer to help minimize the impacts of urbanization. The long term success and function of the wetland is dependent on land development strategies that protect and restore wetland buffers. Science indicates that an undeveloped vegetated buffer is equally important as the wetland itself as it contributes to the function of the wetland by providing wildlife habitat, retaining stormwater, filtering sediment and pollution, and moderating water temperature. Most of the wetlands in Ellensburg are privately owned and regulated by the City's critical areas regulations or shoreline master program.

Frequently flooded areas

Flooding is caused by excess surface water runoff and is exacerbated when eroded soil from cleared land or unstable slopes reduces the waterway's natural capacity to carry water. Construction and development activity within the floodplain reduces the floodway capacity. Flooding can cause significant public safety problems, extensive property damage, and habitat destruction.

The Growth Management Act states that frequently flooded areas should include at a minimum 100-year floodplain designation from the Federal Emergency Management Agency and National Flood Insurance Rate Program. The primary floodplain areas with defined base flood elevations are along Wilson Creek, while other creeks, canals, and irrigation ditch areas are characterized by shallow flooding or have undefined flood depths.

100-YEAR FLOODPLAIN

A 100-year flood is a flood event that has a 1% probability of occurring in any given year.

The flat topography of the City's floodplains can make accurate prediction of flood hazards a challenge, and the floodplain can also be sensitive to relatively small changes resulting from development activities. Under the Flood Insurance Program some floodplain development is allowed if eligibility requirements are met.

Fish and wildlife habitat conservation areas

Fish and wildlife habitat conservation is the management of land for maintaining species in suitable habitats within their natural geographic distribution so that isolated subpopulations are not created. Habitat resources identified in Ellensburg include the Yakima River floodplain, streams and riparian habitats, lakes and ponds, agricultural areas, shrub-steppe habitat, and critical habitat for steelhead and bull trout.

A habitat inventory conducted in 2005 indicated the greatest impacts on areas of wildlife habitat in and around the City have been from agricultural practices and urban development. The majority of the remaining native habitat is generally limited to streams, wetlands, and steep slopes. Seasonal flooding of wetlands in agricultural areas provide temporal habitat for some species such as water fowl. Remnant patches of shrub-steppe habitat are present on steep slopes.

The only river frontage within the City and the largest contiguous tract of native habitat in Ellensburg is found along the Yakima River in Irene Rinehart Riverfront Park. This property is planned to remain undeveloped, park property. The Yakima River floodplain provides significant habitat linkage with other riparian habitats beyond Ellensburg and its UGA.

Critical aquifer recharge areas

Critical aquifer recharge areas are those areas with a critical recharging effect on aquifers used for potable water. Critical aquifer recharge areas have prevailing geographic conditions associated with infiltration rates that create a high potential for contamination of ground water resources or contribute significantly to the replenishment of ground water.

The overall groundwater flow patterns of the aquifer system underlying the City of Ellensburg are generally well established because of the simple hydrogeological framework. This framework consists of groundwater recharge in the uplands around the edge of the Kittitas Valley, deep groundwater flows, and paths that discharge to the Yakima River. There are no naturally occurring aquifer recharge areas identified in the City of Ellensburg that provide water to municipal supply wells.

Geologically hazardous areas

The Growth Management Act defines geologically hazardous areas as land that is not suited for commercial, residential, or industrial development because the lands are susceptible to erosion, sliding, earthquakes, or other geologic events. Geologic hazard areas are regulated mostly to protect public safety and properties. The City of Ellensburg is located on gently sloping topography with very few slopes that qualify as steep slope hazards or landslide hazards under the GMA guidelines. Exceptions to this include slopes immediately west of Brick Road, the slope immediately south of the Kittitas County Fairgrounds extending around the base of the city water tower, and the slope immediately south of the intersection of 10th Avenue and Cora Street.

Shorelines of the state

In Ellensburg, the City of Ellensburg Shoreline Master Program (SMP) regulates shoreline jurisdiction. The Ellensburg Shoreline Master Program contains goals, policies, and regulations that operate as a comprehensive plan as well as regulatory document for shorelines in Ellensburg. Ellensburg contains only two water bodies that are considered shorelines of the state: Yakima River and Lake Mattoon. Critical areas that are in the shoreline jurisdiction of these areas are also regulated by Ellensburg's SMP.

SHORELINE JURISDICTION

In Ellensburg, shoreline jurisdiction includes all shorelines of the state, upland areas within 200 feet of the ordinary high water mark of those waters; associated wetlands and river deltas; and floodways and contiguous floodplain areas landward 200 feet from such floodways.

The purpose and intent of the Ellensburg SMP is to:

- Promote the public health, safety, and general welfare of the community by providing long range, comprehensive policies and effective, reasonable regulations for development and use of shorelines within Ellensburg;
- Manage shorelines in a positive, effective, and equitable manner;
- Assume and carry out the City's responsibilities established by the Shoreline Management Act; and
- Implement the Shoreline Management Act for shorelines of the state in the City of Ellensburg.

The goals and objectives in the most current adopted Ellensburg Shoreline Master Program are hereby adopted by reference in this Comprehensive Plan.

GOALS, POLICIES, & PROGRAMS

These environment goals, policies, and programs help the City to preserve the natural environment, mitigate the impacts of urban development, and restore habitat areas.

Goal E-1: Develop and implement climate change adaptation strategies that create a more resilient community by addressing the impacts of climate change to public health and safety, the economy, public and private infrastructure, water resources, and habitat.

Policy A **Design programs that reduce greenhouse gas emissions through reducing energy consumption and vehicle emissions, and enhancing land use patterns to reduce vehicle dependency.**

Program 1 Support federal, state, and regional policies and education programs intended to protect clean air in Ellensburg and the Kittitas Valley.

Program 2 Advocate for expansion of public transit, car sharing, alternative fuel vehicle facilities, and electric charging stations.

Program 3 Encourage higher density projects to be compatible with future public transportation services.

Program 4 Promote compact growth and infill development in areas that are already developed in order to preserve open space and ecological functions and encourage residential access to services.

Program 5 Work with residents, businesses, and waste haulers to increase recycling and composting opportunities in order to reduce landfill waste.

Policy B **Evaluate the climate vulnerabilities and implications of City actions and identify policies and programs that help to mitigate those vulnerabilities. Consider the effects of shifting conditions (changing rainfall patterns, increasing temperatures, and more extreme weather events) and the effects they cause (altered vegetation, changing water demands, economic shifts).**

Program 1 Minimize the impacts of climate change on our community through implementing climate informed policies, programs, and development regulations.

Goal E-2: Maintain City leadership in energy conservation and renewable energy production.

Policy A **Conduct city operations in a manner that ensures sustainable use of natural resources, promotes an environmentally safe workplace for its employees, and minimizes adverse environmental impacts.**

Program 1 Incorporate LEED certification techniques and/or lifecycle cost analysis for existing and new municipal buildings to reduce ongoing operational energy.

Policy B **Promote and invest in energy efficiency and renewable energy resources and technology as an alternative to non-renewable resources.**

Program 1 Promote the use of solar and other renewable energy technology within the community.

Program 2 Assist citizens with upgrading energy efficiency in homes and businesses through weatherization and improvements to mechanical and lighting systems.

Program 3 Create incentives to encourage the use of sustainable building methods and materials (such as those specified under certification systems like LEED and Built Green) that may reduce impacts on the built and natural environment.

Policy C **Promote community responsibility and engagement through public education and involvement programs that raise awareness about environmental issues.**

Program 1 Include informational handouts and tips for energy efficient practices with utility bills.

Program 2 Provide education to support the implementation of low impact development practices, integrated site planning, and green building practices, focusing on early consideration of these in the site development process.

Goal E-3: Increase the number of residents who choose to walk or bicycle in lieu of driving to reduce auto demand on local and arterial streets, promote air quality, and increase overall community health.

*See the Transportation Chapter for policies and action items that apply to this goal.

Goal E-4: Comply with the Eastern Washington Phase II Municipal Stormwater Permit managed by the Washington State Department of Ecology and EPA.

Policy A **Operate, maintain, and enhance the stormwater system to protect water quality, help preserve and enhance critical areas, and help reduce flooding by maintaining the storm drainage system.**

Program 1 Conduct stormwater plan review and construction inspection for redevelopment and new development projects.

Program 2 Continue to invest and seek funding opportunities for capital improvement projects.

Program 3 Maintain Tree City USA status and minimize the loss of tree canopy and natural areas due to transportation and infrastructure projects and mitigate for losses where impacts are unavoidable.

Program 4 Monitor and assess the storm drainage system and operation and maintenance programs to ensure compliance with the municipal stormwater permit.

Program 5 Encourage low impact development techniques in new development and redevelopment projects to reduce runoff from streets, parking lots, and other impervious surfaces and improve water quality.

Policy B **Strive to eliminate inappropriate discharges into the stormwater system.**

Program 1 Provide education and outreach opportunities on the impacts of rain, snow melt, and wash water on rivers and streams.

Critical areas

The following goals are implemented through the City's Critical Areas regulations in the land development code.

Goal E-5: Protect members of the public and public resources and facilities from injury, loss of life, or property damage due to landslides and steep slope failures, erosion, seismic events, or flooding.

Goal E-6: Maintain healthy, functioning ecosystems through the protection of unique, fragile, and valuable elements of the environment, including ground and surface waters, wetlands, and fish and wildlife and their habitats, to conserve the biodiversity of plant and animal species.

Goal E-7: Direct activities not dependent on critical areas resources to less ecologically sensitive sites and mitigate unavoidable impacts to

critical areas by regulating alterations in and adjacent to critical areas.

Goal E-8: **Prevent cumulative adverse environmental impacts to water quality, wetlands, and fish and wildlife habitat, and the overall net loss of wetlands, frequently flooded areas, and habitat conservation areas.**

ACTION ITEMS

Coordination and collaboration

Work with state and local agencies and organizations to provide educational materials on wood burning stoves, burn restrictions, and other air quality programs.

Critical areas regulations

Review and update critical areas regulations in compliance with RCW 36.70A.172, best available science, and most recent state guidance.

Educational materials

Provide educational materials on energy efficient practices with utility bills. Provide education to support the implementation of low impact development practice and green building practices.

Incentives for sustainable building methods

Create an incentive program to encourage the use of sustainable building methods and materials that may reduce impacts on the built and natural environment.

Land development code review

Review land development code to ensure zoning and land development code regulations provide for and encourage compact growth, infill development, and mixing of residential and commercial uses.

POLICY CONNECTIONS

The **Environment** chapter sets goals and policies to ensure that the natural beauty and environmental resources of Ellensburg are preserved for future generations. Other chapters of the Comprehensive Plan include goals, policies, and programs that address energy conservation, efficient land use, and active transportation.

Policies that address energy efficiency and conservation, reduction of household waste, and environmental considerations for the development of capital facilities can be found in the **Capital Facilities and Utilities** Element.

The **Transportation** element contains a set of policies on active modes of transportation, public transportation, and environmental considerations for the development of transportation facilities.

Policies about the stewardship of city-managed open spaces are in the **Parks, Recreation and Open Space** Element.

The **Land Use** and **Housing** Elements address compact growth, infill development, and managing growth.

CHAPTER 8 HISTORIC PRESERVATION

WHAT YOU WILL FIND IN THIS CHAPTER

- Information about Ellensburg's historic preservation program.
- Policies and programs that seek to help Ellensburg identify and protect historic sites and structures.
- Policies that provide a framework for the adaptive reuse of historic sites and structures.
- Policies that seek to maintain our community character and heritage.

OVERVIEW

The historic preservation chapter defines Ellensburg's preservation goals, policies, and programs that provide a framework for the preservation and active use of historic structures to enhance the city's quality of life, economic vibrancy, and environmental sustainability. The purpose of this chapter is to support the acquisition, preservation, restoration, redevelopment, and continued use of historic properties.

This chapter contains goals, policies, and programs to support the City's role in preserving and protecting the character and integrity of its historic buildings, sites, landscapes, and neighborhoods.

BACKGROUND & CONTEXT

Ellensburg has a well-established preservation program including the Downtown Historic District (1980), Residential Historic District (1984), Ellensburg Landmarks Register (2000), the landmarks and design ordinance (2000), the attainment of Certified Local Government status (2001), and the ordinance for special valuation of improvements to historic property (2002). In 2007 Ellensburg was named one of America's dozen distinctive destinations by the National Trust of Historic Preservation and maintains a Certified National Main Street Community. In addition, the City's Community Development Department, the Ellensburg Public Library, the Kittitas County Historical Museum, and state databases, provide extensive information that address the distinctiveness of local architectural features and how different styles relate to each other.

Many of Ellensburg's historic structures are located within a 16-block area of the Downtown Historic District, an area rebuilt shortly after the fire of 1889. There are also historic structures located on the Central Washington University campus, in the industrial district along the railroad, and in the residential neighborhoods in and surrounding the downtown area. Preservation and rehabilitation efforts are a means of retaining and enhancing our community's unique attributes, and of encouraging development of high quality structures. Many buildings in Ellensburg's downtown that date back to the late 1800s and early 1900s have been restored, and are being used as restaurants, galleries, shops, offices, residences, and community gathering places.

This plan includes the adoption of the downtown historic district, residential historic district, and landmarks register by reference.

GOALS, POLICIES, & PROGRAMS

These historic preservation goals, policies, and programs are designed to work with the other elements to help support the acquisition, preservation, restoration, reconstruction, and rehabilitation of historic property.

Goal HP-1: Identify and protect archaeological and significant historic properties.

Policy A **Identify and protect significant archaeological and historic landmarks during the review process.**

Program 1 Review and update the inventory of historic properties and murals that will inform proposals for new historic districts in Ellensburg.

Program 2 Use the inventory of historic properties in support of the continued application of an independent review process based on National, State, and local standards for historic preservation.

Program 3 Implement and expand the historic properties mitigation program.

Program 4 Develop criteria and review local guidelines to ensure project review for demolition, remodels, and infill development.

Program 5 Publicize and promote education programs on the definition of archaeological and historic properties and guidelines that set forth appropriate materials and architectural design standards reflecting the spacing, scale, and architectural characteristics of the National Register Historic district.

Policy B **Provide education materials that describe the history and distinctiveness of existing and proposed Historic Districts.**

Program 1 Document and make use of technology and data platforms to publicize the existing architectural styles, building materials, spacing, and proportion within historic districts.

Program 2 Complete educational materials available in a variety of formats that outline the benefits of historic preservation and encourage renovation, restoration, and infill construction throughout the community. Materials should also include the necessary steps for renovation, restoration, landscaping, and street/access projects.

Goal HP-2: Maintain the integrity and reuse of historic properties.

Policy A **Continue to encourage and facilitate adaptive reuse of historic buildings.**

Program 1 Enhance and publicize the program of incentives to apply to renovation, rehabilitation and reuse of historic buildings.

Program 2 Administer and review for effectiveness existing tax relief programs, new market housing credits, and property tax deferrals that encourage development of housing in the Downtown Historic District in a manner consistent with the area's historic character.

Program 3 Provide education on possible regulatory relief that may be available when conducting work on historic buildings.

Program 4 Investigate building code requirements from other municipalities for historic buildings to address fire suppression, exiting, and access requirements.

Program 5 Partner with local organizations to provide education programs for local designers and contractors in residential, industrial, and commercial historic building renovation techniques and opportunities that adhere to Secretary of Interior standards.

Program 6 Encourage mixing residential and non-residential uses in the Downtown Historic District and explore prohibiting first floor residential in commercial and mixed use buildings.

Program 7 Create new historic districts in residential areas bordering the existing downtown historic district.

Program 8 Uphold and reinforce design standards that help complement the appearance and design patterns in the immediate neighborhood of infill development projects.

Program 9 Encourage and support green building policies and practices, including but not limited to consideration of recycling materials from demolition projects, energy efficient building design, LEED, Built Green, and encouragement for deconstruction (the piece-by-piece disassembly of an existing building with reuse/recycling of much of the material).

Goal HP-3: Retain clear physical evidence of our community's history, traditions and heritage.

Policy A **Encourage development that contributes to the distinctive and mixed visual fabric of the City's architectural character.**

Program 1 Identify historic buildings and land ownership to accommodate new uses.

Program 2 Review design guidelines and identify mechanisms or designs which can be used to accommodate and inform the design of larger tenants or connect them to the Downtown Historic District.

Policy B **Encourage new development that complements the architectural design of existing neighborhoods.**

Program 1 Provide design guidelines that promote compatible development.

Goal HP-4: Maintain and create civic buildings that reflect sense of community and public purpose.

Policy A **Reuse existing public buildings in such a way that civic and historic design elements are preserved.**

Program 1 Encourage school districts, CWU, City and County to reuse buildings or sale of buildings which allow the exterior of the building to be preserved and the interior modernized and/or preserved for current and future needs of the entity or organization rather than tear down.

Program 2 Prepare inventory and feasibility studies for future reuse of the city buildings.

Policy B **New public buildings should recognize historic design traditions present in the community.**

Program 1 Expand the land development code design standards to address public buildings both within and outside the historic core.

Goal HP-5: Use historic preservation as a means to economic vitality.

Policy A **Publicize historic preservation projects and highlight the economic benefits.**

Program 1 Continue to strengthen partnerships with state and other government agencies and funding sources for preservation, infill, energy efficiency and revitalization.

Policy B **Partner with local organizations to create and provide resources for downtown businesses that take full advantage of the mixed historic character of the community.**

Program 1 Create work plan and provide design assistance and review for the creation, renovation, and installation of 1) public lighting 2) signage – commercial and public, including wall murals 3) parking 4) public art 5) landscaping 6) access, including ADA, elevator and fire suppression and escape.

ACTION ITEMS

Historic Preservation Annual Work Plan

In conjunction with the Landmarks and Design Commission, develop an annual historic preservation and landmarks and design commission work plan.

POLICY CONNECTIONS

Policies and programs that address affordable and diverse housing options are in the **Housing** chapter.

The **Economic Development** chapter includes policies relating to maintaining downtown as a destination for visitors and residents.

CHAPTER 9 DIVERSITY, EQUITY & INCLUSION

WHAT YOU WILL FIND IN THIS CHAPTER

- Background information and context related to local history, current events, and plans for the future, addressing Diversity, Equity, and Inclusion within the City of Ellensburg.
- Policies that seek to make City resources more accessible to all.
- Policies that direct the City's efforts towards encouraging welcoming and inclusive environments within the Community.
- Policies intended to support a culturally inclusive community, where all people experience a sense of belonging.

OVERVIEW

This chapter contains goals, policies, and programs that define how the City of Ellensburg can play a role in fostering an environment of understanding, equity, and belonging within the community. The following is the City of Ellensburg's initial action plan aimed at systematically addressing Diversity, Equity, and Inclusion in a way that can effect sustainable change to benefit all residents.

This document is a starting point for the City. There are likely many issues not yet articulated that can be addressed later as they are identified. This chapter is a living document; it is intended to be revisited and revised periodically. This is an initial framework, within which the City will continue to listen to residents, encourage collaboration and communication, and elevate marginalized voices.

BACKGROUND & CONTEXT

The City of Ellensburg is committed to creating a community with a lived and built environment that improves lives, supports all people, and provides residents with opportunities to flourish. It is important for the Ellensburg community to be inclusive, to celebrate diversity, and to provide equitable opportunities to all. Doing so can help create a thriving local economy, and an environment in which individuals achieve their full potential.

Similar to many cities around the country, the national conversations that occurred in 2020 around race, social justice, and equity, sparked a discussion within our local community. These conversations highlighted the need to build a greater awareness of the impacts and challenges that marginalized communities are faced with on a daily basis. The goal of this chapter is to address ways in which the City can alleviate some of these systemic barriers, and foster a sense of belonging amongst all residents, by consistently listening to the ideas, experiences, and concerns of all who live here.

Through the lens of DEI

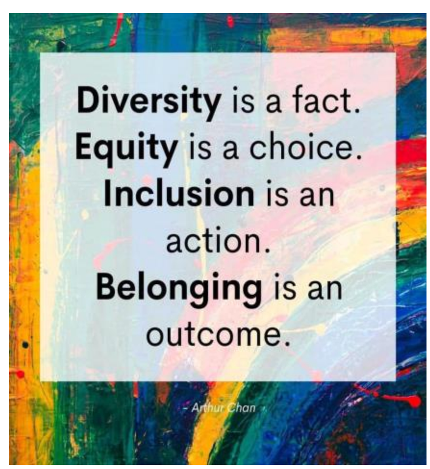
What does this all mean? Supporting diversity, equity, and inclusion related educational opportunities, social gathering opportunities, and supporting access to community resources, can create a sense of belonging within the community for all residents.

Diversity

Diversity is the presence of differences that may include, but are not limited to, race, gender, religion, sexual orientation, ethnicity, nationality, immigration status, socioeconomic status, language, (dis)ability, age, religious commitment, or political perspective. It is important for the City of Ellensburg to acknowledge and embrace the range of human differences present within our community. Doing so will help to build a strong foundation of understanding and a heightened awareness of the unintended impact of local policies. Embracing diversity means sharing space with others, sharing traditions, foods, and stories. The City can help support a strengthened sense of community and connection through outreach, regular events, and creating spaces accessible to all.

Equity

Equity alleviates barriers to ensure everyone has access to the same opportunities. Equity recognizes that advantages and barriers exist, and that as a result, we don't all start from the same place. Creating and supporting goals and policies that meet the community members where they are, will help to remove systemic barriers that make accessing basic community services challenging. Increasing accessibility to important resources and opportunities that best meet residents varying needs helps all residents succeed.



Inclusion

Inclusion is when all residents experience a sense of belonging and know they are both welcome in our community and encouraged to participate. Working on goals and policies that actively recruit participation and involvement from all residents within the community, fosters a sense of belonging and elevates traditionally marginalized voices. These methods can include listening tours, surveys, discussion groups, and use of a variety of media and print publications designed to be accessible to all residents.

Fostering a sense of belonging

In order to support all residents, the City will promote inclusion, listening, and diverse approaches to engagement through this lens of Diversity, Equity, and Inclusion. Engaging and including marginalized groups replaces barriers with bridges and builds trust that strengthens the overall fabric of our community.

Recognizing the Past - Looking to the Future

An important step in building a forward-thinking vision within the community is to first learn about our local history, listen to residents' perceptions now, and consider how new goals and policies will positively affect the City of Ellensburg's plans for the future. The City cannot adequately support our community and elevate marginalized voices without first building a base of contextual knowledge, understanding, and trust.

Past

Historically, Ellensburg has been, and still is, a diverse community, with many stories and experiences that have yet to be discovered or shared. Acknowledging and learning local history within the community, the positive and the negative, can help increase awareness and empathy toward others and strengthen our community as a whole. Understanding local history can help create a more inclusive environment for all, where residents feel welcome and equally represented.

Kittitas Valley has always been, and continues to be, sacred to Native people. Traditionally, the Pshwanapum lived in the Kittitas Valley as a sub-band of the larger political and extended family networks of the Yakama tribes and bands. The Pshwanapum members were also referred to as the K'titas ("Kittitas") band, and they moved seasonally throughout the valley and nearby mountains to harvest roots, salmon, berries, game, and medicines. Several other tribal nations including Kiala, Tatxanixsha, Yumi'sh, and Che-lo-han, would hunt and trade in this area as well. Many descendants of these tribes continue to live throughout the 1855 Treaty

Territory of the Yakamas, practicing, honoring, and teaching the heritage and ancestry of the area. (*Information sourced from Daily Record News article from Aronica Family October 12, 2020, and Kittitas Valley Historical Museum*)

Histories and experiences of marginalized communities and people of color within Ellensburg continue to be uncovered from written and oral records, and there is still much more to be discovered. Historically, members including, but not limited to, Black, Chinese, Jewish, Hispanic, and Japanese communities have moved to Ellensburg as early as the mid-19th Century, for various reasons, such as migrant labor, work on the railroad, and work in local businesses. Sources such as Sanborn Fire Insurance Maps have shown that Ellensburg used to have a “China Town”, and “Chinese Laundries” appear to have existed throughout town (Sanborn Map 1888). An African Methodist Episcopal Church was established in 1908 at 404 South Main Street, and many black individuals played on local baseball teams as well. There is also evidence at times of divisive behavior and negative language towards people of color, as found in newspaper advertisements regarding restaurants and hotels that employed Chinese individuals.

Present

Currently, people of color, members of the LGBTQ[1], and disability communities, among many others, still report that they feel invisible, experience slurs and discriminatory comments, nonverbal glares, and behaviors that feel unwelcoming in Ellensburg. While members of some of marginalized communities have reported frequent, targeted incidents, they also believe that Ellensburg can be more inclusive, and that the welcoming nature of our community can rise to a deeper level of acceptance and affirmation, utilizing the talents, skills, and experiences of all who live here.

Ellensburg can be a welcoming community that comes together in times of need, where strangers reach out and neighbors help each other. However, fully supporting and accepting people of color, ethnic and religious minorities, and members of the LGBTQ, disability communities, over 65 communities, and others, can be improved. Similar to what many towns and cities around the country are currently experiencing and working on, the City of Ellensburg recognizes it needs to be more responsive and prepared when handling issues related to diversity, equity, and inclusion This chapter lays the groundwork for this to happen, as the City continues towards a future of growth and expansion.

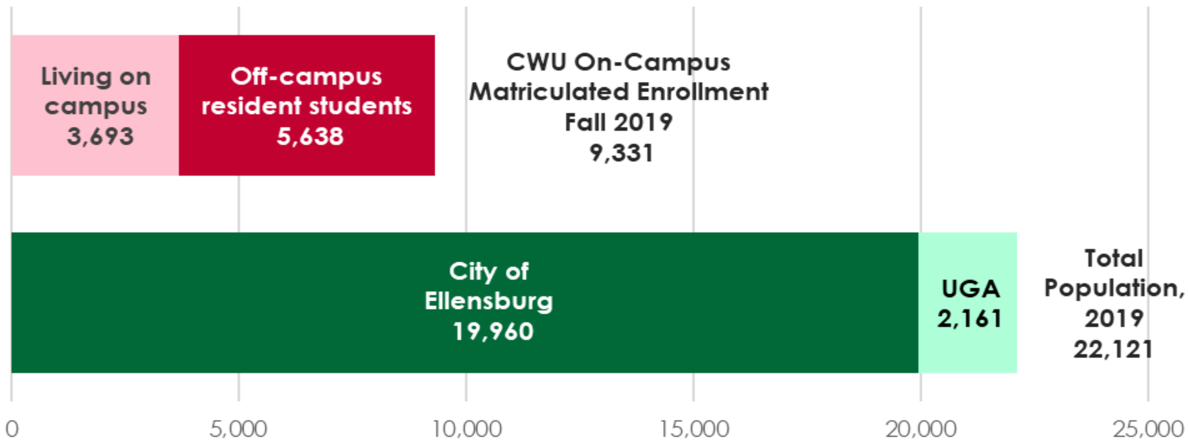
Future

Our dynamic community landscape has continued to develop, particularly in the last ten years, growing in size and in the diversity of residents. Statistics from the City of Ellensburg’s 2021 Housing Action Plan, show that in 2020, the estimated population of the City, with its urban growth area, (UGA) was 22,879 people, demonstrating a growth rate of roughly 1.9% annually

[1] Lesbian, gay, bisexual, transgender, and queer and/or questioning

since 2015. Of the 22,879 people, roughly 9,331 constitute CWU enrollment, 3,693 of which were on-campus living, and 5,638 representing off campus resident students, as depicted in *Figure 26* .

Figure 26. CWU Student Population and Total Population, 2018



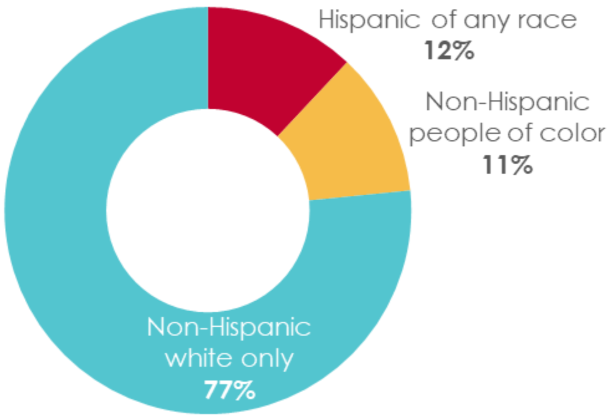
Students living on campus represents the housing occupancy for Fall 2019. Programmed capacity is 3,918 and the full built capacity is 4,249.

Sources: Central Washington University – Ellensburg Campus, Fall 2019; Washington OFM, 2021; BERK, 2021

As the City continues to support the needs of the diverse communities that live here, it is important to recognize that the statistics reflected in this chapter from the 2021 Housing Action Plan, do not reflect all of the diverse demographics of our community. Keeping that in mind, it is still valuable to look at current information that is available, as we work towards obtaining more detailed statistics in the future. By 2040 it is anticipated that 20% of the County population will be in the age bracket over age 65, and 19% in the age bracket of 45 to 64. At the same time, proportional decreases are expected for school-aged youth (5 to 19).

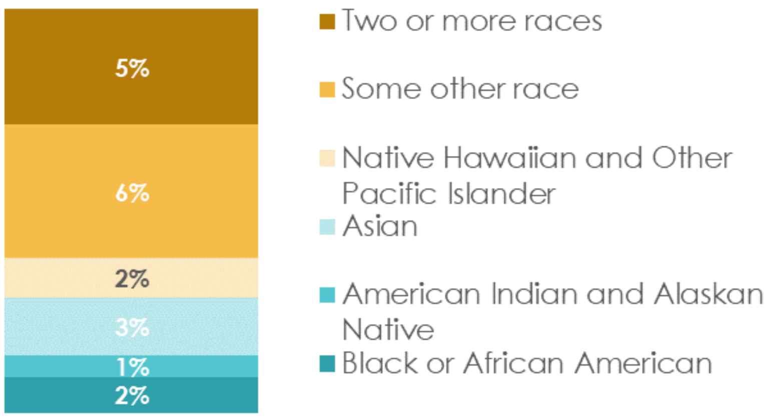
The Census also captures racial identity and Hispanic ethnic identity for respondents. As shown in *Figure 27* below, the Ellensburg community in 2018 was majority White and non-Hispanic (77%) but is growing more ethnically and racially diverse. From 2010 to 2018, Ellensburg's Hispanic population increased from 7% to 12% overall, and non-Hispanic people of color increased from 8% to 11%. *Figure 28 Figure 27*provides a further breakdown of the Non-White Alone demographics.

Figure 27. Ellensburg Population by Race and Ethnicity, 2018



Sources: ACS 5-year B02001 estimates, 2018; BERK, 2021.

Figure 28. Ellensburg Population by Racial Identity for Non-White Alone Residents, 2018



Sources: ACS 5-year B02001 estimates, 2018; BERK, 2021.

The University's emphasis on attracting students from minority and underserved communities, as well as diverse faculty and staff, continues to impact the demographics of Ellensburg. The changing nature of the labor force has also created greater diversity in the community. People from many countries have settled in Ellensburg over the years, and there is no reason to think that these influential factors are going to be less impactful in the future.

As Ellensburg continues to grow, there is the potential for marginalized groups to feel excluded unless the community has a plan for improving cultural relationships. The City of Ellensburg has developed this chapter in a sincere effort to create an equitable, just, and safe community - one where all residents know they belong and are welcome.

GOALS, POLICIES, & PROGRAMS

These DEI goals, policies, and programs contain steps that the City of Ellensburg will take to create an inclusive, welcoming, equitable, and safe community.

Goal DEI-1: Increase accessibility to City Services, Projects, Programs, and Events.

Policy A **Support policies and programs that increase accessibility to City services for all, utilizing the lens of diversity, equity, and inclusion.**

Program 1 Provide increased access to government documents in multiple languages and easily accessible assistance for those who may need additional support.

Program 2 Identify areas of City government where greater physical accessibility and accommodations are needed to increase access to all members of the public.

Policy B **Promote and encourage community engagement and outreach to all.**

Program 1 Actively encourage participation from the public for community projects, events, and recreational activities, through a wide variety of media and information distribution methods.

Program 2 Provide City staff and elected officials with tools and regular training to understand and lead actions that are inclusive and equitable.

Program 3 Establish an ongoing review process of the costs for City-sponsored recreation and leisure activities to ensure that all members of the public have access to these services.

Program 4 Support civic education programs that actively engage diverse groups of the community, and encourage diverse representation among local leadership, organizations, and agencies.

Goal DEI-2: Foster Racial Understanding, Equity, and Belonging within the Community.

Policy A **Encourage cultural sharing.**

Program 1 Regularly support events and celebrations that highlight the variety of cultural traditions within the community.

Program 2 Encourage the creation of spaces where cultural foods and traditions can be shared among members of the community, as well as the creation of public spaces that are accommodating and accessible to all.

Program 3 Encourage increased communication and collaboration between the City government, Central Washington University, businesses, and education and social service sectors, through shared events, projects, and outreach, to help residents feel more comfortable visiting campus, and non-resident students feel more comfortable within the community.

Policy B **Encourage local leadership to address systemic issues that create barriers for participation.**

Program 1 Encourage City leadership to demonstrate support of marginalized groups through a variety of proclamations, and publicly speak to local actions that affect the diverse members of the community.

Program 2 Support the development of a framework to identify and address systemic inequalities within our local institutions.

Program 3 Collaborate with local organizations to help local businesses support diverse members of the community.

Goal DEI-3: Increase accessibility to local services and community resources for all residents.

Policy A **Ensure that high quality service programs are available, accessible, and utilized by all, to support resident's basic needs.**

Program 1 Partner with local health and social services to identify strategies for making their services accessible by all means of transportation.

Program 2 Advocate for low income, residential care facilities, and other housing for aging persons to be located close to services and amenities.

Program 3 Encourage and support programs that seek to provide residents with access to diverse health care providers who can respond to varying cultural and medical needs.

Policy B **Encourage healthy activity and lifestyle by making recreational resources and opportunities accessible and welcoming to all residents.**

Program 1 Provide opportunities for healthy activity in safe and accessible public spaces for all residents.

Program 2 Encourage communication between local businesses, organizations, and schools, to coordinate food pantries and local food distribution.

ACTION ITEMS

1. Work with DEI Commission to begin regular review of current City policies and procedures using the lens of Diversity, Equity, and Inclusion.
2. Begin work towards regular Diversity, Equity, and Inclusion training for City staff and elected officials.
3. Increase use of community engagement and social media tools to help with local outreach.
4. Review fees and costs for city sponsored recreational and leisure activities.
5. Develop a framework of accountability.
6. Develop a work plan for the Diversity, Equity, and Inclusion Commission.

POLICY CONNECTIONS

The **Housing** chapter includes policies and land use designations that support the development of many types of housing to ensure that people who live and work in Ellensburg have adequate housing choices.

The **Transportation** chapter includes policies related to providing a variety of transportation networks that is available for all community members.

The **Capital Facilities and Utilities** chapter includes policies that focus on providing public facilities and utilities that are accessible and affordable to all community members, including access to the library, reasonably priced utilities, and access to data and technology. This chapter also provides goals centered around providing excellent public safety services.

The **Parks and Recreation** chapter includes policies that focus on providing citywide programs and services that meet all community and group needs, in addition to preserving historical areas and features, while also developing high quality, diversified cultural arts facilities and programs that increase community awareness, attendance, and participation opportunities.

The **Economic Development** chapter includes policies related to growing and sustaining local businesses, while creating opportunities for new businesses that can provide goods and services that meet the needs of the local and regional community.

DEFINITIONS AND ACRONYMS

Accessory dwelling units (ADUs) are small, self-contained residential units located on the same lot that is accessory to a single-family home. ADUs may be added to, created within, or detached from the primary single-family dwelling unit. An ADU has its own bathroom, kitchen facilities, living and sleeping areas, though it can share other features with the single-family dwelling including the yard, parking, or storage. Regulations for ADUs are found in the Ellensburg City Code.

ADA: American with Disabilities Act

Area Median Income (AMI) is determined by the U.S. Department of Housing and Urban Development (HUD) using American Community Survey five-year estimates of median household income for a family of four. Kittitas County Area Median Income is $65,600.

Arterial streets contain the greatest proportion of through travel. Such facilities serve the high-volume travel corridors that connect major generators of traffic. Arterials typically connect with collectors that extend into the urban area. There are two different right-of-ways for arterial streets. The principal arterial right-of-way shall be 104 feet with a 70 foot roadway surface area measured from face of curb to face of curb and the minor arterial right-of-way shall be 80 feet with a 46 foot roadway surface area measured from face of curb to face of curb.

Active transportation is any self-propelled, human-powered mode of transportation such as walking and bicycling.

Affordable housing, HUD considers housing to be affordable if occupants are paying no more than 30% of their income on gross housing costs, including basic utilities.

Beautification Areas are located throughout the city and provide over 80 planters located in the Central Business District, flower baskets at Rotary Pavilion, annual flowers at various city locations and parks and recreational facilities, and flowers and shrubs that line city streets and key intersections.

BNSF: Burlington Northern and Santa Fe railroad

Built Green of Central Washington is an environmentally friendly, non-profit residential green building rating program covering Kittitas, Yakima and Klickitat Counties and administered by the Central Washington Home Builders Association. Built Green currently certifies only single-family residential development using a menu of prescriptive measures based on the National Association of Home Builder's (NAHB) National Green Building Standard. Projects earn between a two- and five-star rating based on the number of points achieved during the design and construction process. Only those projects seeking four- and five-star certification require verification by a third party**.** Built Green standards can make a significant impact on housing, health, and the environment.

Capital facilities are the facilities needed to support growth. They include roads, bridges, sewer, parks and open spaces, and facilities for drinking water, stormwater, utilities, garbage disposal and recycling, and all the government buildings, which house public services.

COG: Kittitas County Conference of Governments

Collector street is a secondary street in the urban system and correspondingly has the second highest average daily traffic (ADT). The collector generally receives many vehicles from local streets and/or is the major route to significant activity centers. Collector streets should not generally be encumbered with stop signs. The average daily traffic can exceed 1500+. Right-of-way shall be 64 foot with a 38 foot roadway surface area measured from face of curb to face or curb.

Community Parks are diverse in nature, serving a broader purpose than the neighborhood or pocket parks. Community Parks can serve as a Neighborhood Park but the primary focus of a Community Park is to meet community-based recreation, open space, and public gathering needs. Community Parks serve multiple neighborhoods with special amenities serving the residents of the entire City and Urban Growth Area.

Cost burdened; households are considered to be cost burdened if they spend 30% or more of their gross income on rental or homeowner costs, this includes basic utilities. Households are considered severely cost burdened if they spend more than 50% of their gross income on rental or homeowner costs.

Critical areas include the following areas and ecosystems: (a) wetlands; (b) areas with a critical recharging effect on aquifers used for potable water; (c) fish and wildlife habitat conservation areas; (d) frequently flooded areas; (e) geologically hazardous areas. Fish and wildlife habitat conservation areas do not include such artificial features or constructs as irrigation delivery systems, irrigation infrastructure, irrigation canals, or drainage ditches that lie within the boundaries of, or are maintained by, a port district or an irrigation district or company.

CWU: (Central Washington University

Essential public facilities include those facilities that are typically difficult to site, such as: airports; state education facilities; state or regional transportation facilities; state and local correctional facilities; solid waste handling and disposal facilities; and in-patient facilities including substance abuse facilities, mental health facilities, group homes, and other facilities.

GIS: Geographic Information Systems

GMA: Growth Management Act (RCW 37.70A)

Historic Property means any prehistoric or historic district, site, building, structure, or object included on, or eligible for inclusion on, the National Register, including artifacts, records, and material remains relating to the district, site, building, structure, or object per Section 106 of the National Historic Preservation Act.

Housing choice vouchers is a common name for housing assistance payment contracts (or tenant-based vouchers) provided by the local public housing agency (PHA) with federal funding provided by HUD. The Yakima Housing Authority operates a housing choice voucher program that serves all of Yakima and Kittitas Counties.

A family that is issued a housing choice voucher is responsible for finding suitable housing unit of the family's choice where the owner agrees to rent under the program. This unit may include the family's present residence. Rental units meet minimum standards for health and safety, as determined by the PHA.

A housing subsidy is paid to the landlord directly by the PHA on behalf of the participating family. The family then pays the difference between the actual rent charged by the landlord and the amount subsidized by the program. Under certain circumstances, if authorized by the PHA, the family may use its voucher to purchase a modest home.

HUD; the United States Department of Housing and Urban Development.

Interlocal Agreement; in Washington State, the Interlocal Cooperation Act (Ch. 39.34 RCW) authorizes public agencies to contract with other public agencies via interlocal agreements that enable cooperation among governments to perform governmental activities and deliver public services. Pursuant to RCW 39.34.010, "it is the purpose of [the Interlocal Cooperation Act] to permit local governmental units to make the most efficient use of their powers by enabling them to cooperate with other localities on a basis of mutual advantage and thereby to provide services and facilities in a manner and pursuant to forms of governmental organization that will accord best with geographic, economic, population and other factors influencing the needs and development of local communities."

KVH: Kittitas Valley Healthcare

Leadership in Energy and Environmental Design (LEED) is a green building certification system used throughout North America and internationally. Administered by the United States Green Building Council (USGBC), various LEED rating systems apply to residential, commercial, and institutional buildings. Each rating system consists of a checklist of prescriptive and performance-based measures and certification is earned on the number of points a project achieves during the design and construction process. Certification is administered through the Green Building Certification Institute.

Level of Service (LOS) is a qualitative measure used to relate the quality of a public service, utility, or facility. LOS is used to analyze public services, utilities, and facilities by categorizing and assigning quality levels based on performance measures.

Lifecycle cost analysis is a method for assessing the total cost of facility ownership. It takes into account all costs of acquiring, owning, disposing of a building or building system. Lifecycle cost analysis can be used to assess project alternatives that fulfill the same performance requirements, but differ with respect to initial costs and operating costs.

Local/private access streets: a short street, cul-de-sac, court, or a street with branching places or lanes. A local access street is a minor residential street, and usually there is not through traffic between two streets of a higher classification. The average daily traffic (ADT) can reach up to 1500. Right-of-way shall be 52 feet with a 30 foot roadway surface area measured from face of curb to face of curb. For local access streets with parking on one side of the street only, right-of-way shall be 46 feet with 24 foot roadway surface measured from face of curb to face of curb. For local access streets with no parking, right-of-way shall be 42 feet with a 20 foot roadway surface area measured from face of curb to face of curb.

Low impact development is a term used to describe a land planning and engineering design approach to manage stormwater runoff. Low impact development emphasizes conservation and use of on-site natural features to protect water quality.

Missing middle housing is a range of multi-unit or clustered housing types compatible in scale with single-family homes that help meet the demand for housing. Missing middle buildings typically have a footprint similar in size to a large single family home. Missing middle housing types provide diverse housing options along a spectrum of affordability, including duplexes, fourplexes, and townhomes to support walkable communities, locally serving retail, and public transportation options. Missing middle housing provides a solution to the mismatch between the available U.S. housing stock and shifting demographics

Natural Open Space Parks are natural areas that vary in function and size and include water bodies, wetlands, shoreline habitat, inland forests and/or grasslands that are valued by the City. These spaces are left more or less in a natural state with recreation use as a primary or secondary objective but managed for their natural value. These areas are environmentally sensitive areas and may have limited public access in areas where there are habitats with unique or endangered plant, fish, or animal species.

Neighborhood Parks serve as the recreational and social centers and are the basic unit of a park system. They are generally designed to focus on informal active and passive recreation needs for all ages within a given neighborhood. They typically serve an area within a ¼-mile to a ½-mile service radius uninterrupted by non-residential roads or other physical barriers.

OFM: Washington State Office of Financial Management

Planned unit development (PUD) is both a type of development and a regulatory process. The purpose of PUDs is generally to allow greater flexibility in the configuration of buildings and/or uses on a site than is allowed in standard zoning ordinances. PUDs allow residential and/or commercial units to be built closer together than normally allowed by the original zoning classification, if a certain amount of land is designated as common use for occupants of the entire PUD.

Pocket Parks or mini parks serve a limited population area or unique recreation or aesthetic need; they serve as a recreational and beautification space where acquisition of larger parks is not possible. They typically serve an area population within a ¼-mile radius.

PRSP: Parks and Recreation System Plan

Regional Parks are recreation areas that serve the City and beyond with significant acreage. They typically serve regional resources and focus on active and passive recreation, public access to regional trails, and access to important waters and shorelines. Regional Parks are located within a fifteen-mile radius or within one house driving time to most residents.

Retail leakage refers to the difference between the retail expenditures by residents living in a particular area, and the retail sales produced by the stores located in the same area. If desired products are not available within that area, consumers will travel to other places, or use different methods to obtain these products. Consequently, the dollars spent outside the area are said to be “leaking”.

SEPA: State Environmental Policy Act (RCW 43.21C)

Shoreline jurisdiction in the City of Ellensburg includes: all shorelines of the state, upland areas (shorelands) within 200 feet of the ordinary high water mark of those waters; associated wetlands and river deltas; and floodways and contiguous floodplain areas landward 200 feet from such floodways.

Shorelines means all water areas of the state, including reservoirs, and their associated shorelands, together with the lands underlying them; except (i) shorelines of statewide significance; (ii) shorelines on segments of streams upstream of a point where the mean annual flow is twenty cubic feet per second or less, and the wetlands associated with such upstream segments; (iii) shorelines on lakes less than twenty acres in size and the wetlands associated with such small lakes.

Shorelines of statewide significance east of the crest of the Cascade Range are shorelines downstream of a point where the annual flow is measured at two hundred cubic feet per second or more, or those portions of rivers east of the crest of the Cascade Range downstream from the first three hundred square miles of drainage area, whichever is larger.

Shorelines of the state are the total of all shorelines and shorelines of statewide significance.

SMP: Shoreline Master Program

Special Use Areas cover a broad range of miscellaneous parklands or stand-alone recreation sites. These areas are designed to support a specific, specialized use or often a single major use. These parks may also include neighborhood and community park elements but with amenities that have a regional appeal to citizens and visitors from outside the boundaries of the city.

Stormwater is surface water in abnormal quantity resulting from heavy falls of rain or snow.

Subsidized housing is publicly assisted housing for eligible low-income families, the elderly, and persons with disabilities. Subsidized housing comes in all sizes and types, from scattered single-family houses to large-scale multistory apartments. The United States Department of Housing and Urban Development (HUD) administers federal aid to local housing agencies that manage housing for low-income residents at rents they can afford. HUD furnishes technical and professional assistance in planning, developing, and managing these developments.

Trails and Connections are linear corridors that contribute to the city's ability to preserve and protect natural areas, ecological, and art features and cultural assets. The connections can be natural corridors or manmade non-motorized linkages that at some locations serve as visual connections through historic or scenic corridors. Trails and connections provide opportunities for walking, running, and bicycling and serve as visual connections for habitat viewing, exercise, and outdoor enjoyment.

UGA; Urban Growth Area is designated by the City and County as the area which urban growth shall be encouraged and outside of which growth can occur only if it is not urban in nature. Each city that is located in counties that is required or chooses to plan under RCW 36.70A.040 shall be included within an Urban Growth Area. Based upon the growth management population projection made for the county by the Office of Financial Management, the county and each city within the county shall include areas and densities sufficient to permit the urban growth that is projected to occur in the county or city for the succeeding 20-year period. As part of this planning process, each city within the county must include areas sufficient to accommodate the broad range of needs and uses that will accompany the projected urban growth including, as appropriate, medical, governmental, institutional, commercial, service, retail, and other nonresidential uses.

Universal design is an approach to the design of all products and environments to be as usable as possible by as many people as possible regardless of age, ability, or situation. Universal design in housing applies the principles of universal design to all spaces, features, and aspects of houses and creates homes that are usable by and marketable to people of all ages and abilities. Some features of universally designed homes are adjustable to meet particular needs or needs that change as family members' age yet allow the home to remain marketable on the open real estate market.

WSDOT: Washington State Department of Transportation

APPENDIX A: 6-YEAR CAPITAL IMPROVEMENT PLANS

These 6-Year Capital Improvement Plans are hereby incorporated by reference into the City of Ellensburg Comprehensive Plan as an Appendix to the Capital Facilities and Utilities Chapter. The Capital Improvement Plans will be reviewed and updated annually.

Table 20. Electric Utility Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029
Electric System Plan						
Plan Update (every 6 years)	150000					
Capitol Projects						
Berry to Bull Rd Tie			$ 200,000			
Canyon Rd I90 Crossing Reconductor (D2-1)			$ 100,000			
Bowers Rd to Reecer Creek Extension (HE-2)					$ 250,000	$ 250,000
Feeder 15 Airport Rd to Bender (HE-1)					$ 150,000	$ 150,000
Mountain View Reconductor (D2-2)		$ 500,000				
Sanders to Alder Tie (HE-3)				$ 80,000		
Sanders to Brick Rd (HE-4)				$ 175,000		
Anderson/Umptanum Rd Tie	$ 150,000					
PSE Customer Annexations - Vantage Hwy	$ 75,000	$ 75,000				
Gateway II	$ 125,000	$ 125,000				
AMI Conversion	$ 1,000,000	$ 1,000,000	$ 1,000,000			
SR97 / Highway 10 Loop	$ 300,000					
Wildcat Street Feeder System				$ 315,000		
Street Lighting Laminated / Fiberglass Pole Replacement/ Misc. Lighting	$ 55,317	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000
Seattle (Willow To Vista View Plat) Extension	$ 75,000					
Radio Road Conversion					$ 180,000	
Substation Improvements						
Sub Land Purchase	$ 225,000					
D1 Dolarway Substation Improvement	$ 3,000,000	$ 1,000,000				
TOTAL	$ 5,155,317	$ 2,750,000	$ 1,350,000	$ 620,000	$ 630,000	$ 450,000
Grand total	$10,955,317.00					

Table 21. Information Technology Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029
IT Strategic Plan						
Plan Updates (every 3 years)			$20,000			$20,000
IT Computer Replacements						
Hardware	$65,000	$65,000	$65,000	$65,000	$65,000	$65,000
Software	$34,000	$34,000	$34,000	$34,000	$34,000	$34,000
Consultant Services	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
IT Enterprise Applications						
Hardware	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
Records Management	$50,000	$5,000	$5,000	$5,000	$5,000	$5,000
ERP replacement	$55,000	$55,000	$55,000	$55,000	$55,000	$55,000
Software	$185,000	$185,000	$185,000	$185,000	$185,000	$185,000
Consultant Services	$100,000	$50,000	$50,000	$50,000	$50,000	$50,000
IT Network Resources						
Hardware	$40,000	$40,000	$20,000	$20,000	$20,000	$20,000
Software	$53,000	$53,000	$53,000	$53,000	$53,000	$53,000
Consultant Services	$32,000	$32,000	$32,000	$32,000	$32,000	$32,000
Off Site Data/DR	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Network Cable Upgrades	$10,000	$5,000	$5,000	$5,000	$5,000	$5,000
GIS Strategic Plan						
Plan Updates (every 3 years)		$15,000			$15,000	
GIS Enterprise Applications						
GIS - Asset Management System	$40,000	$40,000	$40,000	$40,000	$40,000	$40,000
GIS - Permit, licensing, and Service Applications	$90,000	$20,000	$20,000	$20,000	$20,000	$20,000
GIS Network Resources						
Hardware	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000
Software	$52,000	$52,000	$52,000	$52,000	$52,000	$52,000

Consultant Services	**$25,000**	**$25,000**	**$25,000**	**$25,000**	**$25,000**	**$25,000**
Total	**$941,000**	**$786,000**	**$771,000**	**$751,000**	**$766,000**	**$771,000**
GRAND TOTAL	**$4,786,000**					

Table 22. Natural Gas Utility Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029
Gas System Planning & Programs						
System Plan Update (every 6 years)			$120,000			
DIMP Program	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
PSMS Program	$30,000	$5,000	$15,000	$5,000	$15,000	$10,000
Public Awareness Program	$25,000	$25,000	$30,000	$30,000	$30,000	$30,000
System Improvements						
No 6 Road / Vantage Hwy Loop	$600,000					
Misc System Integrity Looping	$30,000	$30,000	$30,000	$40,000	$40,000	$40,000
Vantage Highway (Gateway II)		$350,000				
SR97 / Highway 10 Loop	$200,000					
Pipe Boring under Roads, RR, and Creeks	$40,000	$50,000	$50,000	$50,000	$60,000	$60,000
WWTP RNG Station	$100,000					
Emission Mitigation Equipment	$80,000					
Misc System Improvements	$100,000	$120,000	$120,000	$140,000	$140,000	$140,000
Tap/Regulator Station Upgrades						
System Telemetry Upgrades	$15,000		$20,000		$20,000	
Tap Station Land Acquisition	$120,000					
Kittitas Tap Station Site Improvements		$450,000				
Cathodic Protection System Improvements						
Anode Bed Replacements	$160,000					
Cathodic Protection (CP) System Study		$90,000				
Cathodic Protection Close Interval Survey	$30,000					
Tap Station CP Interference Testing/Analysis	$15,000					
Meter/ERT Upgrades/Improvements						
Meter Proving/Refurbish	$40,000	$40,000	$40,000	$50,000	$50,000	$50,000

Meter/ERT Change-Outs	$140,000	$200,000	$200,000	$140,000	$140,000	$140,000
AMI Conversion		$800,000				
Developments						
Misc System Developments	$150,000	$150,000	$200,000	$200,000	$200,000	$225,000
Total	$1,880,000	$2,315,000	$830,000	$660,000	$700,000	$700,000
Grand total	$7,085,000					

Table 23. Parks and Recreation Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029
Rotary Park Fieldhouse	$25,000,000.00					
Rotary Pavilion Property Development	$2,500,000.00					
North Alder Street Park Sprayground	$250,000.00					
IRRP Playground			$200,000			
Kiwanis Park Skatepark Improvements	$545,000.00					
Reed Park Improvements	$200,000.00	$200,000	$200,000			
Community Center				$50,000,000		
McElroy Park Improvements				$30,000		
Pickleball Court Development (4)		$110,000				
Rotary Park and Trail Development			$500,000			$5,000,000
New Park Acquisition					$200,000	
Mt. View Park Multi Purpose Court Improvements		$40,000				
Mt. View Park Tennis Court Development (6)			$410,000			
PTCSTP Reconnection		$825,000	$75,000	$200,000	$500,000	$300,000
Yakima River Trail			$750,000			
Irene Rinehart Park Improvements						$1,827,000
Kleinberg Park Improvements					$17,000	
Mt. View Park Improvements						$188,300
Paul Rogers Park Improvements		$118,000				
South Main Entry Park Improvements						$20,000
Veterans Memorial Park Improvements					$401,000	
West Ellensburg Park Improvements					$432,600	
Wipple Park Improvements	$50,000.00					
Off Leash Park Phase II		$10,000				
Totals	$28,545,000	$1,303,000	$2,135,000	$50,230,000	$1,550,600	$7,335,300
Grand Total	**$91,098,900**					

Table 24. Sewer System Capital Facility Improvement Plan

Project	2024	2025	2026	2027	2028	2029	2030-2040
Maintenance Issues & Concrete & Clay Pipe Replacement	$150,000	$180,000	$180,000	$200,000	$200,000	$200,000	$2,200,000
Concrete & Clay Pipe Replacement							$4,050,000
Cora Street Pump Removal/Main Extension				1,500,000			
Anderson Road Extension	$1,500,000						
Totals	$1,650,000	$180,000	$180,000	$1,700,000	$200,000	$200,000	$6,250,000
Grand Total	***$10,360,000***						

Table 25. Stormwater Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029
Effectiveness Monitoring	$ 74,073	$ 92,039	$ -	$ -	$ -	$ -
University Avenue Gateway Project (Wenas to Whiskey Cr.)	$2,500,000					
Street Tree Inventory and Assessment	$80,000	$0	0	0	0	0
Annual Stormwater Project (Varies)	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000	$ 75,000
Phase II Levee Reecer Dolarway	$ 1,200,000					
University Avenue Gateway II Project (Vista Rd. to E. CL)	$1,025,000		$ 4,900,000			
Totals	$ 4,954,073	$167,039	$ 4,975,000	$ 75,000	$ 75,000	$ 75,000
Grand Total	**$10,321,112**					

Table 26. Telecommunications Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029
Telecom Strategic Plan						
Plan Updates (every 3 years)	$20,000					
System Improvements						
WWTP Fiber Optic Connection	$55,000					
Bull Road	$20,000					
Hardware Refreshment	$100,000	$25,000	$25,000	$25,000	$100,000	$25,000
Outdoor Plant Improvements	$48,000	$48,000	$48,000	$48,000	$48,000	$48,000
Gateway 2 Project	$20,000	$20,000				
Telecom Connections	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000
Telecom Infrastructure	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Line Extensions						
Commercial Customers	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
Wireless Improvements						
Community WiFi, Wireless Equipment for DR/Backup or Temporary Svc.	$10,000	$10,000				
Total	**$353,000**	**$183,000**	**$153,000**	**$153,000**	**$228,000**	**$153,000**
GRAND TOTAL	**$1,223,000**					

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		.5 YEARTRANSPORTATIONIMPROVEMENT PLAN	ADCPTONDAM RESOLUTON	6.202069							
		2024 T026129 (NCLLOES CLRRENT WORK IFEDAAP4MG *IN* 2023)	140-	2023.14							
		I i REVENUE BY YEAR (fousands)									
		SOURCE	2023'	2324	2025	2028	2027	2028	2029		T.-TALS
		A.2TE MAL STREE T I	735	136	308	45	113	345	118		
		REGIONAL STBG	20	1.284	0	0	0	710	750		2.7134
		SALESTAX SERVE	1.370	1.340	0	430	1,425	1.155	500		
		FS 0105141- ...*WC* points TO 9011001. EL 0 C6C5·720715102 VC L C 07/011·5	0	2.560	972	0	750	750	250		5200
		..vsn OT anrr·ry a =c2s=n¹,1	0	3	o	5350	0	0	0		5350
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		DISTRESS 73 COJ NTY S A- ES.¹...1-67 TAX	82	1S	'.35	0	0	603	0		.444
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		GCE FISCAL YEAR WATER QUALITYGROUNT	1.450	4.25·0	0	0	0	.	0		5.703
		COJ NT(-0D3 MG TAX G RA `17	0	6 7	0	3	0		0		7
		LOCAL LODGNG TAX FUNDS	0	68	0	0	0	0	0		86
		TRANSIT	25	0	0	0	0		0	025	
		OTTER AGENCY° R C -MY DEPARTMENT	6	8.501	330	0	0	1,636	300		
		LOCAL 1,1R.·40, 7 Mr:3T D1STRC T O. 0 1:DEFERRALS	0	4,70.7	0	0	1,145	.545	6207		' -703
		1RAFFIC IMPACT FEES	132	831	56	2.196	0	993	993		5.128
		NOT F.-ND ED	0	0	0	0	0	0	0	a	0
		TOTAL REVENIUE	1.427	23.915	2.747	7.270	5.133	10.540	13,911_		7 2_943
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4	SP	Aire ReconslackenGerni.Annad1	80	0	85	0	90	0	95	0	350
5	S	Uri...prnt.. W ay and t2 acar Croak Road Somi..mm on	25	0		00 0				0	25
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	.	L.33...PrPw %Way Gao..ory 114 rs-rn Sroet to Red Noma Diner	2.500	0	0	0			0	0	2.507
8	S	Dowsloon Shay Seal	129	0	0	0	0	0	0	0	129
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10	S	Wilca1Wor Oroday (Urivarsity Way P 156 Ave)	618	0	0	0	0	0	0	0	848
11	.	RMN. S t S ... -.- Ram⁻-,	220	0	0	0	0		0	0	220
12	S	PIerning 079d Seared Use Pa/way		526	0	0	0	0	0	0	578
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32	P	*Wan.* Stand 1E0 Bike Lane -Bean ISchoIscr1 P Aber St	0	0	0	0	150	0	0	0	193
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		TOTAL EXPE NDITJ RE	6.609	6.334	11.966	13.721	5.155	10.755	19.353	21.759	54.702
		A RTC RPL STREET FUND BEGINNING BALANCE 101411 /202211	1329	714	698	510	535	592	317		
		CST GASTAX REVENUE 8 SCIEDULED SALES TAX TRANSFER	120	120	120	120	120	120	120		
		ARTIE RP.L SIRE ET FUNDENIXIM BALANCE	714	599	510	585	592	317	319		

· C u r r e n t y e a r p m p a s s h o a r f a r s c o s m i r g p a s p o s o s .
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Table 27. Transportation Capital Improvement Plan

Table 28. Wastewater Treatment Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029	2030-040
Digester and GBT Building Electrical Upgrades	$ 848,000						
Recirculation Pump Station		$ 275,000					
Boiler Building		$ 40,000					
Aeration	$ 200,000	$ 30,000,000					
New Clarifier		$ 10,000,000					
Rebuild Clarifiers			$ 1,700,000				
Methane Recapture Analysis/Contract	$ 1,040,000						
Totals	$ 2,088,000	$ 40,315,000	$ 1,700,000	$ -	$ -	$ -	$ -
Grand Total	$44,103,000						

Table 29. Water System Capital Improvement Plan

Project	2024	2025	2026	2027	2028	2029	2030-2040
Aquifer Storage and Recovery Program	$ 300,000						$ 5,000,000
Craig's Hill Pressure Zone	$ 1,210,000						
Reservoir Siting Study	$ 50,000						
Craig's Hill Reservoir Seismic Study and	$ 50,000	$ 180,000					
Pfenning Loop					$ 274,000		
Airport Well 3 and 1824 Zone Connector						$ 160,000	
Memorial Park Main Relocation	$ 50,000						
Walnut Street Main Replacement		$ 286,000					
Seattle Ave. Main Extension	$ 323,000						
24-inch Main Inspection	$ 25,000						
24-inch Valve Rehabilitate	$ 40,000	$ 40,000					
New 1860 Pressure Zone				$	$ 1,840,000		
New 4.0 MG 1824 Zone Reservoir				$	$ 4,745,000		
Reservoir Corrosion Control Program	$ 230,000						
Permanent On-Site Well Backup Generators		$ 550,000		$ 550,000		$ 550,000	$ 1,200,000
Recoat Reservoirs			$ 825,000				$ 825,000
AMI Conversion			$ 500,000				
Pressure Reducing Valve							$ 81,000
New Well(s)	$ 50,000	$	$				
Water System Plan Update							$ 300,000
Rotary Park Irrigation	$ 750,000						
Oversizing Fund	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 40,000	$ 520
Pipe Replacement Fund	$ 100,000	$ 100,000	$ 110,000	$ 110,000	$ 120,000	$ 120,000	$ 1,320,000
Meter Testing	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 35,000	$ 455,000
Pump and Motor Inspection/Repair	$ 55,000	$ 55,000	$ 55,000	$ 55,000	$ 55,000	$ 55,000	$ 416,000
Totals	$ 3,308,000	$	$	$	$	$ 960,000	$ 9,597,520
Grand Total				**$38,360,520**			

APPENDIX B TRANSPORTATION IMPROVEMENT PLAN

This chapter presents the capital program that forms the basis of this Transportation Element. Collectively, this program adds up to $135 million in potential transportation improvements to be constructed over the next twenty years as seen in *Table 30*.

Funding to support this program will come from a number of sources including Ellensburg's general funds, gas taxes, property taxes, impact fees, as well as federal and state grants. Since the City's ability to attract outside funding sources is unknown, this project list may reach beyond the 20-year horizon.

In 2016, city voters approved a sales tax measure with funds earmarked for transit. As of 2017, transit service in Ellensburg transitioned from a community services organization to the City, with operations contracted out. The City is increasing coverage of the route and considering other transit improvements that can be funded with the tax and grant funding.

This Transportation Element strives to create a transportation system that provides a safe, balanced, and efficient multimodal transportation system that is consistent with the City's overall vision and adequately serves anticipated growth.

This vision is guided by the transportation goals outlined in this Element to provide a system that is:

- Safe for all Users
- Connected and Efficient
- Multimodal, Offering User Friendly Transportation Options
- Integrated with Transit
- Maintained and Preserved
- Facilitated by Active Partnerships

With these goals in mind, and in conjunction with completing the layered networks described in the previous chapter, a transportation project list was developed.

Table 31 and *Table 32* describe the recommended projects, which represent a balance of safety, maintenance, and operational improvements for all modes. The projects are divided into two categories, Tier 1 and Tier 2. The categories are defined based on how well each project scored using the evaluation metrics, and were reviewed by City staff. Tier 1 projects are those that meet multiple criteria in terms of effectiveness, benefit to the community, and ability to be implemented based on the current budget. Tier 2 projects meet fewer criteria and exceed current budget estimates for the next 20 years.

These projects provide a starting point for the City in developing its Six-Year Transportation Improvement Program, which is updated annually and is developed based on knowledge related to project feasibility and funding availability.

Table 30. Costs of Ellensburg Transportation Element Capital Projects (20+ Years)

Project Needs	Description	Total Cost*	
		Tier 1	**Tier 2**
Auto/Freight Priority Projects	Traffic signals, intersection improvements, multimodal roadway improvements	$18.3M	$66.4M
Pedestrian Projects	Sidewalks, crossings	$8.3M	$24.2M
Bicycle Projects	Bike lanes, sharrows, trails	$3.7M	$14.5M
	Total	**$30.3M**	**$105.1M**

*costs denoted in millions

Table 31. Twenty Year Project List - Tier 1

Project #	Project Location	Description	Project Score	Planning Level Cost
1	14th St & Wildcat Way	Signalize intersection	31.5	$442,000
2	5th Ave & Ruby St	Intersection signal and improvements	31.5	$430,000
3	Mountain View Ave & Ruby St	Signal modification, widening, and improvements	30	$1,357,000
4	14th Ave & Alder St	Intersection signal and improvements	28.5	$494,000
5	Canyon Rd & I90 EB Ramps	Intersection signal and improvements	27	$400,000
6	5th Ave & Railroad Ave	Signalize intersection	27	$472,000
7	University Way & Wildcat Way	Signal modification and widening	25.5	$1,413,000
8	Downtown to CWU University Way Crossing	Pedestrian and bike improvement on Town to Gown Route	24	$50,000
9	University Way	Crossing improvements	24	$60,000
10	Dolarway Rd/SR 97 & University Way	Intersection improvements- Roundabout	24	$2,050,000
11	Ruby St - Mountain View Ave to 5th Ave	Bike lane	22.5	$9,000
12	Walnut St & 18th Ave	Intersection signal and improvements	22.5	$636,000
13	Ruby St & 3rd Ave	Signalize intersection	22.5	$450,000
14	Dean Nicholson Blvd - B Street/JWT to JWT at Alder St	Bike lane	21	$2,900
15	Wildcat Way/18th Ave - 14th to McElroy Park	Bike lane	21	$4,400
16	Cora Street to Fairgrounds	John Wayne Trail reconnection	21	$4,200,000
17	Helena St & Walnut St	Signal modification, widening, and improvements	21	$1,234,000
18	Chestnut St - I-90 to CWU	Bike lane	19.5	$7,600
19	Umptanum Rd - West UGA to East UGA	Bike lane	19.5	$22,400
20	Helena Ave from Cora St to Alder St	Bike lane	19.5	$16,000
21	Willow Street - Mountain View Ave to Capitol Ave	Road widening, curb and gutter improvements, and bike lanes	19.5	$965,000
22	Helena Ave - Water St to Airport Rd	Sidewalk addition	19.5	$1,052,000
23	West City Limits to 14th Ave	Upgrade John Wayne Trail surface	19.5	$325,000
24	Alder St to East City Limits	Upgrade John Wayne Trail surface	19.5	$43,000
25	Canyon Rd & Umptanum Rd	Signal modification, widening, and improvements	19.5	$2,209,000
26	Wildcat Way & 18th Ave	Signalize intersection	19.5	$500,000
27	Helena Ave - Water St to Walnut St	Fill in sidewalk gaps	18	$2,020,000
28	South Wilson Creek Trail	Trails	18	$310,000
29	3rd Ave & Main St	Signal modification	18	$150,000
30	Airport Rd & Bender Rd	Intersection modification to an all way stop	18	$25,000
31	Alder St - Fairgrounds to Airport	Bike lane	16.5	$7,600

Project #	Project Location	Description	Project Score	Planning Level Cost
32	Capitol Ave/Pfenning Rd - Water St to Game Farm Rd	Bike lane	16.5	$11,290
33	University Way - Nanum St to West City Limits	Sidewalk extension	16.5	$770,000
34	3rd Ave. - Water St. to Depot	Paverstone sidewalks and historic lighting	16.5	$674,000
35	South River Connector	Trails	16.5	$160,000
36	15th Ave & Water St	Signal modification and improvements, extend road east to connect to Main St	16.5	$732,000
37	South Railroad Ave - 1st Ave to 5th Ave	Sidewalk	16.5	$670,000
38	University Way & Water St	Signal modification, widening, and improvements	16.5	$1,970,000
39	University Way & Reecer Creek Rd	Signalize intersection	16.5	$450,000
40	Water St & Bender Rd	Intersection signal and improvements	16.5	$500,000
41	Cora Street - 15th Ave to John Wayne Trail	Curb and Sidewalk additions and improvements	15	$390,000
42	IRRP to Thorp Highway Trail	Trails	15	$265,000
43	University Way & Main St	Signal modification, widening, and improvements	15	$2,335,000
Plan	Citywide Transit Master Plan	Plan how system can be expanded to address growth, including infrastructure, equipment and staffing, and long term funding	n/a	$100,000
Total				**$30,384,190**

Table 32. Twenty Year Project List - Tier 2

Project #	Project Location	Description	Project Score	Planning Level Cost
44	Railroad Overpass- No specific Location [1]	Bridge	21	$30,000,000
45	Capitol Ave - Willow St to Oak St	Sidewalks and bike lane	15	$1,271,000
46	Capitol Ave/Pfenning Rd - Oak St to JWT	Sidewalk on north and west sides	15	$1,318,000
47	Capitol Ave & Chestnut St	Intersection modification	15	$750,000
48	Lake Matoon Trail	Trails	13.5	$1,250,000
49	Helena Ave & Water St	Signal modification, widening, and improvements	13.5	$710,000
50	Wenas St & University Way	Signalize intersection	13.5	$450,000
51	Bull Rd/Willow St & Mountain View Ave	Signalize intersection	13.5	$450,000
52	West Ellensburg Trail - Rotary Park to JWT	Trails	13.5	$1,300,000
53	Manitoba Ave & Ruby St	Intersection signal and improvements, align north and south Ruby streets	13.5	$2,898,000
54	Capitol Ave- Main St to Sampson St	Sidewalk replacement	12	$907,000
55	Brook Lane - 11th Ave to 18th Ave	Sidewalk	12	$1,403,200
56	Canyon Multi-Use Pathway - IRRP to S. City Limits	Trails	12	$25,000,000
57	University Way & BNSF RR	Overpass structure replacement/widening	12	$20,000,000
58	University Way & Alder St	Signal modification, widening, and improvements	12	$1,160,000
59	Reecer Creek Rd - University Way to North UGA	Bike lane	10.5	$13,360
60	Brick Rd/Sanders Rd - McElroy Park to Alder St	Bike lane	10.5	$14,460
61	Bull St /Willow St - I-90 to Capitol Avenue	Bike Lane/Sharrows	10.5	$14,600
62	Brick Rd - Skyline Dr to Cemetary	Sidewalk addition on west side	10.5	$1,044,800
63	Idaho Ave - Water St to Airport Rd	Sidewalk addition on both sides	10.5	$1,046,000
64	Willow St - Spokane Ave to Seattle Ave	Fill in sidewalk gaps	10.5	$112,000
65	University Way - Okanogan St to Reecer Creek Rd	Sidewalk	10.5	$1,832,000
66	Umptanum & Anderson	Road widening	9	$10,000,000
67	Pfenning Rd - Vantage Hwy to Ashford Way	Sidewalk addition on west side	7.5	$848,400
68	University Way - Brick Rd to Pfenning Rd	Sidewalk	6	$1,275,000
Total				**$105,067,820**

[1] Although the Railroad Overpass scored in Tier 1, it was moved to Tier 2 due to high cost.

*All of the recommended transportation projects in *Table 31* and *Table 32* would require further analysis prior to actual construction

Figure 29. Tier 1 Project Locations

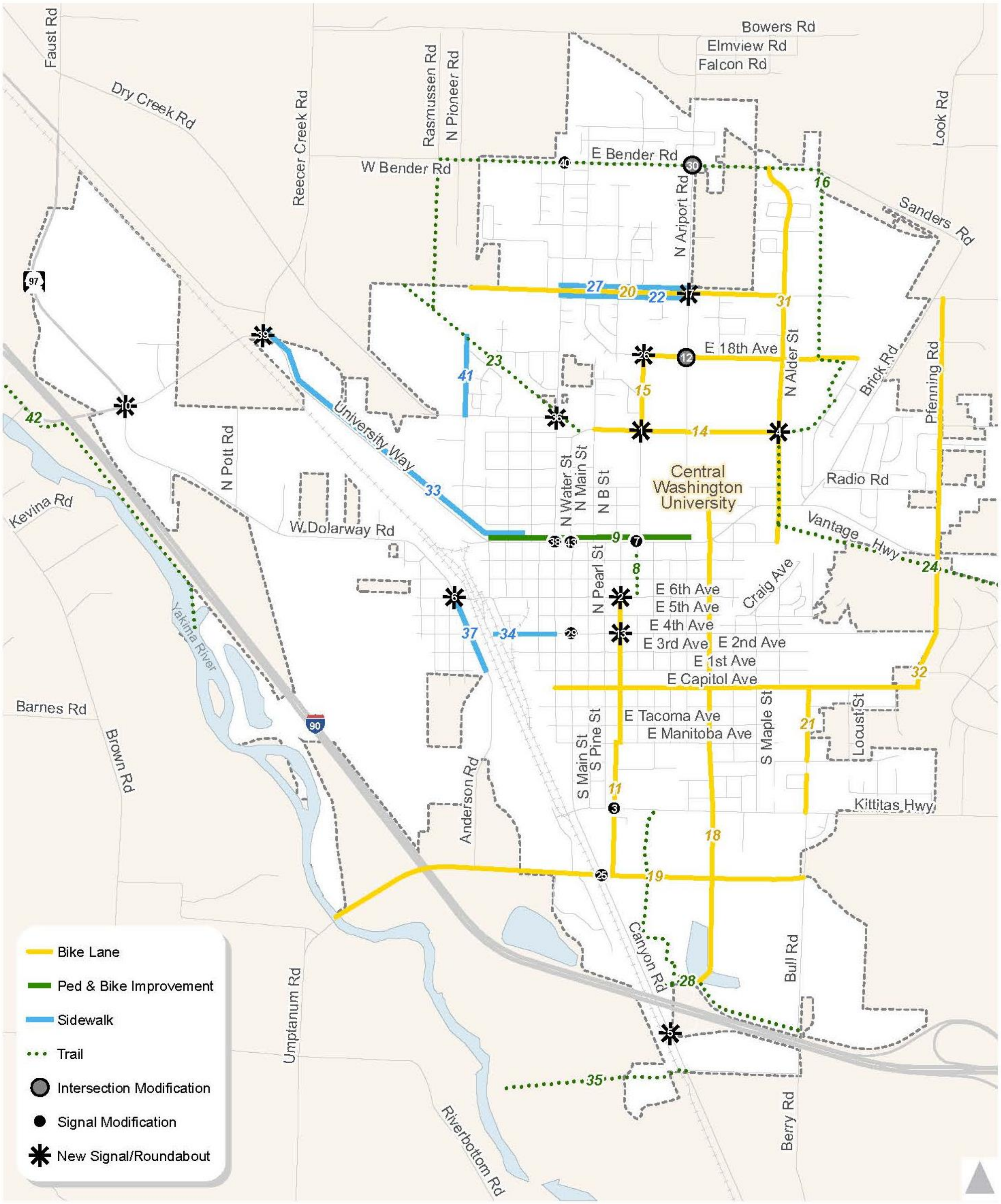
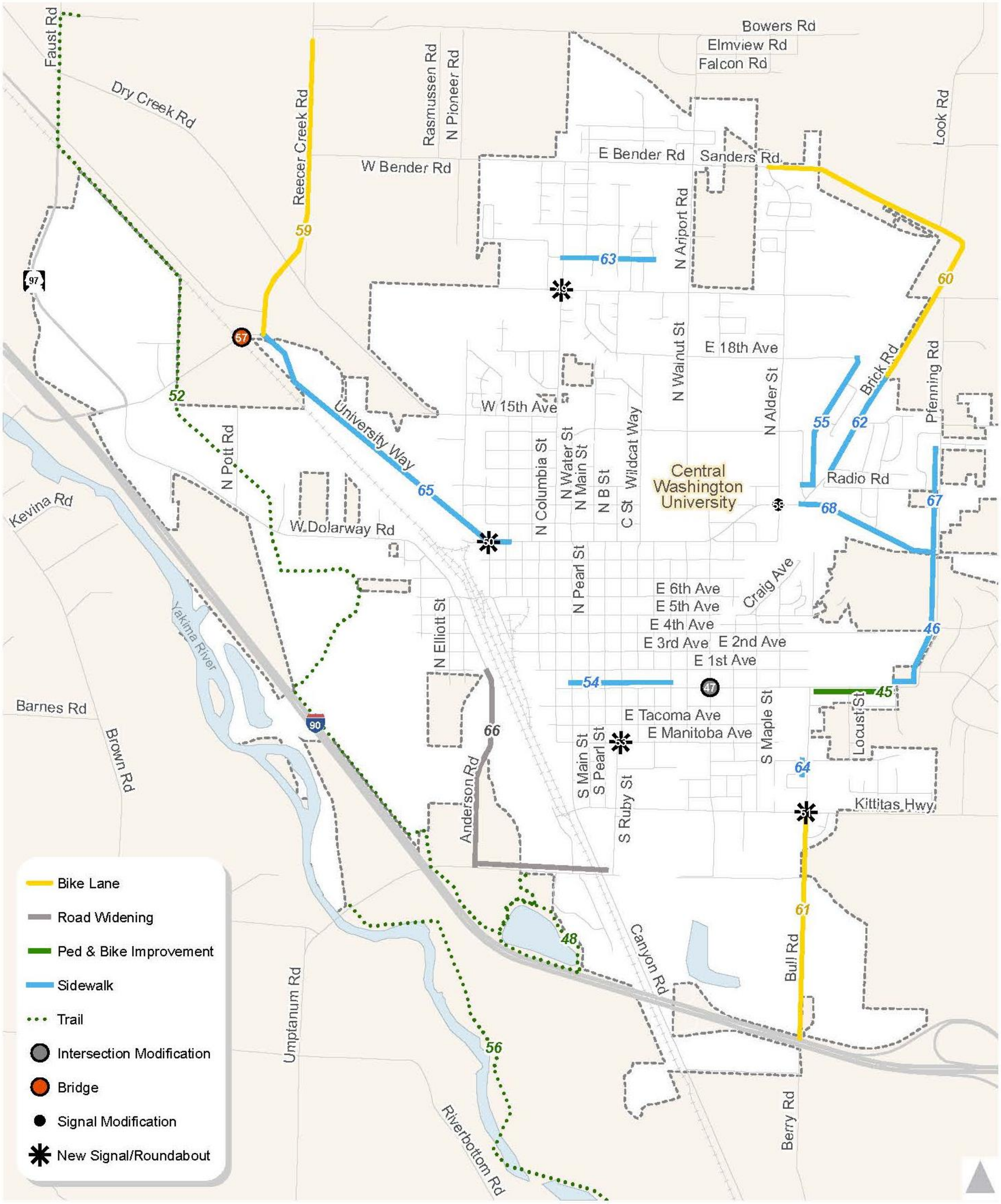


Figure 30. Tier 2 Project Locations



REGIONAL COLLABORATION

As stated earlier, one of the City's top priorities in this plan is effective coordination with regional partners to ensure that the local and regional transportation systems complement one another. A key element of this will be partnering with neighboring cities, Kittitas County, and WSDOT to ensure regional travel patterns do not impact quality of life in Ellensburg.

Roadway Facilities

There are projects outside of Ellensburg's purview that will affect travel in and around the City. One of the biggest projects that will impact travel in the region is the WSDOT I-90 Snoqualmie Pass East widening. The first two phases of the project will complete widening, paving, and safety improvements along seven miles of I-90 and are projected to be finished in 2019. Completion of this roadway is expected to improve safety and mobility within Kittitas County, which will directly impact Ellensburg's residents and visitors.

As part of this planning process, transportation projects were identified that fall outside Ellensburg's city limits and local authority including:

- The new roundabout at the intersection of Dolarway Road and University Way.
- Intersection improvements at University Way and Reecer Creek Road.

Transit Facilities

On the transit side, Ellensburg is working to improve Central Transit service and facilities within the City that will connect with regional transit options. Envisioned improvements include:

- Adding a northeast route stretching east to Pfenning Road and north to Bender Road
- Adding a west route traveling out to Dolarway Road and University Way
- Development of a transit center

With the anticipated future growth in the region, the transit system will need significant capital to keep up with demand. The City is planning to conduct a transit master plan in the coming years to identify how the current transit system can be improved to meet these demands.

Greater Kittitas County currently only has on-demand transit service within the region, but a more integrated Central Transit city network will support the county transit and any future expansions. Increased Central Transit service will also connect residents to the intercity Yakima Commuter route that travels between Ellensburg and Yakima during the week.

Trails

Many of the trails in Ellensburg connect to recreational opportunities throughout the County. The John Wayne Trail, that stops at the east and west edges of the city, stretches over 220 miles crossing many other jurisdictions in the county and state. The network of trails west of the city wind through city parks and out into greater Kittitas County. Regional coordination for trail upkeep and improvements ensures that bicyclists and pedestrians can reach all of the amenities Ellensburg has to offer.

IMPLEMENTING THE TRANSPORTATION ELEMENT

The recommended projects and programs of the Transportation Element were identified in the previous chapter based on their consistency with overall goals of this Element and the anticipated revenues over the next 20 years. Implementing the Transportation Element will require close coordination among the City departments, citizens, businesses, and other agencies within the region.

In order to guide the City's implementation of the plan, projects were prioritized to assist in assembling an updated six-year Transportation Improvement Program (TIP), working toward the 2037 planning horizon. This chapter summarizes the recommended plan, likely revenue sources, and criteria used to prioritize projects.

The Transportation Element is a living document and serves as the blueprint for transportation in Ellensburg over the next several years. Realistically, the plan is most useful over the next five years, at which point it should be updated.

In addition to the capital program described in the prior chapter, the transportation program includes $16 million for maintenance, operations and roadway rehabilitation as seen in *Table 33***.** Maintaining Ellensburg's transportation system is important for sustaining the quality and safety of roadways.

Table 33. Twenty Year Transportation Program

Investment	Description	Planning Level Cost
Pavement and maintenance	Annual maintenance programs	$16M
Annual projects	Bridge inspections, engineering transfer, signal optimization, and alley reconstruction	$1.9M
Capital projects	Tier 1 projects	$30.3M
Total		**$48.2M**

Overview of Costs and Revenues

A key GMA planning requirement is the concept of fiscal restraint in transportation planning. A fiscally constrained Transportation Element must first allow for operation and maintenance of existing facilities, and then capital improvements. To introduce fiscal constraint into the plan, an inventory of anticipated revenues and costs was undertaken to identify funds that are likely to be available for capital construction and operations.

The proposed Transportation Element for the City of Ellensburg contains approximately $48 million in transportation investments over the next 20 years. The Transportation Element focuses on capital projects that will complete the layered network plan, as well as ongoing pavement maintenance to ensure that the roadway network is kept in good condition.

It is worthwhile to note that the City of Ellensburg anticipates generating approximately $2.4 million annually for transportation capital projects and system upkeep. Revenues include those from outside sources and grants, general city funds, impact fees, and gas tax receipts. If the City were able to maintain this level of revenue, the City could afford around $30 million in transportation projects over the next 20 years, after funding needed maintenance and rehabilitation.

The project list included in the previous chapter includes $135 million in transportation investments, in recognition that the City will be awarded grants over the duration of the plan. In addition, the designation of Tier 1 and Tier 2 transportation projects within the Element acknowledges that should supplementary funding become available, projects that would further support the development of the transportation network have been identified and prioritized as part of this planning process.

Funding Approach

The comparison of revenues to costs indicates that the City will need to carefully prioritize its projects, since not all of the transportation needs may be affordable with existing revenue sources during the 20-year period. If this occurs, the City has several options:

- Increase the amount of revenue from existing sources, including impact fees, Transportation Benefit Districts or increased general fund revenues
- Adopt new sources of revenue, such as a vehicle license fee that could fund either transportation capital or programmatic expenditures
- Develop a grant strategy to secure additional funding for capital projects
- Lower the level of service standard, and therefore reduce the need for some transportation improvements.

The following section describes impact fees, transportation benefit districts, and grant strategies in more detail, and forecasts potential revenue based on stated assumptions.

Impact Fees

State law (RCW 82.02.050) authorizes communities to impose impact fees. Transportation impact fees are a one-time charge paid by development, proportional to their impacts to fund improvements that provide new transportation system capacity.

While transportation impact fees cannot be used for roadway maintenance or projects that exclusively address an existing traffic operations or safety issue without providing future capacity, they can fund a wide variety of projects in the street right-of-way.

The City currently has a transportation impact fee program that funds a limited number of roadway improvements. The current fee was updated in 2013 and has a base rate of $1,758/PM peak hour trip. The city maintains an impact fee schedule that associates individual land uses, such as single family homes or retail or restaurant space, with the number of PM peak hour trips that they generate. The current budget estimates over $100,000 in revenue each year with the current fee schedule.

Given the needs identified in the previous chapter, it may make sense for the City to consider updating its impact fee program to increase revenues for transportation and fund a more robust list of projects. Many jurisdictions around the state are looking to increase their impact fee rates and more communities are updating their programs to fund projects that benefit both motorized, as well as nonmotorized travelers.

WHAT ARE POTENTIAL NEW REVENUE SOURCES?

- Proceeds from General Obligation Bonds
- Creation of Local Improvement Districts
- Mitigation fees for pedestrian and bicycle facilities
- Reciprocal impact fees with adjacent jurisdictions
- Property tax levy lid lift for transportation
- Business license fee per employee

The City can explore the feasibility and likely revenue amounts from these or other sources as the plan is implemented over the next several years.

Transportation Benefit District

State law (RCW 36.73) authorizes cities and counties to form transportation benefit districts (TBDs) to raise revenue to fund local transportation projects, usually through vehicle license fees or sales taxes. TBD revenue is typically used for transportation projects such as roadway improvements, sidewalks, bike infrastructure, and transportation demand management. Construction, maintenance, and operation costs are also eligible.

Ellensburg established a TBD in 2016, and voted in a sales and use tax within the City to fund transportation services. The levy is established for ten years with the possibility of a continuation. It is estimated that the 0.2% tax will generate over $700,000 each year, a total of over $7 million in the next 10 years to benefit public transit. The Transportation Benefit District is also authorized to establish a motor vehicle license fee of up to $100 to further fund transportation projects.

Grant Strategy

While grants are among the best ways for cities to attract outside funding, they can be time consuming to put together, straining staff resources at unpredictable times.

Some communities develop annual grant strategies, which identify the projects they want to fund, the grant programs where these projects are most likely to successfully compete, and program resources (either staff time or consultant support) to develop grant applications. Given the robust public outreach process and strong safety and multimodal justifications for many of the projects, many of the projects on this Plan's Tier 2 Contingency List would likely perform well for Safe Routes to School, WSDOT Bike and Pedestrian Safety, Transportation Investment Board, or Federal Aid grants. Ellensburg should consider developing an annual grant strategy to identify funds for design and construction of Tier 2 Contingency Projects.

SETTING PRIORITIES

Project prioritization is needed, in order to help identify when best to fund and implement the projects since funding is limited. Criteria were established to help prioritize the projects and implementation. These criteria, not listed in any priority order, are identified in the following text box.

Using these criteria, the recommended projects were evaluated and ranked based on how well each could meet the criteria. High priority projects for Ellensburg are those that meet multiple criteria in terms of effectiveness, benefit to the community, and ability to be implemented.

20- YEAR PROJECT LIST METRICS

The following information describes the process by which the 20-year project list was developed and evaluated. The 20 year project list was developed to create a transportation system that realizes Ellensburg's ultimate transportation vision: to provide a safe, balanced, and efficient multimodal transportation system that is consistent with the City's overall vision and adequately serves anticipated growth. This vision is guided by the following transportation goals outlined in the Transportation Element:

- **Safe for All Users**
- **Connected and Efficient.**
- **Multimodal**
- **Integrate Transit**
- **Fund Maintenance and Preservation**
- **Facilitate Active Partnerships**

CRITERIA FOR PROJECT PRIORITIZATION

1. Meets City's transportation goals:
   - Safe for all Users
   - Connected and Efficient
   - Multimodal, Offering User Friendly Transportation Options
   - Integrate Transit
   - Fund Maintenance and Preservation
   - Facilitate Active Partnerships
2. Project costs are aligned with City budget constraints and leverage non-city (federal, state, private) funds

With these goals in mind, as well as, completing the layered networks; evaluating existing and future infrastructure needs based on adopted LOS; reviewing existing transportation plans; and working with the public, Planning Commission, and City Council to identify areas in need of transportation improvements, a draft project list was developed. The draft project list included over 70 potential projects. Each project was evaluated and scored relative to the transportation goals using a scoring matrix. The scoring matrix included 11 metric covering the 6 goals. Each metric's description, as well as its scoring potential, can be seen as follows.

Evaluation Metrics

1. **Provides safe connections for all users.** Create a transportation network that provides safe and comfortable connections for all users to key destinations, including Downtown, Central Washington University, local schools, parks, retail, and services. To do this, streets should be designed to accommodate priority users.

Addresses a location with a history of injury/fatality collisions	6=Serious injury and/or bike/ped collision 3= Addresses location with high number of collisions 0=Low collision rate

2. **Supports commerce through efficient connections.** Prioritize connections with state routes and removal of bottlenecks that delay the movement of people and goods. Key to achieving this goal will be coordination with the Washington Department of Transportation and evaluation of projects that improve citywide mobility over constraints like railroads and natural features.

Project improves or eliminates bottleneck location to LOS standard under current or future conditions	6=Solves LOS Issue 3=Improves but does not eliminate LOS deficiency 0=Does not improve LOS deficiency or no LOS deficiency in project vicinity

3. **Offers complete and user friendly connections for walking and biking.** Fills gaps in the system to accommodate safe, enjoyable, and energy efficient travel by those choosing to walk or bike. Where possible, the City will look for ways to improve street and neighborhood connectivity.

Encourages pedestrian travel	3=New Pedestrian Facility (e.g. sidewalk, trail, shared use path, crosswalk, signalization) 0=No pedestrian facility
Encourages bicycle travel	3=Exclusive facility (e.g. buffered bike lane, shared use path, trail) 1.5=Shared facility (e.g. bicycle lane, sharrow, bike boulevard) 0=No bike facility
Connects neighborhoods and other disconnected streets for pedestrians and bicyclists	2=Project creates an additional connection between neighborhoods 0=No new connections

4. **Integrates transit into the citywide and regional transportation network.** The City will take an active role in ensuring that transit is a community asset, offering convenient routes, serving key destinations, and coordinating with other regional transit operators.

Encourages transit travel	3=Infrastructure or access to transit improvement within 1/4 mile proximity 1.5=Infrastructure or access to transit improvement within 1/2 mile proximity 0=No transit improvement
Coordination with regional transit	3=Coordinates with regional transportation 0=Does not coordinate with regional transportation

5. **Reliably funds system maintenance and preservation.** Plan for a system that is financially viable, including consideration of full lifecycle costs in infrastructure investments and leveraging funds (including grants and private dollars) wherever possible to maximize community benefits.

Project's costs are aligned with City budget constraints	3=Low cost improvement ($0-500,000) 1.5=Moderate improvement cost ($500,000-$1,000,000) 0=High cost ($1,000,000+)
On-going maintenance costs	3=Project will reduce ongoing maintenance (e.g., replacement of signal with roundabout; reduction in paved surface) 1.5=Project addresses near-term maintenance need (street overlay) 0=Project will increase maintenance costs

6. **Facilitates active partnerships.** To provide for a seamless system, the City will actively coordinate with a broad range of groups (including Kittitas County, Central Washington University, the Washington Department of Transportation, Ellensburg School District, businesses, and the public) to develop and operate the transportation system.

Project is on-books for another agency or jurisdiction	3=Yes 0=No partnerships
Project is a strong match for grant opportunities or outside funding sources	3=Yes 0=No

APPENDIX C HOUSEHOLD AND EMPLOYMENT GROWTH

The following figures depict household and employment growth by traffic analysis zone (TAZ) for Ellensburg and the Urban Growth Area. The maps show the forecasted growth in housing and employment based on the amount of growth assigned by the Kittitas County Conference of Governments and distributed within the UGA with guidance from City staff. Land use growth informs the City on where to expect increases in travel volumes and translates into future traffic levels through the travel demand forecasting process. Travel modes describe land uses as producing or attracting trips at the TAZ level. Trips are typically "produced" by households and "attracted" to non-households.

- ***Figure 31*****: Growth in Households (2017-2037**) – Displays the raw growth in household by TAZ between 2017 and 2037. Population growth was provided by the Kittitas County Conference of Governments. Population growth converted to households by dividing population by the average number of people per household.
- ***Figure 32*****: Growth in Employment (2017-2037)** – Displays the raw growth in employment by TAZ between 2017-2037. Employment growth was provided by Kittitas County Conference of Governments.

Figure 31. Household Growth

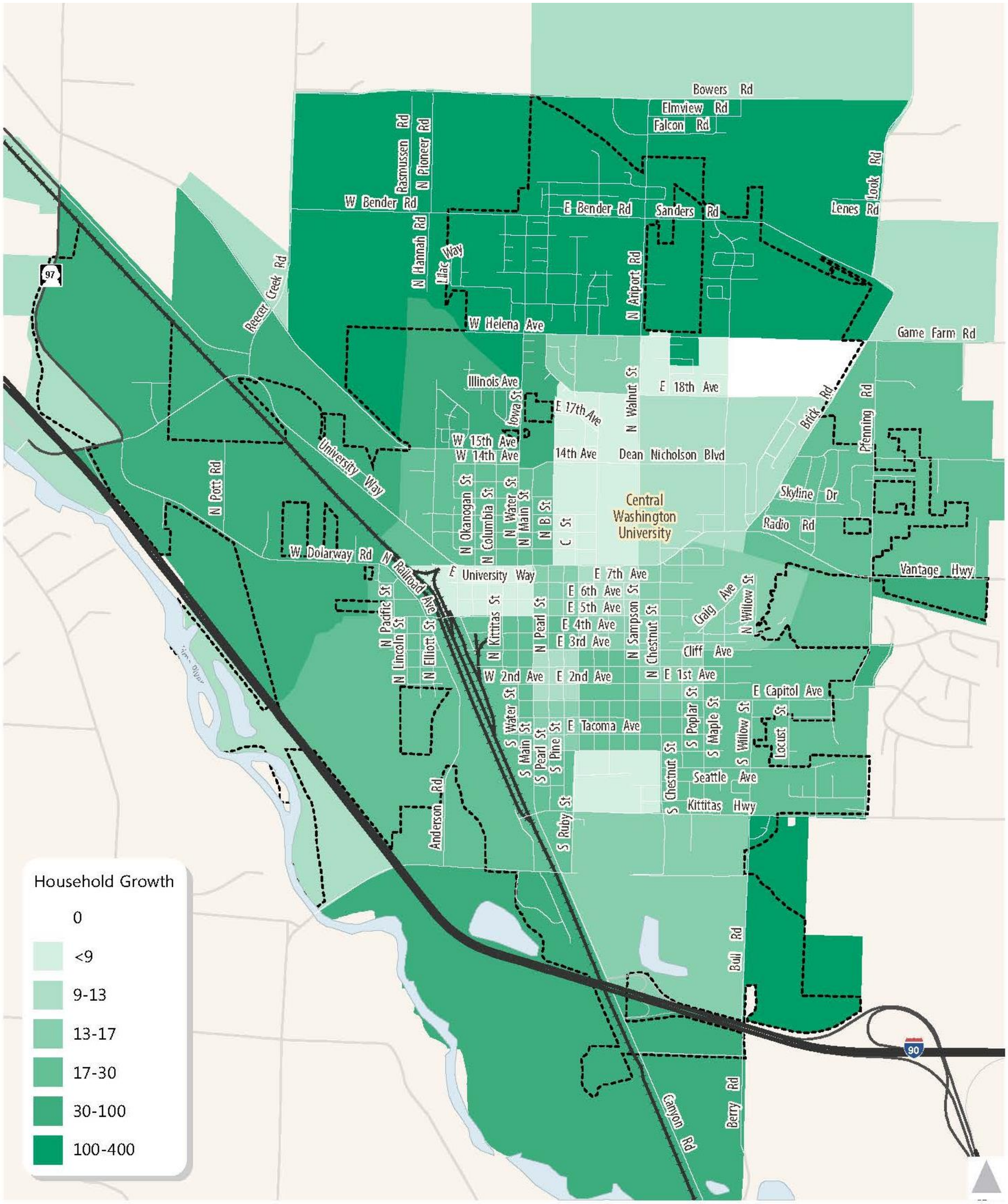
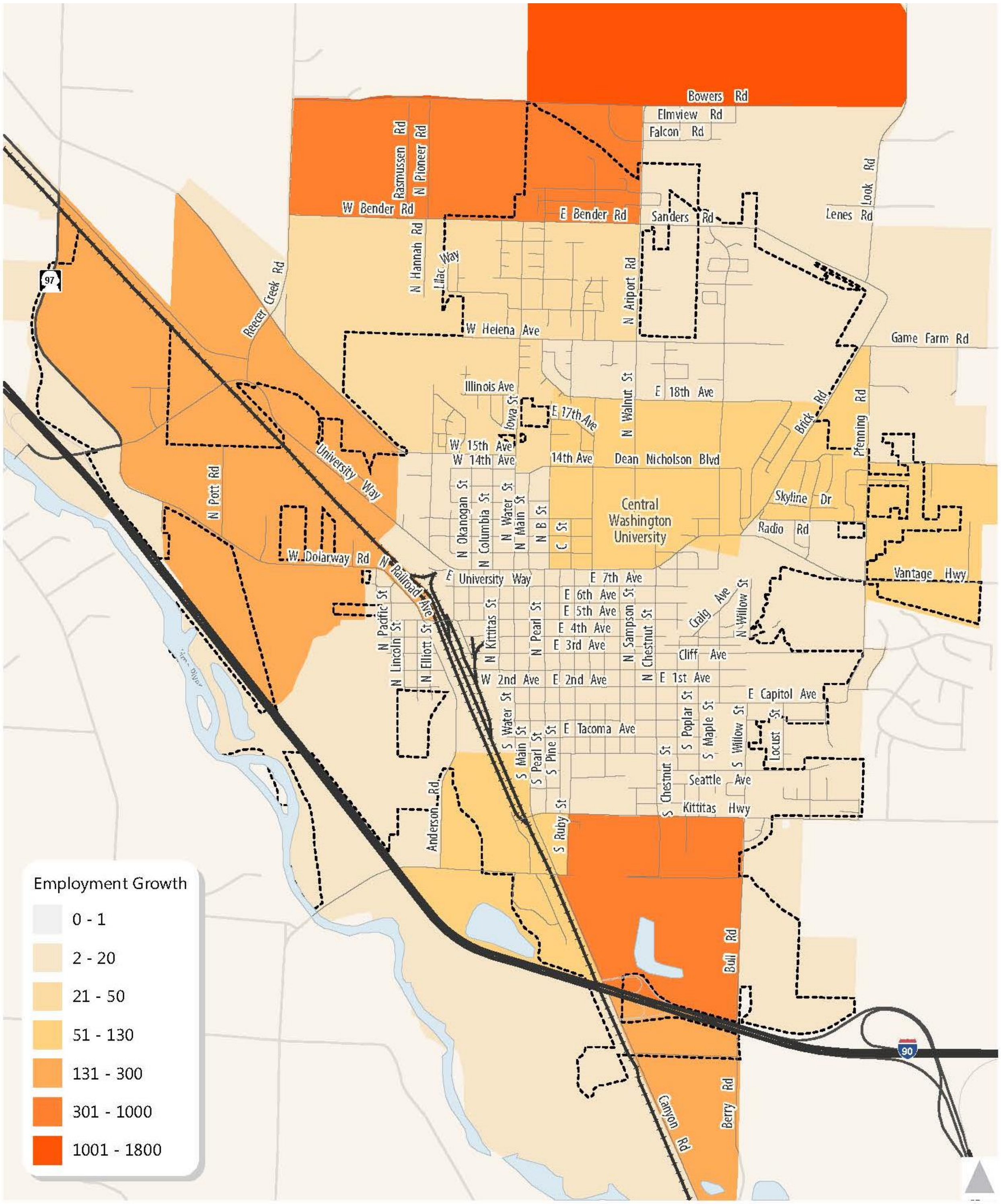


Figure 32. Employment Growth



APPENDIX D LEVEL OF SERVICE REPORTS

This appendix shows level of service (LOS) calculations at 48 intersections for year 2017 Existing conditions, year 2037 No Action, and year 2037 With Potential Mitigations. The 2017 volumes represent counts collected in 2015 and 2016. For both of the 2037 future scenarios, volumes represent traffic forecasts developed using the Kittitas County Travel Demand Model and the traffic growth assumptions described in **Appendix B.** The 2037 No Action LOS calculations assume no changes are made to the City's existing transportation network. The 2037 With Potential Mitigations LOS calculations assume intersection improvements to reach the City's level of service standards. The City's level of service policy sets the following standards for its roadways:

- LOS B for local streets
- LOS C for arterials and collectors
- LOS D for arterials at the interchanges with I-90

2017 Level of Service Reports

HCM 2010 TWSC
1: I-90 WestBound Offramp/I-90 Westbound Onramp

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	273	0	0	231	148	13	1	89	0	0	0
Future Vol, veh/h	2	273	0	0	231	148	13	1	89	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	15	15	15	11	11	11	0	0	0
Mvmt Flow	2	297	0	0	251	161	14	1	97	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	251	0	-	-	-	0	552	552	297
Stage 1	-	-	-	-	-	-	301	301	-
Stage 2	-	-	-	-	-	-	251	251	-
Critical Hdwy	4.2	-	-	-	-	-	6.51	6.61	6.31
Critical Hdwy Stg 1	-	-	-	-	-	-	5.51	5.61	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.51	5.61	-
Follow-up Hdwy	2.29	-	-	-	-	-	3.599	4.099	3.399
Pot Cap-1 Maneuver	1269	-	0	0	-	-	480	429	722
Stage 1	-	-	0	0	-	-	731	649	-
Stage 2	-	-	0	0	-	-	770	683	-
Platoon blocked, %		-			-	-			
Mov Cap-1 Maneuver	1269	-	-	-	-	-	479	0	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	479	0	-
Stage 1	-	-	-	-	-	-	730	0	-
Stage 2	-	-	-	-	-	-	770	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	0	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	678	1269	-	-	-
HCM Lane V/C Ratio	0.165	0.002	-	-	-
HCM Control Delay (s)	11.4	7.8	0	-	-
HCM Lane LOS	B	A	A	-	-
HCM 95th %tile Q(veh)	0.6	0	-	-	-

Existing

Synchro 9 Report
Page 1

HCM 2010 AWSC
2: Dolarway Rd & University Way

Intersection	
Intersection Delay, s/veh	15.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑	↱	↰	↑		↰	↑	↱
Traffic Vol, veh/h	102	166	123	25	183	43	147	28	62	48	34	101
Future Vol, veh/h	102	166	123	25	183	43	147	28	62	48	34	101
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	20	20	20	13	13	13	15	15	15	5	5	5
Mvmt Flow	111	180	134	27	199	47	160	30	67	52	37	110
Number of Lanes	1	1	0	1	1	1	1	1	0	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	3	2	3	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	2	2	3
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	3	3	2
HCM Control Delay	19.1	14.8	14.5	12.1
HCM LOS	C	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	WBLn3	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	100%	0%	100%	0%	0%	100%	0%	0%
Vol Thru, %	0%	31%	0%	57%	0%	100%	0%	0%	100%	0%
Vol Right, %	0%	69%	0%	43%	0%	0%	100%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	147	90	102	289	25	183	43	48	34	101
LT Vol	147	0	102	0	25	0	0	48	0	0
Through Vol	0	28	0	166	0	183	0	0	34	0
RT Vol	0	62	0	123	0	0	43	0	0	101
Lane Flow Rate	160	98	111	314	27	199	47	52	37	110
Geometry Grp	8	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.372	0.201	0.245	0.625	0.063	0.43	0.092	0.123	0.082	0.222
Departure Headway (Hd)	8.392	7.393	7.971	7.163	8.285	7.776	7.063	8.499	7.988	7.273
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	428	484	450	503	432	463	507	422	448	493
Service Time	6.149	5.15	5.721	4.912	6.04	5.531	4.817	6.26	5.749	5.034
HCM Lane V/C Ratio	0.374	0.202	0.247	0.624	0.063	0.43	0.093	0.123	0.083	0.223
HCM Control Delay	16.1	12	13.3	21.2	11.6	16.3	10.5	12.5	11.5	12.1
HCM Lane LOS	C	B	B	C	B	C	B	B	B	B
HCM 95th-tile Q	1.7	0.7	1	4.2	0.2	2.1	0.3	0.4	0.3	0.8

HCM 2010 TWSC
3: University Way & Reecer Creek Rd

Intersection						
Int Delay, s/veh	4.5					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	132	180	167	190	92	62
Future Vol, veh/h	132	180	167	190	92	62
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	143	196	182	207	100	67

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	388	0	-	0	768	285
Stage 1	-	-	-	-	285	-
Stage 2	-	-	-	-	483	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1170	-	-	-	370	754
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	620	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1170	-	-	-	325	754
Mov Cap-2 Maneuver	-	-	-	-	325	-
Stage 1	-	-	-	-	763	-
Stage 2	-	-	-	-	544	-

Approach	EB	WB	SB
HCM Control Delay, s	3.6	0	16.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1170	-	-	-	325	754
HCM Lane V/C Ratio	0.123	-	-	-	0.308	0.089
HCM Control Delay (s)	8.5	-	-	-	20.9	10.2
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.4	-	-	-	1.3	0.3

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HCM 2010 TWSC
4: Water St & Bender Rd

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	76	38	40	43	40	71
Future Vol, veh/h	76	38	40	43	40	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	83	41	43	47	43	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	124	0	237	103
Stage 1	-	-	-	-	103	-
Stage 2	-	-	-	-	134	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1463	-	751	952
Stage 1	-	-	-	-	921	-
Stage 2	-	-	-	-	892	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1463	-	728	952
Mov Cap-2 Maneuver	-	-	-	-	728	-
Stage 1	-	-	-	-	921	-
Stage 2	-	-	-	-	865	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	9.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	857	-	-	1463	-
HCM Lane V/C Ratio	0.141	-	-	0.03	-
HCM Control Delay (s)	9.9	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Existing

Synchro 9 Report
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HCM 2010 TWSC
5: Airport Rd & Bender Rd/Sanders Rd

Intersection	
Int Delay, s/veh	7.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	70	35	14	68	18	34	31	18	16	36	4
Future Vol, veh/h	10	70	35	14	68	18	34	31	18	16	36	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	76	38	15	74	20	37	34	20	17	39	4

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	240	203	41	250	195	43	43	0	0	53	0	0
Stage 1	76	76	-	117	117	-	-	-	-	-	-	-
Stage 2	164	127	-	133	78	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	714	693	1030	703	700	1027	1566	-	-	1553	-	-
Stage 1	933	832	-	888	799	-	-	-	-	-	-	-
Stage 2	838	791	-	870	830	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	625	669	1030	602	676	1027	1566	-	-	1553	-	-
Mov Cap-2 Maneuver	625	669	-	602	676	-	-	-	-	-	-	-
Stage 1	911	823	-	867	780	-	-	-	-	-	-	-
Stage 2	726	772	-	752	821	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	11	3	2.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1566	-	-	744	707	1553	-	-
HCM Lane V/C Ratio	0.024	-	-	0.168	0.154	0.011	-	-
HCM Control Delay (s)	7.4	0	-	10.8	11	7.3	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	0.5	0	-	-

Existing

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HCM 2010 TWSC
6: Alder St & Sanders Rd

Intersection	
Int Delay, s/veh	2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	61	22	20	44	28	9
Future Vol, veh/h	61	22	20	44	28	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	66	24	22	48	30	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	90	0	169	78
Stage 1	-	-	-	-	78	-
Stage 2	-	-	-	-	91	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1505	-	821	983
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	933	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1505	-	809	983
Mov Cap-2 Maneuver	-	-	-	-	809	-
Stage 1	-	-	-	-	945	-
Stage 2	-	-	-	-	919	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.3	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	809	983	-	-	1505	-
HCM Lane V/C Ratio	0.038	0.01	-	-	0.014	-
HCM Control Delay (s)	9.6	8.7	-	-	7.4	0
HCM Lane LOS	A	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-

HCM 2010 AWSC
7: Water Street & Idaho St

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	1	19	19	0	6	35	208	36	6	110	7
Future Vol, veh/h	3	1	19	19	0	6	35	208	36	6	110	7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	1	21	21	0	7	38	226	39	7	120	8
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.6	8.1	9.3	8.2
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	13%	13%	76%	5%
Vol Thru, %	75%	4%	0%	89%
Vol Right, %	13%	83%	24%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	279	23	25	123
LT Vol	35	3	19	6
Through Vol	208	1	0	110
RT Vol	36	19	6	7
Lane Flow Rate	303	25	27	134
Geometry Grp	1	1	1	1
Degree of Util (X)	0.343	0.031	0.037	0.161
Departure Headway (Hd)	4.073	4.443	4.917	4.332
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	870	809	731	832
Service Time	2.153	2.451	2.926	2.338
HCM Lane V/C Ratio	0.348	0.031	0.037	0.161
HCM Control Delay	9.3	7.6	8.1	8.2
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	1.5	0.1	0.1	0.6

Existing

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HCM 2010 AWSC
8: Water Street & Helena Avenue

Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			↰	↱		✣	
Traffic Vol, veh/h	10	5	4	121	2	10	16	77	167	26	134	2
Future Vol, veh/h	10	5	4	121	2	10	16	77	167	26	134	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	11	5	4	132	2	11	17	84	182	28	146	2
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	8.3	9.4	8.5	9.2
HCM LOS	A	A	A	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	17%	0%	53%	91%	16%
Vol Thru, %	83%	0%	26%	2%	83%
Vol Right, %	0%	100%	21%	8%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	93	167	19	133	162
LT Vol	16	0	10	121	26
Through Vol	77	0	5	2	134
RT Vol	0	167	4	10	2
Lane Flow Rate	101	182	21	145	176
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.145	0.221	0.029	0.204	0.232
Departure Headway (Hd)	5.171	4.381	5.104	5.073	4.753
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	693	819	698	705	754
Service Time	2.906	2.115	3.162	3.117	2.792
HCM Lane V/C Ratio	0.146	0.222	0.03	0.206	0.233
HCM Control Delay	8.8	8.4	8.3	9.4	9.2
HCM Lane LOS	A	A	A	A	A
HCM 95th-tile Q	0.5	0.8	0.1	0.8	0.9

HCM 2010 TWSC
9: Walnut Street/Airport Rd & Helena Avenue

Intersection	
Int Delay, s/veh	6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	61	54	9	52	29	56	151	22	20	127	24
Future Vol, veh/h	24	61	54	9	52	29	56	151	22	20	127	24
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	1	1	1
Mvmt Flow	26	66	59	10	57	32	61	164	24	22	138	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	537	505	151	555	506	176	164	0	0	188	0	0
Stage 1	195	195	-	298	298	-	-	-	-	-	-	-
Stage 2	342	310	-	257	208	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	458	473	901	445	472	872	1421	-	-	1392	-	-
Stage 1	811	743	-	715	671	-	-	-	-	-	-	-
Stage 2	677	663	-	752	734	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	379	443	901	351	442	872	1421	-	-	1392	-	-
Mov Cap-2 Maneuver	379	443	-	351	442	-	-	-	-	-	-	-
Stage 1	772	730	-	681	639	-	-	-	-	-	-	-
Stage 2	566	631	-	628	722	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.4	13.3	1.9	0.9
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1421	-	-	533	351	537	1392	-	-
HCM Lane V/C Ratio	0.043	-	-	0.283	0.028	0.164	0.016	-	-
HCM Control Delay (s)	7.6	0	-	14.4	15.6	13	7.6	0	-
HCM Lane LOS	A	A	-	B	C	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.2	0.1	0.6	0	-	-

HCM 2010 TWSC
10: Wildcat Way & 18th Avenue

Intersection	
Int Delay, s/veh	8.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	50	368	29	22	57	368
Future Vol, veh/h	50	368	29	22	57	368
Conflicting Peds, #/hr	0	5	3	0	3	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	0	0	0	0
Mvmt Flow	54	400	32	24	62	400

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	459	0	349	263
Stage 1	-	-	-	-	259	-
Stage 2	-	-	-	-	90	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1113	-	652	781
Stage 1	-	-	-	-	789	-
Stage 2	-	-	-	-	939	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1109	-	628	774
Mov Cap-2 Maneuver	-	-	-	-	628	-
Stage 1	-	-	-	-	785	-
Stage 2	-	-	-	-	909	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.7	17.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	751	-	-	1109	-
HCM Lane V/C Ratio	0.615	-	-	0.028	-
HCM Control Delay (s)	17.1	-	-	8.3	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	4.3	-	-	0.1	-

Existing

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HCM 2010 AWSC
11: Walnut Street & 18th Avenue

Intersection	
Intersection Delay, s/veh	19.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	142	179	17	51	184	92	28	77	96	68	83	121
Future Vol, veh/h	142	179	17	51	184	92	28	77	96	68	83	121
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	1	1	1
Mvmt Flow	154	195	18	55	200	100	30	84	104	74	90	132
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	22.2	20.2	14.8	17.6
HCM LOS	C	C	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	42%	16%	25%
Vol Thru, %	38%	53%	56%	31%
Vol Right, %	48%	5%	28%	44%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	201	338	327	272
LT Vol	28	142	51	68
Through Vol	77	179	184	83
RT Vol	96	17	92	121
Lane Flow Rate	218	367	355	296
Geometry Grp	1	1	1	1
Degree of Util (X)	0.416	0.673	0.637	0.548
Departure Headway (Hd)	6.857	6.591	6.448	6.678
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	524	547	562	541
Service Time	4.917	4.625	4.481	4.721
HCM Lane V/C Ratio	0.416	0.671	0.632	0.547
HCM Control Delay	14.8	22.2	20.2	17.6
HCM Lane LOS	B	C	C	C
HCM 95th-tile Q	2	5	4.5	3.3

HCM 2010 AWSC
12: Alder Street & 18th Avenue

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	23	25	57	37	30	7	79	213	40	7	134	27
Future Vol, veh/h	23	25	57	37	30	7	79	213	40	7	134	27
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	25	27	62	40	33	8	86	232	43	8	146	29
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	9.3	9.4	11.7	9.4
HCM LOS	A	A	B	A

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	24%	22%	100%	0%	4%
Vol Thru, %	64%	24%	0%	81%	80%
Vol Right, %	12%	54%	0%	19%	16%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	332	105	37	37	168
LT Vol	79	23	37	0	7
Through Vol	213	25	0	30	134
RT Vol	40	57	0	7	27
Lane Flow Rate	361	114	40	40	183
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.466	0.163	0.072	0.065	0.243
Departure Headway (Hd)	4.649	5.147	6.443	5.802	4.793
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	769	689	551	611	743
Service Time	2.707	3.235	4.236	3.595	2.863
HCM Lane V/C Ratio	0.469	0.165	0.073	0.065	0.246
HCM Control Delay	11.7	9.3	9.7	9	9.4
HCM Lane LOS	B	A	A	A	A
HCM 95th-tile Q	2.5	0.6	0.2	0.2	1

HCM 2010 TWSC
13: Water Street & 15th Avenue

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	52	77	111	234	143	34
Future Vol, veh/h	52	77	111	234	143	34
Conflicting Peds, #/hr	1	1	1	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	57	84	121	254	155	37

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	672	176	193	0	-	0
Stage 1	175	-	-	-	-	-
Stage 2	497	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	424	872	1392	-	-	-
Stage 1	860	-	-	-	-	-
Stage 2	615	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	386	870	1391	-	-	-
Mov Cap-2 Maneuver	386	-	-	-	-	-
Stage 1	859	-	-	-	-	-
Stage 2	561	-	-	-	-	-

Approach	EB		NB		SB	
HCM Control Delay, s	13.2		2.5		0	
HCM LOS	B					

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1391	-	578	-	-
HCM Lane V/C Ratio	0.087	-	0.243	-	-
HCM Control Delay (s)	7.8	-	13.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.3	-	0.9	-	-

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HCM 2010 TWSC
14: Main St & 14th Avenue

Intersection						
Int Delay, s/veh	5.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	97	31	126	115	36	144
Future Vol, veh/h	97	31	126	115	36	144
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	105	34	137	125	39	157

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	139	0	521	122
Stage 1	-	-	-	-	122	-
Stage 2	-	-	-	-	399	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1445	-	516	929
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	678	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1445	-	463	929
Mov Cap-2 Maneuver	-	-	-	-	463	-
Stage 1	-	-	-	-	903	-
Stage 2	-	-	-	-	609	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.1	11.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	773	-	-	1445	-
HCM Lane V/C Ratio	0.253	-	-	0.095	-
HCM Control Delay (s)	11.2	-	-	7.8	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1	-	-	0.3	-

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HCM 2010 AWSC
15: Wildcat Way & 14th Avenue/Dean Nicholson Blvd

Intersection	
Intersection Delay, s/veh	21.3
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	123	147	28	133	127	14	70	213	44	20	256	105
Future Vol, veh/h	123	147	28	133	127	14	70	213	44	20	256	105
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	134	160	30	145	138	15	76	232	48	22	278	114
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	15.7	15.2	19	32
HCM LOS	C	C	C	D

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	83%	0%	84%	0%	90%	0%	71%
Vol Right, %	0%	17%	0%	16%	0%	10%	0%	29%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	257	123	175	133	141	20	361
LT Vol	70	0	123	0	133	0	20	0
Through Vol	0	213	0	147	0	127	0	256
RT Vol	0	44	0	28	0	14	0	105
Lane Flow Rate	76	279	134	190	145	153	22	392
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.173	0.587	0.314	0.413	0.342	0.337	0.049	0.797
Departure Headway (Hd)	8.205	7.566	8.447	7.815	8.506	7.917	8.038	7.315
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	435	475	424	458	421	452	444	494
Service Time	5.991	5.352	6.238	5.605	6.298	5.709	5.815	5.091
HCM Lane V/C Ratio	0.175	0.587	0.316	0.415	0.344	0.338	0.05	0.794
HCM Control Delay	12.7	20.7	15.1	16.1	15.7	14.7	11.2	33.2
HCM Lane LOS	B	C	C	C	C	B	B	D
HCM 95th-tile Q	0.6	3.7	1.3	2	1.5	1.5	0.2	7.4

HCM 2010 AWSC
16: Alder Street & Dean Nicholson Blvd/14th Avenue

Intersection	
Intersection Delay, s/veh	12.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	59	12	106	7	18	10	68	305	8	8	217	38
Future Vol, veh/h	59	12	106	7	18	10	68	305	8	8	217	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	1	1	1	0	0	0	0	0	0	2	2	2
Mvmt Flow	64	13	115	8	20	11	74	332	9	9	236	41
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.7	9.3	14.6	11.5
HCM LOS	B	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	18%	33%	20%	3%
Vol Thru, %	80%	7%	51%	83%
Vol Right, %	2%	60%	29%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	381	177	35	263
LT Vol	68	59	7	8
Through Vol	305	12	18	217
RT Vol	8	106	10	38
Lane Flow Rate	414	192	38	286
Geometry Grp	1	1	1	1
Degree of Util (X)	0.576	0.29	0.062	0.403
Departure Headway (Hd)	5.005	5.43	5.902	5.079
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	725	662	605	709
Service Time	3.005	3.47	3.954	3.108
HCM Lane V/C Ratio	0.571	0.29	0.063	0.403
HCM Control Delay	14.6	10.7	9.3	11.5
HCM Lane LOS	B	B	A	B
HCM 95th-tile Q	3.7	1.2	0.2	2

HCM 2010 TWSC
17: Wenas Street & University Way

Intersection	
Int Delay, s/veh	3.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	408	46	52	460	95	60
Future Vol, veh/h	408	46	52	460	95	60
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	2	2	1	1
Mvmt Flow	443	50	57	500	103	65

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	494	0	1082	469
Stage 1	-	-	-	-	469	-
Stage 2	-	-	-	-	613	-
Critical Hdwy	-	-	4.12	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	1070	-	242	596
Stage 1	-	-	-	-	632	-
Stage 2	-	-	-	-	542	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1070	-	229	595
Mov Cap-2 Maneuver	-	-	-	-	229	-
Stage 1	-	-	-	-	631	-
Stage 2	-	-	-	-	513	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	24.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	229	595	-	-	1070	-
HCM Lane V/C Ratio	0.451	0.11	-	-	0.053	-
HCM Control Delay (s)	33	11.8	-	-	8.6	-
HCM Lane LOS	D	B	-	-	A	-
HCM 95th %tile Q(veh)	2.2	0.4	-	-	0.2	-

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HCM 2010 Signalized Intersection Summary
18: Water Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	420	68	78	475	121	79	254	98	41	185	67
Future Volume (veh/h)	44	420	68	78	475	121	79	254	98	41	185	67
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1900	1900	1810	1900	1810	1810	1900	1810	1810	1900
Adj Flow Rate, veh/h	48	457	74	85	516	132	86	276	107	45	201	73
Adj No. of Lanes	0	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	5	5	5	5	5	5	5	5	5
Cap, veh/h	165	1451	231	224	1269	319	295	383	149	212	391	142
Arrive On Green	0.58	0.58	0.58	0.58	0.58	0.58	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	181	2520	402	278	2205	554	1069	1243	482	968	1268	460
Grp Volume(v), veh/h	292	0	287	364	0	369	86	0	383	45	0	274
Grp Sat Flow(s),veh/h/ln	1542	0	1560	1488	0	1549	1069	0	1725	968	0	1728
Q Serve(g_s), s	0.0	0.0	6.6	1.2	0.0	9.2	5.0	0.0	13.6	3.0	0.0	9.0
Cycle Q Clear(g_c), s	5.7	0.0	6.6	7.8	0.0	9.2	14.0	0.0	13.6	16.6	0.0	9.0
Prop In Lane	0.16		0.26	0.23		0.36	1.00		0.28	1.00		0.27
Lane Grp Cap(c), veh/h	948	0	898	921	0	892	295	0	532	212	0	533
V/C Ratio(X)	0.31	0.00	0.32	0.40	0.00	0.41	0.29	0.00	0.72	0.21	0.00	0.51
Avail Cap(c_a), veh/h	948	0	898	921	0	892	368	0	650	278	0	651
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	7.4	0.0	7.6	7.8	0.0	8.2	25.4	0.0	21.2	28.6	0.0	19.6
Incr Delay (d2), s/veh	0.8	0.0	0.9	1.3	0.0	1.4	0.7	0.0	3.3	0.6	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	0.0	3.0	4.0	0.0	4.2	1.5	0.0	7.0	0.8	0.0	4.4
LnGrp Delay(d),s/veh	8.3	0.0	8.6	9.1	0.0	9.6	26.0	0.0	24.6	29.2	0.0	20.5
LnGrp LOS	A		A	A		A	C		C	C		C
Approach Vol, veh/h		579			733			469			319	
Approach Delay, s/veh		8.4			9.3			24.8			21.8	
Approach LOS		A			A			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		25.3		43.7		25.3		43.7				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		26.0		35.0		26.0		35.0				
Max Q Clear Time (g_c+I1), s		16.0		8.6		18.6		11.2				
Green Ext Time (p_c), s		3.2		8.6		2.7		8.3				
Intersection Summary												
HCM 2010 Ctrl Delay			14.4									
HCM 2010 LOS			B									

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HCM 2010 Signalized Intersection Summary
19: Main St & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	175	332	46	32	315	82	53	141	28	181	202	141
Future Volume (veh/h)	175	332	46	32	315	82	53	141	28	181	202	141
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1845	1845	1900	1863	1863	1863	1881	1881	1881
Adj Flow Rate, veh/h	190	361	50	35	342	89	58	153	30	197	220	153
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	3	3	3	2	2	2	1	1	1
Cap, veh/h	579	1515	208	561	1218	312	287	275	229	385	410	344
Arrive On Green	0.08	0.51	0.51	0.02	0.44	0.44	0.04	0.15	0.15	0.11	0.22	0.22
Sat Flow, veh/h	1707	3000	412	1757	2748	704	1774	1863	1556	1792	1881	1576
Grp Volume(v), veh/h	190	204	207	35	216	215	58	153	30	197	220	153
Grp Sat Flow(s),veh/h/ln	1707	1703	1709	1757	1752	1700	1774	1863	1556	1792	1881	1576
Q Serve(g_s), s	3.8	4.6	4.7	0.8	5.4	5.6	1.9	5.3	1.2	6.1	7.1	5.8
Cycle Q Clear(g_c), s	3.8	4.6	4.7	0.8	5.4	5.6	1.9	5.3	1.2	6.1	7.1	5.8
Prop In Lane	1.00		0.24	1.00		0.41	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	579	860	863	561	776	753	287	275	229	385	410	344
V/C Ratio(X)	0.33	0.24	0.24	0.06	0.28	0.29	0.20	0.56	0.13	0.51	0.54	0.45
Avail Cap(c_a), veh/h	622	860	863	715	776	753	412	513	429	385	518	434
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	8.2	9.6	9.6	10.1	12.2	12.2	23.7	27.3	25.6	20.3	23.9	23.4
Incr Delay (d2), s/veh	0.1	0.6	0.7	0.0	0.9	1.0	0.1	0.7	0.1	0.5	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	2.3	2.3	0.4	2.8	2.8	0.9	2.8	0.5	3.0	3.8	2.5
LnGrp Delay(d),s/veh	8.3	10.2	10.3	10.1	13.1	13.2	23.8	28.0	25.7	20.8	24.3	23.7
LnGrp LOS	A	B	B	B	B	B	C	C	C	C	C	C
Approach Vol, veh/h		601			466			241			570	
Approach Delay, s/veh		9.6			12.9			26.7			22.9	
Approach LOS		A			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	14.2	5.0	38.9	6.1	19.0	9.3	34.6
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	3.5	4.0	3.5	4.0
Max Green Setting (Gmax), s	7.5	19.0	7.5	20.0	7.5	19.0	7.5	20.0
Max Q Clear Time (g_c+I1), s	8.1	7.3	2.8	6.7	3.9	9.1	5.8	7.6
Green Ext Time (p_c), s	0.0	1.1	0.0	1.7	0.0	1.0	0.1	1.7

Intersection Summary			
HCM 2010 Ctrl Delay			16.7
HCM 2010 LOS			B

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HCM Signalized Intersection Capacity Analysis
20: Wildcat Way & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	23	482	84	103	505	11	102	120	124	15	80	27
Future Volume (vph)	23	482	84	103	505	11	102	120	124	15	80	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.98			1.00		1.00	0.92		1.00	0.96	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3526			3571		1805	1755		1805	1829	
Flt Permitted		0.92			0.76		0.68	1.00		0.34	1.00	
Satd. Flow (perm)		3253			2736		1296	1755		654	1829	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	25	524	91	112	549	12	111	130	135	16	87	29
RTOR Reduction (vph)	0	13	0	0	1	0	0	67	0	0	22	0
Lane Group Flow (vph)	0	627	0	0	672	0	111	198	0	16	94	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		47.7			47.7		13.3	13.3		13.3	13.3	
Effective Green, g (s)		47.7			47.7		13.3	13.3		13.3	13.3	
Actuated g/C Ratio		0.69			0.69		0.19	0.19		0.19	0.19	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		0.2			0.2		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		2248			1891		249	338		126	352	
v/s Ratio Prot								c0.11			0.05	
v/s Ratio Perm		0.19			c0.25		0.09			0.02		
v/c Ratio		0.28			0.36		0.45	0.59		0.13	0.27	
Uniform Delay, d1		4.1			4.4		24.6	25.3		23.0	23.7	
Progression Factor		1.08			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.3			0.5		1.3	2.6		0.5	0.4	
Delay (s)		4.7			4.9		25.9	27.9		23.5	24.1	
Level of Service		A			A		C	C		C	C	
Approach Delay (s)		4.7			4.9			27.3			24.0	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Existing

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HCM Signalized Intersection Capacity Analysis
21: Walnut Street & University Way

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	743	32	12	700	26	24
Future Volume (vph)	743	32	12	700	26	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.5	
Lane Util. Factor	0.95			0.95	1.00	
Frt	0.99			1.00	0.94	
Flt Protected	1.00			1.00	0.97	
Satd. Flow (prot)	3517			3536	1698	
Flt Permitted	1.00			0.94	0.97	
Satd. Flow (perm)	3517			3330	1698	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	808	35	13	761	28	26
RTOR Reduction (vph)	2	0	0	0	24	0
Lane Group Flow (vph)	841	0	0	774	30	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			2	8	
Permitted Phases			2			
Actuated Green, G (s)	57.3			57.3	4.7	
Effective Green, g (s)	57.3			57.3	4.7	
Actuated g/C Ratio	0.81			0.81	0.07	
Clearance Time (s)	4.0			4.0	4.5	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	2858			2706	113	
v/s Ratio Prot	c0.24				c0.02	
v/s Ratio Perm				0.23		
v/c Ratio	0.29			0.29	0.26	
Uniform Delay, d1	1.6			1.6	31.3	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.3			0.3	1.2	
Delay (s)	1.9			1.9	32.5	
Level of Service	A			A	C	
Approach Delay (s)	1.9			1.9	32.5	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	2.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	70.5	Sum of lost time (s)	8.5
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM 2010 Signalized Intersection Summary
22: Chestnut Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	213	452	1	30	495	80	25	59	54	72	24	268
Future Volume (veh/h)	213	452	1	30	495	80	25	59	54	72	24	268
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	0.99		0.97	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1881	1881	1900	1900	1900	1900	1881	1881	1900
Adj Flow Rate, veh/h	232	491	1	33	538	87	27	64	59	78	26	291
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	1	1	1	0	0	0	1	1	1
Cap, veh/h	544	1925	4	572	1459	235	197	246	226	372	36	400
Arrive On Green	0.09	0.53	0.53	0.03	0.48	0.48	0.27	0.27	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1774	3623	7	1792	3064	493	1072	899	829	1264	131	1465
Grp Volume(v), veh/h	232	240	252	33	313	312	27	0	123	78	0	317
Grp Sat Flow(s),veh/h/ln	1774	1770	1861	1792	1787	1770	1072	0	1728	1264	0	1596
Q Serve(g_s), s	4.5	5.4	5.4	0.7	8.2	8.3	1.7	0.0	4.1	3.8	0.0	13.3
Cycle Q Clear(g_c), s	4.5	5.4	5.4	0.7	8.2	8.3	15.1	0.0	4.1	7.9	0.0	13.3
Prop In Lane	1.00		0.00	1.00		0.28	1.00		0.48	1.00		0.92
Lane Grp Cap(c), veh/h	544	940	989	572	851	843	197	0	472	372	0	436
V/C Ratio(X)	0.43	0.26	0.26	0.06	0.37	0.37	0.14	0.00	0.26	0.21	0.00	0.73
Avail Cap(c_a), veh/h	555	940	989	875	851	843	252	0	560	437	0	518
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.1	9.4	9.4	9.1	12.3	12.3	31.2	0.0	21.0	24.1	0.0	24.4
Incr Delay (d2), s/veh	0.5	0.7	0.6	0.0	1.2	1.2	0.4	0.0	0.4	0.4	0.0	4.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	2.8	2.9	0.3	4.3	4.3	0.5	0.0	2.0	1.4	0.0	6.4
LnGrp Delay(d),s/veh	8.6	10.1	10.0	9.1	13.5	13.6	31.7	0.0	21.5	24.5	0.0	29.3
LnGrp LOS	A	B	B	A	B	B	C		C	C		C
Approach Vol, veh/h		724			658			150			395	
Approach Delay, s/veh		9.6			13.3			23.3			28.3	
Approach LOS		A			B			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.5	43.3		24.2	10.5	39.2		24.2				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	15.0	23.0		24.0	7.0	31.0		24.0				
Max Q Clear Time (g_c+I1), s	2.7	7.4		15.3	6.5	10.3		17.1				
Green Ext Time (p_c), s	0.0	6.3		2.4	0.0	7.2		2.0				
Intersection Summary												
HCM 2010 Ctrl Delay			15.8									
HCM 2010 LOS			B									

Existing

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HCM 2010 Signalized Intersection Summary
23: Alder Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	222	503	8	2	294	78	7	0	3	88	3	202
Future Volume (veh/h)	222	503	8	2	294	78	7	0	3	88	3	202
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	241	547	9	2	320	85	8	0	3	96	3	220
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	531	1817	30	454	1416	371	414	13	129	657	19	633
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.39	0.00	0.39	0.39	0.39	0.39
Sat Flow, veh/h	996	3635	60	866	2833	741	841	34	328	1431	49	1615
Grp Volume(v), veh/h	241	272	284	2	202	203	11	0	0	99	0	220
Grp Sat Flow(s),veh/h/ln	996	1805	1889	866	1805	1769	1203	0	0	1480	0	1615
Q Serve(g_s), s	13.3	6.6	6.6	0.1	4.7	4.8	0.0	0.0	0.0	0.0	0.0	7.1
Cycle Q Clear(g_c), s	18.1	6.6	6.6	6.7	4.7	4.8	2.6	0.0	0.0	2.6	0.0	7.1
Prop In Lane	1.00		0.03	1.00		0.42	0.73		0.27	0.97		1.00
Lane Grp Cap(c), veh/h	531	903	945	454	903	885	556	0	0	676	0	633
V/C Ratio(X)	0.45	0.30	0.30	0.00	0.22	0.23	0.02	0.00	0.00	0.15	0.00	0.35
Avail Cap(c_a), veh/h	531	903	945	454	903	885	556	0	0	676	0	633
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.6	10.9	10.9	12.8	10.4	10.4	13.8	0.0	0.0	14.5	0.0	15.8
Incr Delay (d2), s/veh	2.8	0.9	0.8	0.0	0.6	0.6	0.1	0.0	0.0	0.5	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	3.5	3.6	0.0	2.4	2.5	0.1	0.0	0.0	1.4	0.0	3.4
LnGrp Delay(d),s/veh	18.4	11.7	11.7	12.9	11.0	11.1	13.9	0.0	0.0	14.9	0.0	17.3
LnGrp LOS	B	B	B	B	B	B	B			B		B
Approach Vol, veh/h		797			407			11			319	
Approach Delay, s/veh		13.7			11.0			13.9			16.6	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		41.0		33.0		41.0		33.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		37.0		29.0		37.0		29.0
Max Q Clear Time (g_c+I1), s		20.1		4.6		8.7		9.1
Green Ext Time (p_c), s		8.6		1.4		11.2		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	13.6
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
24: Pfenning Rd & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	43	289	48	49	153	18	22	302	71	20	28	18
Future Volume (veh/h)	43	289	48	49	153	18	22	302	71	20	28	18
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	47	314	52	53	166	20	24	328	77	22	30	20
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	579	560	93	437	586	71	141	490	111	258	304	157
Arrive On Green	0.36	0.36	0.36	0.36	0.36	0.36	0.34	0.34	0.34	0.34	0.34	0.34
Sat Flow, veh/h	1193	1559	258	1012	1631	197	46	1422	321	300	883	455
Grp Volume(v), veh/h	47	0	366	53	0	186	429	0	0	72	0	0
Grp Sat Flow(s),veh/h/ln	1193	0	1817	1012	0	1828	1789	0	0	1638	0	0
Q Serve(g_s), s	0.9	0.0	4.9	1.3	0.0	2.2	0.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.1	0.0	4.9	6.3	0.0	2.2	6.2	0.0	0.0	0.8	0.0	0.0
Prop In Lane	1.00		0.14	1.00		0.11	0.06		0.18	0.31		0.28
Lane Grp Cap(c), veh/h	579	0	653	437	0	657	741	0	0	719	0	0
V/C Ratio(X)	0.08	0.00	0.56	0.12	0.00	0.28	0.58	0.00	0.00	0.10	0.00	0.00
Avail Cap(c_a), veh/h	856	0	1076	672	0	1082	1179	0	0	1066	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.0	0.0	7.8	10.3	0.0	6.9	8.6	0.0	0.0	6.8	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	0.8	0.1	0.0	0.2	0.7	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.6	0.4	0.0	1.1	3.1	0.0	0.0	0.4	0.0	0.0
LnGrp Delay(d),s/veh	8.1	0.0	8.6	10.4	0.0	7.2	9.3	0.0	0.0	6.9	0.0	0.0
LnGrp LOS	A		A	B		A	A			A		
Approach Vol, veh/h		413			239			429			72	
Approach Delay, s/veh		8.5			7.9			9.3			6.9	
Approach LOS		A			A			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		15.0		15.4		15.0		15.4
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		8.2		6.9		2.8		8.3
Green Ext Time (p_c), s		2.3		2.9		2.8		2.7

Intersection Summary	
HCM 2010 Ctrl Delay	8.6
HCM 2010 LOS	A

Existing

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HCM 2010 TWSC
25: 5th Avenue & Railroad Avenue

Intersection	
Int Delay, s/veh	8.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	19	0	62	34	181	0	33	63	180	46	3
Future Vol, veh/h	2	19	0	62	34	181	0	33	63	180	46	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	21	0	67	37	197	0	36	68	196	50	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	630	547	52	523	515	70	53	0	0	104	0	0
Stage 1	443	443	-	70	70	-	-	-	-	-	-	-
Stage 2	187	104	-	453	445	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	394	445	1016	465	464	993	1553	-	-	1488	-	-
Stage 1	594	576	-	940	837	-	-	-	-	-	-	-
Stage 2	815	809	-	586	575	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	265	386	1016	401	403	993	1553	-	-	1488	-	-
Mov Cap-2 Maneuver	265	386	-	401	403	-	-	-	-	-	-	-
Stage 1	594	500	-	940	837	-	-	-	-	-	-	-
Stage 2	625	809	-	488	499	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.4	12.3	0	6.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1553	-	-	370	401	806	1488	-	-
HCM Lane V/C Ratio	-	-	-	0.062	0.168	0.29	0.131	-	-
HCM Control Delay (s)	0	-	-	15.4	15.8	11.3	7.8	-	-
HCM Lane LOS	A	-	-	C	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.6	1.2	0.5	-	-

HCM 2010 Signalized Intersection Summary
26: Water Street & 5th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	89	73	40	54	19	88	360	36	40	397	30
Future Volume (veh/h)	39	89	73	40	54	19	88	360	36	40	397	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1743	1743	1900	1881	1881	1900	1863	1863	1900
Adj Flow Rate, veh/h	42	97	79	43	59	21	96	391	39	43	432	33
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	9	9	9	1	1	1	2	2	2
Cap, veh/h	288	171	139	206	229	82	658	1173	117	681	1191	91
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.70	0.70	0.70	0.70	0.70	0.70
Sat Flow, veh/h	1256	912	743	1121	1226	436	932	1683	168	953	1709	131
Grp Volume(v), veh/h	42	0	176	43	0	80	96	0	430	43	0	465
Grp Sat Flow(s),veh/h/ln	1256	0	1654	1121	0	1662	932	0	1851	953	0	1839
Q Serve(g_s), s	2.0	0.0	6.7	2.5	0.0	2.8	3.2	0.0	6.3	1.3	0.0	7.1
Cycle Q Clear(g_c), s	4.9	0.0	6.7	9.2	0.0	2.8	10.3	0.0	6.3	7.6	0.0	7.1
Prop In Lane	1.00		0.45	1.00		0.26	1.00		0.09	1.00		0.07
Lane Grp Cap(c), veh/h	288	0	310	206	0	311	658	0	1290	681	0	1282
V/C Ratio(X)	0.15	0.00	0.57	0.21	0.00	0.26	0.15	0.00	0.33	0.06	0.00	0.36
Avail Cap(c_a), veh/h	489	0	575	386	0	578	658	0	1290	681	0	1282
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.0	0.0	25.5	29.7	0.0	23.9	6.3	0.0	4.1	5.6	0.0	4.2
Incr Delay (d2), s/veh	0.3	0.0	2.3	0.7	0.0	0.6	0.5	0.0	0.7	0.2	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	3.2	0.8	0.0	1.3	0.9	0.0	3.5	0.4	0.0	3.8
LnGrp Delay(d),s/veh	26.4	0.0	27.8	30.4	0.0	24.6	6.8	0.0	4.8	5.8	0.0	5.0
LnGrp LOS	C		C	C		C	A		A	A		A
Approach Vol, veh/h		218			123			526			508	
Approach Delay, s/veh		27.5			26.6			5.2			5.1	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		52.1		16.9		52.1		16.9
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		37.0		24.0		37.0		24.0
Max Q Clear Time (g_c+I1), s		12.3		8.7		9.6		11.2
Green Ext Time (p_c), s		5.1		1.8		5.2		1.7

Intersection Summary		
HCM 2010 Ctrl Delay		10.6
HCM 2010 LOS		B

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HCM 2010 Signalized Intersection Summary
27: Main St & 5th Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	26	131	49	79	157	41	32	446	31	27	417	23
Future Volume (veh/h)	26	131	49	79	157	41	32	446	31	27	417	23
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	28	142	53	86	171	45	35	485	34	29	453	25
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	3	3	3	2	2	2	2	2	2
Cap, veh/h	359	314	117	390	389	102	411	871	61	381	886	49
Arrive On Green	0.03	0.25	0.25	0.06	0.28	0.28	0.51	0.51	0.51	0.51	0.51	0.51
Sat Flow, veh/h	1740	1257	469	1757	1395	367	912	1717	120	879	1746	96
Grp Volume(v), veh/h	28	0	195	86	0	216	35	0	519	29	0	478
Grp Sat Flow(s),veh/h/ln	1740	0	1726	1757	0	1762	912	0	1837	879	0	1843
Q Serve(g_s), s	0.8	0.0	6.5	2.4	0.0	6.9	1.8	0.0	13.2	1.6	0.0	11.7
Cycle Q Clear(g_c), s	0.8	0.0	6.5	2.4	0.0	6.9	13.5	0.0	13.2	14.8	0.0	11.7
Prop In Lane	1.00		0.27	1.00		0.21	1.00		0.07	1.00		0.05
Lane Grp Cap(c), veh/h	359	0	432	390	0	491	411	0	932	381	0	934
V/C Ratio(X)	0.08	0.00	0.45	0.22	0.00	0.44	0.09	0.00	0.56	0.08	0.00	0.51
Avail Cap(c_a), veh/h	435	0	432	415	0	491	411	0	932	381	0	934
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	18.1	0.0	21.6	17.4	0.0	20.2	15.7	0.0	11.5	16.6	0.0	11.2
Incr Delay (d2), s/veh	0.1	0.0	3.4	0.3	0.0	2.8	0.4	0.0	2.4	0.4	0.0	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	3.5	1.2	0.0	3.7	0.5	0.0	7.3	0.4	0.0	6.5
LnGrp Delay(d),s/veh	18.2	0.0	25.0	17.7	0.0	23.0	16.1	0.0	13.9	17.0	0.0	13.2
LnGrp LOS	B		C	B		C	B		B	B		B
Approach Vol, veh/h		223			302			554			507	
Approach Delay, s/veh		24.1			21.5			14.0			13.4	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.5	21.0		38.5	6.6	23.0		38.5
Change Period (Y+Rc), s	4.5	4.0		4.0	4.5	4.0		4.0
Max Green Setting (Gmax), s	5.0	17.0		33.0	5.0	17.0		33.0
Max Q Clear Time (g_c+I1), s	4.4	8.5		16.8	2.8	8.9		15.5
Green Ext Time (p_c), s	0.0	1.1		4.6	0.0	1.1		4.7

Intersection Summary	
HCM 2010 Ctrl Delay	16.7
HCM 2010 LOS	B

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HCM 2010 AWSC
28: Ruby Street & 5th Avenue

Intersection	
Intersection Delay, s/veh	18.3
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	151	75	81	155	11	151	157	70	43	152	31
Future Vol, veh/h	18	151	75	81	155	11	151	157	70	43	152	31
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	20	164	82	88	168	12	164	171	76	47	165	34
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	15.5	16.4	23.2	15
HCM LOS	C	C	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	40%	7%	33%	19%
Vol Thru, %	42%	62%	63%	67%
Vol Right, %	19%	31%	4%	14%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	378	244	247	226
LT Vol	151	18	81	43
Through Vol	157	151	155	152
RT Vol	70	75	11	31
Lane Flow Rate	411	265	268	246
Geometry Grp	1	1	1	1
Degree of Util (X)	0.71	0.48	0.5	0.449
Departure Headway (Hd)	6.222	6.519	6.7	6.584
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	579	549	534	543
Service Time	4.292	4.599	4.781	4.668
HCM Lane V/C Ratio	0.71	0.483	0.502	0.453
HCM Control Delay	23.2	15.5	16.4	15
HCM Lane LOS	C	C	C	B
HCM 95th-tile Q	5.8	2.6	2.8	2.3

HCM 2010 TWSC
29: Chestnut Street & 5th Avenue

Intersection												
Int Delay, s/veh	0.9											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱		↰	↱	
Traffic Vol, veh/h	2	3	2	9	5	21	2	333	4	11	283	3
Future Vol, veh/h	2	3	2	9	5	21	2	333	4	11	283	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	3	2	10	5	23	2	362	4	12	308	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	716	704	309	704	703	364	311	0	0	366	0	0
Stage 1	333	333	-	368	368	-	-	-	-	-	-	-
Stage 2	383	371	-	336	335	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	345	361	731	352	362	681	1249	-	-	1193	-	-
Stage 1	681	644	-	652	621	-	-	-	-	-	-	-
Stage 2	640	620	-	678	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	327	357	731	345	358	681	1249	-	-	1193	-	-
Mov Cap-2 Maneuver	327	357	-	345	358	-	-	-	-	-	-	-
Stage 1	680	638	-	651	620	-	-	-	-	-	-	-
Stage 2	612	619	-	666	637	-	-	-	-	-	-	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	14			12.9			0			0.3		
HCM LOS	B			B								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1249	-	-	327	449	494	1193	-	-
HCM Lane V/C Ratio	0.002	-	-	0.007	0.012	0.077	0.01	-	-
HCM Control Delay (s)	7.9	-	-	16.1	13.1	12.9	8	-	-
HCM Lane LOS	A	-	-	C	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0.2	0	-	-

HCM 2010 Signalized Intersection Summary
30: Water Street & 3rd Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	7	81	71	44	83	43	27	362	40	68	382	16
Future Volume (veh/h)	7	81	71	44	83	43	27	362	40	68	382	16
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1863	1863	1900	1827	1827	1900
Adj Flow Rate, veh/h	8	88	77	48	90	47	29	393	43	74	415	17
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	4	4	4
Cap, veh/h	239	162	142	213	205	107	687	1162	127	673	1228	50
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.70	0.70	0.70	0.70	0.70	0.70
Sat Flow, veh/h	1228	904	791	1196	1139	595	952	1650	181	930	1743	71
Grp Volume(v), veh/h	8	0	165	48	0	137	29	0	436	74	0	432
Grp Sat Flow(s),veh/h/ln	1228	0	1695	1196	0	1734	952	0	1830	930	0	1814
Q Serve(g_s), s	0.4	0.0	6.1	2.6	0.0	4.9	0.8	0.0	6.4	2.3	0.0	6.4
Cycle Q Clear(g_c), s	5.3	0.0	6.1	8.7	0.0	4.9	7.2	0.0	6.4	8.7	0.0	6.4
Prop In Lane	1.00		0.47	1.00		0.34	1.00		0.10	1.00		0.04
Lane Grp Cap(c), veh/h	239	0	305	213	0	312	687	0	1289	673	0	1278
V/C Ratio(X)	0.03	0.00	0.54	0.22	0.00	0.44	0.04	0.00	0.34	0.11	0.00	0.34
Avail Cap(c_a), veh/h	356	0	467	328	0	477	687	0	1289	673	0	1278
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.5	0.0	25.7	29.7	0.0	25.2	5.4	0.0	4.0	5.6	0.0	4.0
Incr Delay (d2), s/veh	0.1	0.0	2.1	0.8	0.0	1.4	0.1	0.0	0.7	0.3	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	3.0	0.9	0.0	2.4	0.2	0.0	3.4	0.7	0.0	3.4
LnGrp Delay(d),s/veh	27.6	0.0	27.8	30.4	0.0	26.6	5.5	0.0	4.7	6.0	0.0	4.7
LnGrp LOS	C		C	C		C	A		A	A		A
Approach Vol, veh/h		173			185			465			506	
Approach Delay, s/veh		27.8			27.6			4.7			4.9	
Approach LOS		C			C			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		52.6		16.4		52.6		16.4				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		42.0		19.0		42.0		19.0				
Max Q Clear Time (g_c+I1), s		9.2		8.1		10.7		10.7				
Green Ext Time (p_c), s		4.9		1.6		4.8		1.4				
Intersection Summary												
HCM 2010 Ctrl Delay			11.0									
HCM 2010 LOS			B									

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HCM Signalized Intersection Capacity Analysis
31: Main St & 3rd Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	119	32	98	110	79	32	578	60	69	576	22
Future Volume (vph)	32	119	32	98	110	79	32	578	60	69	576	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1759	1790		1781	1743		1766	1831		1768	1851	
Flt Permitted	0.53	1.00		0.61	1.00		0.32	1.00		0.30	1.00	
Satd. Flow (perm)	978	1790		1137	1743		598	1831		549	1851	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	129	35	107	120	86	35	628	65	75	626	24
RTOR Reduction (vph)	0	15	0	0	40	0	0	5	0	0	2	0
Lane Group Flow (vph)	35	149	0	107	166	0	35	688	0	75	648	0
Confl. Peds. (#/hr)	4		4	2		3	3		4	2		2
Confl. Bikes (#/hr)			3			1			4			3
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			2			2	
Permitted Phases	1			1			2			2		
Actuated Green, G (s)	17.0	17.0		17.0	17.0		44.0	44.0		44.0	44.0	
Effective Green, g (s)	17.0	17.0		17.0	17.0		44.0	44.0		44.0	44.0	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.64	0.64		0.64	0.64	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	240	441		280	429		381	1167		350	1180	
v/s Ratio Prot		0.08			c0.10			c0.38			0.35	
v/s Ratio Perm	0.04			0.09			0.06			0.14		
v/c Ratio	0.15	0.34		0.38	0.39		0.09	0.59		0.21	0.55	
Uniform Delay, d1	20.3	21.4		21.6	21.7		4.8	7.3		5.2	7.0	
Progression Factor	1.21	1.18		1.00	1.00		0.73	1.18		1.00	1.00	
Incremental Delay, d2	0.1	0.2		0.3	0.2		0.4	2.0		1.4	1.8	
Delay (s)	24.8	25.4		21.9	21.9		4.0	10.6		6.6	8.8	
Level of Service	C	C		C	C		A	B		A	A	
Approach Delay (s)		25.3			21.9			10.3			8.6	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Existing

Synchro 9 Report
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HCM 2010 AWSC
32: Ruby Street & 3rd Avenue

Intersection	
Intersection Delay, s/veh	20
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	130	159	36	28	130	26	29	176	33	42	212	130
Future Vol, veh/h	130	159	36	28	130	26	29	176	33	42	212	130
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	141	173	39	30	141	28	32	191	36	46	230	141
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	21.2	14.6	16.1	24
HCM LOS	C	B	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	12%	40%	15%	11%
Vol Thru, %	74%	49%	71%	55%
Vol Right, %	14%	11%	14%	34%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	238	325	184	384
LT Vol	29	130	28	42
Through Vol	176	159	130	212
RT Vol	33	36	26	130
Lane Flow Rate	259	353	200	417
Geometry Grp	1	1	1	1
Degree of Util (X)	0.489	0.647	0.392	0.721
Departure Headway (Hd)	6.803	6.708	7.054	6.323
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	533	540	512	576
Service Time	4.803	4.708	5.071	4.323
HCM Lane V/C Ratio	0.486	0.654	0.391	0.724
HCM Control Delay	16.1	21.2	14.6	24
HCM Lane LOS	C	C	B	C
HCM 95th-tile Q	2.7	4.6	1.8	6

HCM 2010 AWSC
33: Chestnut Street & 3rd Avenue

Intersection	
Intersection Delay, s/veh	11.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	45	63	21	6	44	48	28	205	13	60	228	36
Future Vol, veh/h	45	63	21	6	44	48	28	205	13	60	228	36
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	49	68	23	7	48	52	30	223	14	65	248	39
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	10.4	9.7	11.4	12
HCM LOS	B	A	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	35%	6%	100%	0%
Vol Thru, %	0%	94%	49%	45%	0%	86%
Vol Right, %	0%	6%	16%	49%	0%	14%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	28	218	129	98	60	264
LT Vol	28	0	45	6	60	0
Through Vol	0	205	63	44	0	228
RT Vol	0	13	21	48	0	36
Lane Flow Rate	30	237	140	107	65	287
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.052	0.372	0.222	0.164	0.111	0.439
Departure Headway (Hd)	6.206	5.657	5.711	5.537	6.105	5.503
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	578	637	628	647	588	654
Service Time	3.934	3.386	3.75	3.577	3.83	3.227
HCM Lane V/C Ratio	0.052	0.372	0.223	0.165	0.111	0.439
HCM Control Delay	9.3	11.7	10.4	9.7	9.6	12.5
HCM Lane LOS	A	B	B	A	A	B
HCM 95th-tile Q	0.2	1.7	0.8	0.6	0.4	2.2

HCM 2010 Signalized Intersection Summary
34: Water Street & Capitol Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	56	84	59	4	62	63	23	221	26	49	321	63
Future Volume (veh/h)	56	84	59	4	62	63	23	221	26	49	321	63
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1900	1900	1827	1827	1900	1900	1863	1863
Adj Flow Rate, veh/h	61	91	64	4	67	68	25	240	28	53	349	68
Adj No. of Lanes	0	1	1	1	1	0	1	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	138	163	275	170	149	151	704	1144	133	178	1126	1127
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.71	0.71	0.71	0.71	0.71	0.71
Sat Flow, veh/h	376	945	1599	1251	866	879	947	1606	187	167	1582	1583
Grp Volume(v), veh/h	152	0	64	4	0	135	25	0	268	402	0	68
Grp Sat Flow(s),veh/h/ln	1321	0	1599	1251	0	1745	947	0	1794	1749	0	1583
Q Serve(g_s), s	3.4	0.0	2.4	0.2	0.0	4.8	0.7	0.0	3.5	0.0	0.0	0.9
Cycle Q Clear(g_c), s	8.2	0.0	2.4	8.4	0.0	4.8	6.1	0.0	3.5	5.5	0.0	0.9
Prop In Lane	0.40		1.00	1.00		0.50	1.00		0.10	0.13		1.00
Lane Grp Cap(c), veh/h	300	0	275	170	0	300	704	0	1277	1304	0	1127
V/C Ratio(X)	0.51	0.00	0.23	0.02	0.00	0.45	0.04	0.00	0.21	0.31	0.00	0.06
Avail Cap(c_a), veh/h	554	0	533	372	0	582	704	0	1277	1304	0	1127
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.0	0.0	24.6	31.1	0.0	25.6	4.8	0.0	3.4	3.6	0.0	3.0
Incr Delay (d2), s/veh	1.6	0.0	0.5	0.1	0.0	1.3	0.1	0.0	0.4	0.6	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	0.0	1.1	0.1	0.0	2.4	0.2	0.0	1.8	3.0	0.0	0.4
LnGrp Delay(d),s/veh	28.6	0.0	25.2	31.1	0.0	26.9	4.9	0.0	3.7	4.3	0.0	3.1
LnGrp LOS	C		C	C		C	A		A	A		A
Approach Vol, veh/h		216			139			293			470	
Approach Delay, s/veh		27.6			27.0			3.8			4.1	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		53.1		15.9		53.1		15.9
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		38.0		23.0		38.0		23.0
Max Q Clear Time (g_c+I1), s		8.1		10.2		7.5		10.4
Green Ext Time (p_c), s		3.5		1.4		3.5		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	11.4
HCM 2010 LOS	B

Existing

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HCM 2010 Signalized Intersection Summary
35: Main St & Capitol Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	49	80	23	97	75	59	19	564	34	47	522	27
Future Volume (veh/h)	49	80	23	97	75	59	19	564	34	47	522	27
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1881	1881	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	53	87	25	105	82	64	21	613	37	51	567	29
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	3	3	3	3	3	3
Cap, veh/h	234	251	72	265	175	137	560	1215	73	522	1227	63
Arrive On Green	0.18	0.18	0.18	0.18	0.18	0.18	0.71	0.71	0.71	0.71	0.71	0.71
Sat Flow, veh/h	1249	1406	404	1288	981	765	811	1722	104	771	1740	89
Grp Volume(v), veh/h	53	0	112	105	0	146	21	0	650	51	0	596
Grp Sat Flow(s),veh/h/ln	1249	0	1810	1288	0	1746	811	0	1826	771	0	1829
Q Serve(g_s), s	2.7	0.0	3.7	5.4	0.0	5.2	0.8	0.0	11.2	2.2	0.0	9.8
Cycle Q Clear(g_c), s	7.9	0.0	3.7	9.1	0.0	5.2	10.6	0.0	11.2	13.5	0.0	9.8
Prop In Lane	1.00		0.22	1.00		0.44	1.00		0.06	1.00		0.05
Lane Grp Cap(c), veh/h	234	0	324	265	0	312	560	0	1288	522	0	1290
V/C Ratio(X)	0.23	0.00	0.35	0.40	0.00	0.47	0.04	0.00	0.50	0.10	0.00	0.46
Avail Cap(c_a), veh/h	391	0	551	427	0	531	560	0	1288	522	0	1290
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.9	0.0	24.8	28.8	0.0	25.4	6.8	0.0	4.7	7.7	0.0	4.4
Incr Delay (d2), s/veh	0.5	0.0	0.6	1.0	0.0	1.1	0.1	0.0	1.4	0.4	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	1.9	2.0	0.0	2.6	0.2	0.0	6.1	0.5	0.0	5.2
LnGrp Delay(d),s/veh	29.4	0.0	25.4	29.7	0.0	26.5	6.9	0.0	6.1	8.1	0.0	5.6
LnGrp LOS	C		C	C		C	A		A	A		A
Approach Vol, veh/h		165			251			671			647	
Approach Delay, s/veh		26.7			27.8			6.1			5.8	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		52.7		16.3		52.7		16.3
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0		40.0		21.0
Max Q Clear Time (g_c+I1), s		13.2		9.9		15.5		11.1
Green Ext Time (p_c), s		7.2		1.3		7.1		1.2

Intersection Summary	
HCM 2010 Ctrl Delay	11.1
HCM 2010 LOS	B

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HCM 2010 AWSC
36: Chestnut Street & Capitol Avenue

Intersection	
Intersection Delay, s/veh	10.1
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	24	75	13	14	47	33	15	181	18	42	198	19
Future Vol, veh/h	24	75	13	14	47	33	15	181	18	42	198	19
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	26	82	14	15	51	36	16	197	20	46	215	21
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	9.5	9.1	10.1	10.7
HCM LOS	A	A	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	7%	21%	15%	16%
Vol Thru, %	85%	67%	50%	76%
Vol Right, %	8%	12%	35%	7%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	214	112	94	259
LT Vol	15	24	14	42
Through Vol	181	75	47	198
RT Vol	18	13	33	19
Lane Flow Rate	233	122	102	282
Geometry Grp	1	1	1	1
Degree of Util (X)	0.311	0.178	0.146	0.374
Departure Headway (Hd)	4.815	5.261	5.143	4.781
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	740	674	690	746
Service Time	2.888	3.351	3.235	2.85
HCM Lane V/C Ratio	0.315	0.181	0.148	0.378
HCM Control Delay	10.1	9.5	9.1	10.7
HCM Lane LOS	B	A	A	B
HCM 95th-tile Q	1.3	0.6	0.5	1.7

HCM 2010 TWSC
37: Willow Street & Capitol Avenue

Intersection						
Int Delay, s/veh	3.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	83	40	57	79	15	41
Future Vol, veh/h	83	40	57	79	15	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	90	43	62	86	16	45

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	134	0	322	112
Stage 1	-	-	-	-	112	-
Stage 2	-	-	-	-	210	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1451	-	672	941
Stage 1	-	-	-	-	913	-
Stage 2	-	-	-	-	825	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1451	-	643	941
Mov Cap-2 Maneuver	-	-	-	-	643	-
Stage 1	-	-	-	-	913	-
Stage 2	-	-	-	-	790	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.2	9.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	837	-	-	1451	-
HCM Lane V/C Ratio	0.073	-	-	0.043	-
HCM Control Delay (s)	9.6	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Existing

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HCM 2010 Signalized Intersection Summary
38: Main Street & Manitoba Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	34	276	20	44	34	160	654	10	23	639	17
Future Volume (veh/h)	22	34	276	20	44	34	160	654	10	23	639	17
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1900	1900	1900	1900	1900	1881	1881	1900
Adj Flow Rate, veh/h	24	37	300	22	48	37	174	711	11	25	695	18
Adj No. of Lanes	0	1	1	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	0	0	0	1	1	1
Cap, veh/h	190	263	365	106	203	130	408	1224	19	431	968	25
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.07	0.66	0.66	0.53	0.53	0.53
Sat Flow, veh/h	514	1154	1599	188	892	571	1810	1866	29	735	1826	47
Grp Volume(v), veh/h	61	0	300	107	0	0	174	0	722	25	0	713
Grp Sat Flow(s),veh/h/ln	1669	0	1599	1650	0	0	1810	0	1895	735	0	1873
Q Serve(g_s), s	0.0	0.0	12.3	0.0	0.0	0.0	2.7	0.0	14.6	1.3	0.0	19.9
Cycle Q Clear(g_c), s	1.8	0.0	12.3	3.4	0.0	0.0	2.7	0.0	14.6	7.3	0.0	19.9
Prop In Lane	0.39		1.00	0.21		0.35	1.00		0.02	1.00		0.03
Lane Grp Cap(c), veh/h	453	0	365	439	0	0	408	0	1243	431	0	993
V/C Ratio(X)	0.13	0.00	0.82	0.24	0.00	0.00	0.43	0.00	0.58	0.06	0.00	0.72
Avail Cap(c_a), veh/h	576	0	487	558	0	0	469	0	1243	431	0	993
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.2	0.0	25.3	21.9	0.0	0.0	9.9	0.0	6.6	11.0	0.0	12.3
Incr Delay (d2), s/veh	0.2	0.0	8.9	0.3	0.0	0.0	0.7	0.0	2.0	0.3	0.0	4.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	6.3	1.7	0.0	0.0	1.4	0.0	8.1	0.3	0.0	11.3
LnGrp Delay(d),s/veh	21.4	0.0	34.2	22.2	0.0	0.0	10.6	0.0	8.6	11.3	0.0	16.8
LnGrp LOS	C		C	C			B		A	B		B
Approach Vol, veh/h		361			107			896			738	
Approach Delay, s/veh		32.1			22.2			9.0			16.6	
Approach LOS		C			C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		49.3		19.7	8.7	40.6		19.7
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0	7.0	29.0		21.0
Max Q Clear Time (g_c+I1), s		16.6		14.3	4.7	21.9		5.4
Green Ext Time (p_c), s		11.9		1.4	0.1	5.0		2.3

Intersection Summary	
HCM 2010 Ctrl Delay	16.3
HCM 2010 LOS	B

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HCM 2010 TWSC
39: Manitoba Avenue

Intersection	
Int Delay, s/veh	5.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	302	13	126	114	21	233
Future Vol, veh/h	302	13	126	114	21	233
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	328	14	137	124	23	253

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	342	0	733	335
Stage 1	-	-	-	-	335	-
Stage 2	-	-	-	-	398	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1217	-	388	707
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	678	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1217	-	341	707
Mov Cap-2 Maneuver	-	-	-	-	341	-
Stage 1	-	-	-	-	725	-
Stage 2	-	-	-	-	596	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	14.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	649	-	-	1217	-
HCM Lane V/C Ratio	0.425	-	-	0.113	-
HCM Control Delay (s)	14.6	-	-	8.3	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	2.1	-	-	0.4	-

HCM 2010 TWSC
40: Manitoba Avenue & Ruby Street

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	73	462	115	10	37	125
Future Vol, veh/h	73	462	115	10	37	125
Conflicting Peds, #/hr	1	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	79	502	125	11	40	136

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	137	0	-	0	793	132
Stage 1	-	-	-	-	131	-
Stage 2	-	-	-	-	662	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1453	-	-	-	360	923
Stage 1	-	-	-	-	900	-
Stage 2	-	-	-	-	517	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1452	-	-	-	332	921
Mov Cap-2 Maneuver	-	-	-	-	332	-
Stage 1	-	-	-	-	899	-
Stage 2	-	-	-	-	478	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	12.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1452	-	-	-	655
HCM Lane V/C Ratio	0.055	-	-	-	0.269
HCM Control Delay (s)	7.6	0	-	-	12.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.2	-	-	-	1.1

HCM 2010 Signalized Intersection Summary
41: Canyon Rd/Main St & Mountain View Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	26	6	149	43	224	11	436	90	204	533	13
Future Volume (veh/h)	18	26	6	149	43	224	11	436	90	204	533	13
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1900	1827	1827	1900	1810	1810	1900	1827	1827	1900
Adj Flow Rate, veh/h	20	28	7	162	47	0	12	474	0	222	579	14
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	4	4	4	5	5	5	4	4	4
Cap, veh/h	297	235	59	311	313	0	500	1290	0	653	1142	28
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.00	0.01	0.71	0.00	0.64	0.64	0.64
Sat Flow, veh/h	1290	1372	343	1342	1827	0	1723	1810	0	899	1776	43
Grp Volume(v), veh/h	20	0	35	162	47	0	12	474	0	222	0	593
Grp Sat Flow(s),veh/h/ln	1290	0	1715	1342	1827	0	1723	1810	0	899	0	1819
Q Serve(g_s), s	0.9	0.0	1.2	8.0	1.5	0.0	0.2	7.0	0.0	8.8	0.0	11.9
Cycle Q Clear(g_c), s	2.4	0.0	1.2	9.2	1.5	0.0	0.2	7.0	0.0	11.0	0.0	11.9
Prop In Lane	1.00		0.20	1.00		0.00	1.00		0.00	1.00		0.02
Lane Grp Cap(c), veh/h	297	0	294	311	313	0	500	1290	0	653	0	1170
V/C Ratio(X)	0.07	0.00	0.12	0.52	0.15	0.00	0.02	0.37	0.00	0.34	0.00	0.51
Avail Cap(c_a), veh/h	469	0	522	489	556	0	679	1290	0	653	0	1170
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.4	0.0	24.2	28.1	24.3	0.0	4.9	3.9	0.0	6.9	0.0	6.5
Incr Delay (d2), s/veh	0.0	0.0	0.1	1.6	0.3	0.0	0.0	0.8	0.0	1.4	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.6	3.1	0.8	0.0	0.1	3.7	0.0	2.4	0.0	6.4
LnGrp Delay(d),s/veh	25.4	0.0	24.3	29.7	24.6	0.0	4.9	4.7	0.0	8.3	0.0	8.1
LnGrp LOS	C		C	C	C		A	A		A		A
Approach Vol, veh/h		55			209			486			815	
Approach Delay, s/veh		24.7			28.6			4.7			8.2	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		53.2		15.8	4.8	48.4		15.8
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0	8.0	28.0		21.0
Max Q Clear Time (g_c+I1), s		9.0		4.4	2.2	13.9		11.2
Green Ext Time (p_c), s		9.5		0.9	0.0	6.7		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	10.4
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
42: Ruby Street & Mountain View Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	15	229	16	75	232	22	23	54	159	24	40	24
Future Volume (veh/h)	15	229	16	75	232	22	23	54	159	24	40	24
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1900	1900	1900	1900	1863	1900	1900	1900	1900
Adj Flow Rate, veh/h	16	249	17	82	252	24	25	59	173	26	43	26
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	2	2	2	0	0	0
Cap, veh/h	749	991	68	786	1049	100	73	86	214	121	181	89
Arrive On Green	0.02	0.57	0.57	0.07	0.61	0.61	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	1792	1741	119	1810	1709	163	89	445	1099	290	930	459
Grp Volume(v), veh/h	16	0	266	82	0	276	257	0	0	95	0	0
Grp Sat Flow(s),veh/h/ln	1792	0	1860	1810	0	1871	1633	0	0	1678	0	0
Q Serve(g_s), s	0.3	0.0	5.1	1.2	0.0	4.7	4.7	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.3	0.0	5.1	1.2	0.0	4.7	10.6	0.0	0.0	3.2	0.0	0.0
Prop In Lane	1.00		0.06	1.00		0.09	0.10		0.67	0.27		0.27
Lane Grp Cap(c), veh/h	749	0	1058	786	0	1149	373	0	0	391	0	0
V/C Ratio(X)	0.02	0.00	0.25	0.10	0.00	0.24	0.69	0.00	0.00	0.24	0.00	0.00
Avail Cap(c_a), veh/h	961	0	1058	867	0	1149	536	0	0	549	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.0	0.0	7.7	4.8	0.0	6.2	27.3	0.0	0.0	24.3	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.6	0.0	0.0	0.5	2.7	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.8	0.6	0.0	2.6	5.1	0.0	0.0	1.6	0.0	0.0
LnGrp Delay(d),s/veh	6.0	0.0	8.3	4.8	0.0	6.7	30.0	0.0	0.0	24.7	0.0	0.0
LnGrp LOS	A		A	A		A	C			C		
Approach Vol, veh/h		282			358			257			95	
Approach Delay, s/veh		8.1			6.3			30.0			24.7	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.8	44.4		17.8	5.6	47.6		17.8
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	8.0	28.0		21.0	10.0	28.0		21.0
Max Q Clear Time (g_c+I1), s	3.2	7.1		5.2	2.3	6.7		12.6
Green Ext Time (p_c), s	0.0	3.3		1.7	0.0	3.3		1.2

Intersection Summary	
HCM 2010 Ctrl Delay	14.7
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
43: Chestnut Street & Mountain View Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	1	209	53	114	290	15	76	37	93	15	24	5
Future Volume (veh/h)	1	209	53	114	290	15	76	37	93	15	24	5
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1827	1827	1900	1863	1863	1900
Adj Flow Rate, veh/h	1	227	58	124	315	16	83	40	101	16	26	0
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	2	2	2
Cap, veh/h	741	850	217	777	1044	53	406	71	179	305	287	0
Arrive On Green	0.59	0.59	0.59	0.59	0.59	0.59	0.15	0.15	0.15	0.15	0.15	0.00
Sat Flow, veh/h	1045	1432	366	1090	1758	89	1352	460	1162	1243	1863	0
Grp Volume(v), veh/h	1	0	285	124	0	331	83	0	141	16	26	0
Grp Sat Flow(s),veh/h/ln	1045	0	1798	1090	0	1847	1352	0	1622	1243	1863	0
Q Serve(g_s), s	0.0	0.0	2.6	2.1	0.0	3.0	1.9	0.0	2.7	0.4	0.4	0.0
Cycle Q Clear(g_c), s	3.0	0.0	2.6	4.7	0.0	3.0	2.3	0.0	2.7	3.1	0.4	0.0
Prop In Lane	1.00		0.20	1.00		0.05	1.00		0.72	1.00		0.00
Lane Grp Cap(c), veh/h	741	0	1068	777	0	1097	406	0	250	305	287	0
V/C Ratio(X)	0.00	0.00	0.27	0.16	0.00	0.30	0.20	0.00	0.56	0.05	0.09	0.00
Avail Cap(c_a), veh/h	943	0	1415	988	0	1453	1001	0	963	851	1106	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	4.1	0.0	3.3	4.4	0.0	3.4	13.2	0.0	13.2	14.7	12.2	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.1	0.0	0.2	0.1	0.0	0.7	0.0	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	1.3	0.6	0.0	1.5	0.7	0.0	1.3	0.1	0.2	0.0
LnGrp Delay(d),s/veh	4.1	0.0	3.5	4.6	0.0	3.6	13.3	0.0	14.0	14.7	12.3	0.0
LnGrp LOS	A		A	A		A	B		B	B	B	
Approach Vol, veh/h		286			455			224			42	
Approach Delay, s/veh		3.5			3.9			13.7			13.2	
Approach LOS		A			A			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		24.5		9.2		24.5		9.2
Change Period (Y+Rc), s		4.5		4.0		4.5		4.0
Max Green Setting (Gmax), s		26.5		20.0		26.5		20.0
Max Q Clear Time (g_c+I1), s		5.0		4.7		6.7		5.1
Green Ext Time (p_c), s		4.9		0.5		4.8		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	6.3
HCM 2010 LOS	A

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HCM 2010 TWSC
44: Bull Road/Willow Street & Mountain View Avenue

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	226	9	0	114	6	0	4	3	12	2	26
Future Vol, veh/h	40	226	9	0	114	6	0	4	3	12	2	26
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	43	246	10	0	124	7	0	4	3	13	2	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	130	0	0	255	0	0	466	468	251	468	469	127
Stage 1	-	-	-	-	-	-	338	338	-	127	127	-
Stage 2	-	-	-	-	-	-	128	130	-	341	342	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1455	-	-	1310	-	-	507	493	788	505	492	923
Stage 1	-	-	-	-	-	-	676	641	-	877	791	-
Stage 2	-	-	-	-	-	-	876	789	-	674	638	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1455	-	-	1310	-	-	479	478	788	488	477	923
Mov Cap-2 Maneuver	-	-	-	-	-	-	479	478	-	488	477	-
Stage 1	-	-	-	-	-	-	656	622	-	851	791	-
Stage 2	-	-	-	-	-	-	847	789	-	647	619	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	11.3	10.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	575	1455	-	-	1310	-	-	486	923
HCM Lane V/C Ratio	0.013	0.03	-	-	-	-	-	0.031	0.031
HCM Control Delay (s)	11.3	7.5	-	-	0	-	-	12.6	9
HCM Lane LOS	B	A	-	-	A	-	-	B	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.1	0.1

HCM 2010 TWSC
45: Umptanum Road & Railroad Ave

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	69	98	36	52	21
Future Vol, veh/h	10	69	98	36	52	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	75	107	39	57	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	146	0	-	0	223	126
Stage 1	-	-	-	-	126	-
Stage 2	-	-	-	-	97	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1436	-	-	-	765	924
Stage 1	-	-	-	-	900	-
Stage 2	-	-	-	-	927	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1436	-	-	-	759	924
Mov Cap-2 Maneuver	-	-	-	-	759	-
Stage 1	-	-	-	-	900	-
Stage 2	-	-	-	-	920	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1436	-	-	-	800
HCM Lane V/C Ratio	0.008	-	-	-	0.099
HCM Control Delay (s)	7.5	-	-	-	10
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.3

HCM 2010 Signalized Intersection Summary
46: Canyon Road & Umptanum Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	61	101	64	68	77	116	383	84	100	434	25
Future Volume (veh/h)	13	61	101	64	68	77	116	383	84	100	434	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1900	1827	1827	1900	1810	1810	1810	1827	1827	1900
Adj Flow Rate, veh/h	14	66	110	70	74	84	126	416	0	109	472	27
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	4	4	4	5	5	5	4	4	4
Cap, veh/h	235	121	201	218	158	179	161	983	836	139	1746	100
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.09	0.54	0.00	0.08	0.52	0.52
Sat Flow, veh/h	1166	600	1000	1180	782	888	1723	1810	1538	1740	3338	191
Grp Volume(v), veh/h	14	0	176	70	0	158	126	416	0	109	245	254
Grp Sat Flow(s),veh/h/ln	1166	0	1599	1180	0	1670	1723	1810	1538	1740	1736	1793
Q Serve(g_s), s	0.8	0.0	7.3	4.2	0.0	6.2	5.3	10.1	0.0	4.6	5.8	5.8
Cycle Q Clear(g_c), s	7.0	0.0	7.3	11.5	0.0	6.2	5.3	10.1	0.0	4.6	5.8	5.8
Prop In Lane	1.00		0.63	1.00		0.53	1.00		1.00	1.00		0.11
Lane Grp Cap(c), veh/h	235	0	322	218	0	336	161	983	836	139	908	938
V/C Ratio(X)	0.06	0.00	0.55	0.32	0.00	0.47	0.78	0.42	0.00	0.79	0.27	0.27
Avail Cap(c_a), veh/h	386	0	530	380	0	564	268	983	836	188	908	938
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.1	0.0	26.5	31.7	0.0	26.1	32.8	10.0	0.0	33.4	9.8	9.8
Incr Delay (d2), s/veh	0.1	0.0	1.4	0.8	0.0	1.0	9.6	1.3	0.0	14.2	0.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	3.4	1.4	0.0	2.9	3.0	5.3	0.0	2.7	3.0	3.1
LnGrp Delay(d),s/veh	29.2	0.0	28.0	32.5	0.0	27.1	42.5	11.4	0.0	47.7	10.5	10.5
LnGrp LOS	C		C	C		C	D	B		D	B	B
Approach Vol, veh/h		190			228			542			608	
Approach Delay, s/veh		28.1			28.7			18.6			17.2	
Approach LOS		C			C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.9	44.7		19.4	11.4	43.2		19.4				
Change Period (Y+Rc), s	4.0	4.5		4.5	4.5	4.5		* 4.5				
Max Green Setting (Gmax), s	8.0	28.5		24.5	11.5	24.5		* 25				
Max Q Clear Time (g_c+I1), s	6.6	12.1		9.3	7.3	7.8		13.5				
Green Ext Time (p_c), s	0.0	5.4		1.6	0.2	5.4		1.4				
Intersection Summary												
HCM 2010 Ctrl Delay			20.7									
HCM 2010 LOS			C									
Notes												

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HCM 2010 Signalized Intersection Summary
47: Canyon Rd & I-90 WB Ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	24	280	170	24	88	363
Future Volume (veh/h)	24	280	170	24	88	363
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	26	304	185	26	96	395
Adj No. of Lanes	1	1	2	0	1	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	456	407	1022	142	663	1860
Arrive On Green	0.26	0.26	0.33	0.32	0.10	0.53
Sat Flow, veh/h	1774	1583	3216	433	1774	3632
Grp Volume(v), veh/h	26	304	104	107	96	395
Grp Sat Flow(s),veh/h/ln	1774	1583	1770	1786	1774	1770
Q Serve(g_s), s	0.5	8.4	2.0	2.0	1.4	2.8
Cycle Q Clear(g_c), s	0.5	8.4	2.0	2.0	1.4	2.8
Prop In Lane	1.00	1.00		0.24	1.00	
Lane Grp Cap(c), veh/h	456	407	579	584	663	1860
V/C Ratio(X)	0.06	0.75	0.18	0.18	0.14	0.21
Avail Cap(c_a), veh/h	921	822	1311	1323	1060	2622
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.3	16.2	11.4	11.5	7.2	6.0
Incr Delay (d2), s/veh	0.1	3.9	0.1	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	4.1	1.0	1.0	0.7	1.4
LnGrp Delay(d),s/veh	13.3	20.1	11.5	11.6	7.2	6.1
LnGrp LOS	B	C	B	B	A	A
Approach Vol, veh/h	330		211			491
Approach Delay, s/veh	19.5		11.6			6.3
Approach LOS	B		B			A

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	9.4	20.4				29.8		17.6
Change Period (Y+Rc), s	5.1	5.4				5.4		5.9
Max Green Setting (Gmax), s	14.9	34.6				34.6		24.1
Max Q Clear Time (g_c+I1), s	3.4	4.0				4.8		10.4
Green Ext Time (p_c), s	0.1	4.2				4.2		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B

Notes

Existing

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HCM 2010 TWSC
48: Canyon Road & I-90 EB Ramp

Intersection	
Int Delay, s/veh	3.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	54	104	186	41	135	181
Future Vol, veh/h	54	104	186	41	135	181
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	0	-	-	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	20	20	16	16	9	9
Mvmt Flow	59	113	202	45	147	197

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	714	-	0	0	247	0
Stage 1	224	-	-	-	-	-
Stage 2	490	-	-	-	-	-
Critical Hdwy	6.6	-	-	-	4.19	-
Critical Hdwy Stg 1	5.6	-	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-	-
Follow-up Hdwy	3.68	-	-	-	2.281	-
Pot Cap-1 Maneuver	372	0	-	-	1279	-
Stage 1	773	0	-	-	-	-
Stage 2	580	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	329	-	-	-	1279	-
Mov Cap-2 Maneuver	329	-	-	-	-	-
Stage 1	773	-	-	-	-	-
Stage 2	513	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.3	0	3.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	329	-	1279	-
HCM Lane V/C Ratio	-	-	0.178	-	0.115	-
HCM Control Delay (s)	-	-	18.3	0	8.2	-
HCM Lane LOS	-	-	C	A	A	-
HCM 95th %tile Q(veh)	-	-	0.6	-	0.4	-

2037 Projected Level of Service Reports – without capital improvement projects

HCM 2010 TWSC
1: I-90 WestBound Offramp/I-90 Westbound Onramp

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	570	0	0	430	450	20	10	100	0	0	0
Future Vol, veh/h	10	570	0	0	430	450	20	10	100	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	15	15	15	11	11	11	0	0	0
Mvmt Flow	11	620	0	0	467	489	22	11	109	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	467	0	-	-	-	0	1108	1108	620
Stage 1	-	-	-	-	-	-	641	641	-
Stage 2	-	-	-	-	-	-	467	467	-
Critical Hdwy	4.2	-	-	-	-	-	6.51	6.61	6.31
Critical Hdwy Stg 1	-	-	-	-	-	-	5.51	5.61	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.51	5.61	-
Follow-up Hdwy	2.29	-	-	-	-	-	3.599	4.099	3.399
Pot Cap-1 Maneuver	1054	-	0	0	-	-	223	202	472
Stage 1	-	-	0	0	-	-	508	456	-
Stage 2	-	-	0	0	-	-	613	547	-
Platoon blocked, %		-			-	-			
Mov Cap-1 Maneuver	1054	-	-	-	-	-	219	0	472
Mov Cap-2 Maneuver	-	-	-	-	-	-	219	0	-
Stage 1	-	-	-	-	-	-	500	0	-
Stage 2	-	-	-	-	-	-	613	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	396	1054	-	-	-
HCM Lane V/C Ratio	0.357	0.01	-	-	-
HCM Control Delay (s)	19.1	8.5	0	-	-
HCM Lane LOS	C	A	A	-	-
HCM 95th %tile Q(veh)	1.6	0	-	-	-

2037 No Projects

Synchro 9 Report
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MOVEMENT SUMMARY

Site: 101 [US-97 & Dolarway]

Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Dolarway Rd											
3	L2	196	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.7
8	T1	109	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.7
18	R2	109	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.0
Approach		413	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.5
East: University Way											
1	L2	54	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.7
6	T1	609	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.7
16	R2	65	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.2
Approach		728	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.6
North: US-97											
7	L2	130	3.0	0.713	18.6	LOS C	8.2	209.9	0.93	1.10	28.9
4	T1	163	3.0	0.713	18.6	LOS C	8.2	209.9	0.93	1.10	28.9
14	R2	293	3.0	0.713	17.4	LOS C	8.2	209.9	0.93	1.10	28.3
Approach		587	3.0	0.713	18.0	LOS C	8.2	209.9	0.93	1.10	28.6
West: University Way/US-97											
5	L2	152	3.0	0.153	5.0	LOS A	0.6	15.8	0.44	0.35	32.5
2	T1	554	3.0	0.732	16.5	LOS C	7.4	188.5	0.81	0.84	29.9
12	R2	174	3.0	0.732	16.5	LOS C	7.4	188.5	0.81	0.84	29.1
Approach		880	3.0	0.732	14.5	LOS B	7.4	188.5	0.75	0.75	30.1
All Vehicles		2609	3.0	0.835	18.7	LOS C	11.7	298.5	0.86	0.99	28.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

HCM 2010 TWSC
3: University Way & Reecer Creek Rd

Intersection	
Int Delay, s/veh	43.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		↰	↱
Traffic Vol, veh/h	320	470	280	380	110	80
Future Vol, veh/h	320	470	280	380	110	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	348	511	304	413	120	87

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	717	0	-	0	1718	511
Stage 1	-	-	-	-	511	-
Stage 2	-	-	-	-	1207	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	884	-	-	-	~ 99	563
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	283	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	884	-	-	-	~ 60	563
Mov Cap-2 Maneuver	-	-	-	-	~ 60	-
Stage 1	-	-	-	-	602	-
Stage 2	-	-	-	-	172	-

Approach	EB	WB	SB
HCM Control Delay, s	4.7	0	$ 358.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	884	-	-	-	60	563
HCM Lane V/C Ratio	0.393	-	-	-	1.993	0.154
HCM Control Delay (s)	11.7	-	-	-	$ 610.4	12.6
HCM Lane LOS	B	-	-	-	F	B
HCM 95th %tile Q(veh)	1.9	-	-	-	11.4	0.5

Notes
~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

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HCM 2010 TWSC
4: Water St & Bender Rd

Intersection	
Int Delay, s/veh	5.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	160	80	80	100	80	160
Future Vol, veh/h	160	80	80	100	80	160
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	174	87	87	109	87	174

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	261	0	500	217
Stage 1	-	-	-	-	217	-
Stage 2	-	-	-	-	283	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1303	-	530	823
Stage 1	-	-	-	-	819	-
Stage 2	-	-	-	-	765	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1303	-	492	823
Mov Cap-2 Maneuver	-	-	-	-	492	-
Stage 1	-	-	-	-	819	-
Stage 2	-	-	-	-	711	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	13.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	672	-	-	1303	-
HCM Lane V/C Ratio	0.388	-	-	0.067	-
HCM Control Delay (s)	13.7	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1.8	-	-	0.2	-

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HCM 2010 TWSC
5: Airport Rd & Bender Rd/Sanders Rd

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	120	60	40	80	200	100	540	80	310	650	40
Future Vol, veh/h	50	120	60	40	80	200	100	540	80	310	650	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	130	65	43	87	217	109	587	87	337	707	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	2402	2293	728	2348	2272	630	750	0	0	674	0	0
Stage 1	1402	1402	-	848	848	-	-	-	-	-	-	-
Stage 2	1000	891	-	1500	1424	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	~ 23	~ 39	423	~ 25	~ 40	482	859	-	-	917	-	-
Stage 1	173	207	-	356	378	-	-	-	-	-	-	-
Stage 2	293	361	-	152	202	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 11	423	-	~ 12	482	859	-	-	917	-	-
Mov Cap-2 Maneuver	-	~ 11	-	-	~ 12	-	-	-	-	-	-	-
Stage 1	137	~ 76	-	283	300	-	-	-	-	-	-	-
Stage 2	91	287	-	-	~ 74	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			1.4	3.5
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	859	-	-	-	-	917	-	-
HCM Lane V/C Ratio	0.127	-	-	-	-	0.367	-	-
HCM Control Delay (s)	9.8	0	-	-	-	11.2	0	-
HCM Lane LOS	A	A	-	-	-	B	A	-
HCM 95th %tile Q(veh)	0.4	-	-	-	-	1.7	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 TWSC
6: Alder St & Sanders Rd

Intersection	
Int Delay, s/veh	7.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	440	150	80	260	150	50
Future Vol, veh/h	440	150	80	260	150	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	478	163	87	283	163	54

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	641	0	1017	560
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	457	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	943	-	263	528
Stage 1	-	-	-	-	572	-
Stage 2	-	-	-	-	638	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	943	-	234	528
Mov Cap-2 Maneuver	-	-	-	-	234	-
Stage 1	-	-	-	-	572	-
Stage 2	-	-	-	-	568	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.2	40.3
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	234	528	-	-	943	-
HCM Lane V/C Ratio	0.697	0.103	-	-	0.092	-
HCM Control Delay (s)	49.5	12.6	-	-	9.2	0
HCM Lane LOS	E	B	-	-	A	A
HCM 95th %tile Q(veh)	4.6	0.3	-	-	0.3	-

HCM 2010 AWSC
7: Water Street & Idaho St

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	10	20	20	0	10	60	320	60	20	170	20
Future Vol, veh/h	10	10	20	20	0	10	60	320	60	20	170	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	11	22	22	0	11	65	348	65	22	185	22
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.7	8.8	13.1	9.5
HCM LOS	A	A	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	25%	67%	10%
Vol Thru, %	73%	25%	0%	81%
Vol Right, %	14%	50%	33%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	440	40	30	210
LT Vol	60	10	20	20
Through Vol	320	10	0	170
RT Vol	60	20	10	20
Lane Flow Rate	478	43	33	228
Geometry Grp	1	1	1	1
Degree of Util (X)	0.575	0.064	0.05	0.291
Departure Headway (Hd)	4.329	5.272	5.476	4.59
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	832	676	651	781
Service Time	2.358	3.331	3.536	2.626
HCM Lane V/C Ratio	0.575	0.064	0.051	0.292
HCM Control Delay	13.1	8.7	8.8	9.5
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	3.7	0.2	0.2	1.2

HCM 2010 AWSC
8: Water Street & Helena Avenue

Intersection	
Intersection Delay, s/veh	13.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	20	10	260	20	20	30	120	240	70	180	20
Future Vol, veh/h	20	20	10	260	20	20	30	120	240	70	180	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	22	22	11	283	22	22	33	130	261	76	196	22
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	10.2	15.9	11.6	14.1
HCM LOS	B	C	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	0%	40%	87%	26%
Vol Thru, %	80%	0%	40%	7%	67%
Vol Right, %	0%	100%	20%	7%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	150	240	50	300	270
LT Vol	30	0	20	260	70
Through Vol	120	0	20	20	180
RT Vol	0	240	10	20	20
Lane Flow Rate	163	261	54	326	293
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.283	0.393	0.097	0.54	0.474
Departure Headway (Hd)	6.24	5.427	6.447	5.966	5.82
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	574	660	552	603	616
Service Time	4.003	3.189	4.538	4.025	3.884
HCM Lane V/C Ratio	0.284	0.395	0.098	0.541	0.476
HCM Control Delay	11.5	11.7	10.2	15.9	14.1
HCM Lane LOS	B	B	B	C	B
HCM 95th-tile Q	1.2	1.9	0.3	3.2	2.5

HCM 2010 TWSC
9: Walnut Street/Airport Rd & Helena Avenue

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	120	90	80	10	90	90	70	630	110	100	350	40
Future Vol, veh/h	120	90	80	10	90	90	70	630	110	100	350	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	1	1	1
Mvmt Flow	130	98	87	11	98	98	76	685	120	109	380	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1615	1577	402	1609	1538	745	424	0	0	804	0	0
Stage 1	620	620	-	897	897	-	-	-	-	-	-	-
Stage 2	995	957	-	712	641	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	~ 84	111	653	85	117	417	1141	-	-	825	-	-
Stage 1	479	483	-	337	361	-	-	-	-	-	-	-
Stage 2	297	339	-	427	473	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	-	~ 80	653	-	~ 85	417	1141	-	-	825	-	-
Mov Cap-2 Maneuver	-	~ 80	-	-	~ 85	-	-	-	-	-	-	-
Stage 1	420	399	-	296	317	-	-	-	-	-	-	-
Stage 2	138	297	-	231	391	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s			0.7	2
HCM LOS	-	-		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1141	-	-	-	-	141	825	-	-
HCM Lane V/C Ratio	0.067	-	-	-	-	1.388	0.132	-	-
HCM Control Delay (s)	8.4	0	-	-	-	271.2	10	0	-
HCM Lane LOS	A	A	-	-	-	F	B	A	-
HCM 95th %tile Q(veh)	0.2	-	-	-	-	12.6	0.5	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 TWSC
10: Wildcat Way & 18th Avenue

Intersection	
Int Delay, s/veh	28.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	100	470	140	40	60	500
Future Vol, veh/h	100	470	140	40	60	500
Conflicting Peds, #/hr	0	5	3	0	3	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	10	10	0	0	0	0
Mvmt Flow	109	511	152	43	65	543

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	625	0	720	373
Stage 1	-	-	-	-	369	-
Stage 2	-	-	-	-	351	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	966	-	398	678
Stage 1	-	-	-	-	704	-
Stage 2	-	-	-	-	717	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	962	-	331	672
Mov Cap-2 Maneuver	-	-	-	-	331	-
Stage 1	-	-	-	-	701	-
Stage 2	-	-	-	-	599	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	64.2
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	605	-	-	962	-
HCM Lane V/C Ratio	1.006	-	-	0.158	-
HCM Control Delay (s)	64.2	-	-	9.4	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	15.3	-	-	0.6	-

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HCM 2010 AWSC
11: Walnut Street & 18th Avenue

Intersection	
Intersection Delay, s/veh	275.6
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	280	220	30	80	200	330	40	290	130	140	100	220
Future Vol, veh/h	280	220	30	80	200	330	40	290	130	140	100	220
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	1	1	1
Mvmt Flow	304	239	33	87	217	359	43	315	141	152	109	239
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	298.2	365.9	204.8	200.8
HCM LOS	F	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	9%	53%	13%	30%
Vol Thru, %	63%	42%	33%	22%
Vol Right, %	28%	6%	54%	48%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	460	530	610	460
LT Vol	40	280	80	140
Through Vol	290	220	200	100
RT Vol	130	30	330	220
Lane Flow Rate	500	576	663	500
Geometry Grp	1	1	1	1
Degree of Util (X)	1.314	1.547	1.713	1.304
Departure Headway (Hd)	14.558	14.113	13.12	14.528
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	255	265	285	255
Service Time	12.558	12.113	11.12	12.528
HCM Lane V/C Ratio	1.961	2.174	2.326	1.961
HCM Control Delay	204.8	298.2	365.9	200.8
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	16.9	23.7	30.3	16.7

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HCM 2010 AWSC
12: Alder Street & 18th Avenue

Intersection	
Intersection Delay, s/veh	17.6
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	30	100	40	30	10	200	240	40	10	150	60
Future Vol, veh/h	60	30	100	40	30	10	200	240	40	10	150	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	65	33	109	43	33	11	217	261	43	11	163	65
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	12.2	10.6	23.5	11.8
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	42%	32%	100%	0%	5%
Vol Thru, %	50%	16%	0%	75%	68%
Vol Right, %	8%	53%	0%	25%	27%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	480	190	40	40	220
LT Vol	200	60	40	0	10
Through Vol	240	30	0	30	150
RT Vol	40	100	0	10	60
Lane Flow Rate	522	207	43	43	239
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.765	0.345	0.09	0.082	0.367
Departure Headway (Hd)	5.278	6.008	7.489	6.798	5.519
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	683	595	476	524	648
Service Time	3.328	4.079	5.272	4.581	3.583
HCM Lane V/C Ratio	0.764	0.348	0.09	0.082	0.369
HCM Control Delay	23.5	12.2	11	10.2	11.8
HCM Lane LOS	C	B	B	B	B
HCM 95th-tile Q	7.2	1.5	0.3	0.3	1.7

HCM 2010 TWSC
13: Water Street & 15th Avenue

Intersection						
Int Delay, s/veh	6.4					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	90	220	150	380	320	80
Future Vol, veh/h	90	220	150	380	320	80
Conflicting Peds, #/hr	1	1	1	0	0	1
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	50	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	98	239	163	413	348	87

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1132	393	436	0	-	0
Stage 1	392	-	-	-	-	-
Stage 2	740	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	227	660	1134	-	-	-
Stage 1	687	-	-	-	-	-
Stage 2	475	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	194	659	1133	-	-	-
Mov Cap-2 Maneuver	194	-	-	-	-	-
Stage 1	686	-	-	-	-	-
Stage 2	406	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	21.5	2.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1133	-	194	659	-	-
HCM Lane V/C Ratio	0.144	-	0.504	0.363	-	-
HCM Control Delay (s)	8.7	-	41.1	13.5	-	-
HCM Lane LOS	A	-	E	B	-	-
HCM 95th %tile Q(veh)	0.5	-	2.5	1.7	-	-

HCM 2010 TWSC
14: Main St & 14th Avenue

Intersection						
Int Delay, s/veh	7.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑			↑	↰	↱
Traffic Vol, veh/h	130	110	210	200	70	350
Future Vol, veh/h	130	110	210	200	70	350
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	50	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	141	120	228	217	76	380

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	261	0	875	201
Stage 1	-	-	-	-	201	-
Stage 2	-	-	-	-	674	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1303	-	320	840
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	506	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1303	-	256	840
Mov Cap-2 Maneuver	-	-	-	-	256	-
Stage 1	-	-	-	-	833	-
Stage 2	-	-	-	-	405	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.3	14.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	256	840	-	-	1303	-
HCM Lane V/C Ratio	0.297	0.453	-	-	0.175	-
HCM Control Delay (s)	24.9	12.8	-	-	8.3	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	1.2	2.4	-	-	0.6	-

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HCM 2010 AWSC
15: Wildcat Way & 14th Avenue/Dean Nicholson Blvd

Intersection	
Intersection Delay, s/veh	150.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	360	40	220	210	30	90	340	70	30	410	170
Future Vol, veh/h	140	360	40	220	210	30	90	340	70	30	410	170
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	152	391	43	239	228	33	98	370	76	33	446	185
Number of Lanes	1	1	0	1	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	99.2	37.2	113.8	311.2
HCM LOS	F	E	F	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	83%	0%	90%	0%	88%	0%	71%
Vol Right, %	0%	17%	0%	10%	0%	12%	0%	29%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	90	410	140	400	220	240	30	580
LT Vol	90	0	140	0	220	0	30	0
Through Vol	0	340	0	360	0	210	0	410
RT Vol	0	70	0	40	0	30	0	170
Lane Flow Rate	98	446	152	435	239	261	33	630
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.272	1.163	0.422	1.137	0.68	0.699	0.091	1.644
Departure Headway (Hd)	11.67	11.008	11.687	11.077	12.187	11.556	10.884	10.138
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	310	334	310	330	299	316	331	366
Service Time	9.37	8.708	9.387	8.777	9.887	9.256	8.584	7.838
HCM Lane V/C Ratio	0.316	1.335	0.49	1.318	0.799	0.826	0.1	1.721
HCM Control Delay	18.7	134.7	22.7	126	37.3	37.2	14.7	326.5
HCM Lane LOS	C	F	C	F	E	E	B	F
HCM 95th-tile Q	1.1	15.7	2	14.9	4.6	4.9	0.3	34.9

HCM 2010 AWSC
16: Alder Street & Dean Nicholson Blvd/14th Avenue

Intersection	
Intersection Delay, s/veh	41.3
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	80	20	120	30	30	40	80	490	10	10	280	40
Future Vol, veh/h	80	20	120	30	30	40	80	490	10	10	280	40
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	1	1	1	0	0	0	0	0	0	2	2	2
Mvmt Flow	87	22	130	33	33	43	87	533	11	11	304	43
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	15.3	12.5	68.9	18.9
HCM LOS	C	B	F	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	36%	30%	3%
Vol Thru, %	84%	9%	30%	85%
Vol Right, %	2%	55%	40%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	580	220	100	330
LT Vol	80	80	30	10
Through Vol	490	20	30	280
RT Vol	10	120	40	40
Lane Flow Rate	630	239	109	359
Geometry Grp	1	1	1	1
Degree of Util (X)	1.032	0.445	0.217	0.614
Departure Headway (Hd)	5.894	6.912	7.463	6.35
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	618	524	484	574
Service Time	3.894	4.912	5.463	4.35
HCM Lane V/C Ratio	1.019	0.456	0.225	0.625
HCM Control Delay	68.9	15.3	12.5	18.9
HCM Lane LOS	F	C	B	C
HCM 95th-tile Q	16.6	2.3	0.8	4.1

HCM 2010 TWSC
17: Wenas Street & University Way

Intersection	
Int Delay, s/veh	17.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↰	↑	↰	↱
Traffic Vol, veh/h	630	60	70	750	110	70
Future Vol, veh/h	630	60	70	750	110	70
Conflicting Peds, #/hr	0	1	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	3	2	2	1	1
Mvmt Flow	685	65	76	815	120	76

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	751	0	1685	718
Stage 1	-	-	-	-	718	-
Stage 2	-	-	-	-	967	-
Critical Hdwy	-	-	4.12	-	6.41	6.21
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.218	-	3.509	3.309
Pot Cap-1 Maneuver	-	-	858	-	~ 104	431
Stage 1	-	-	-	-	485	-
Stage 2	-	-	-	-	370	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	858	-	~ 95	431
Mov Cap-2 Maneuver	-	-	-	-	~ 95	-
Stage 1	-	-	-	-	485	-
Stage 2	-	-	-	-	337	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	164
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	95	431	-	-	858	-
HCM Lane V/C Ratio	1.259	0.177	-	-	0.089	-
HCM Control Delay (s)	258.7	15.1	-	-	9.6	-
HCM Lane LOS	F	C	-	-	A	-
HCM 95th %tile Q(veh)	8.4	0.6	-	-	0.3	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 Signalized Intersection Summary
18: Water Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	510	80	100	680	180	120	370	120	60	370	120
Future Volume (veh/h)	180	510	80	100	680	180	120	370	120	60	370	120
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1900	1900	1810	1900	1810	1810	1900	1810	1810	1900
Adj Flow Rate, veh/h	196	554	87	109	739	196	130	402	130	65	402	130
Adj No. of Lanes	0	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	5	5	5	5	5	5	5	5	5
Cap, veh/h	208	768	131	140	931	290	190	494	160	190	494	160
Arrive On Green	0.51	0.51	0.51	0.51	0.51	0.51	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	240	1514	258	151	1836	571	844	1311	424	844	1311	424
Grp Volume(v), veh/h	302	0	535	513	0	531	130	0	532	65	0	532
Grp Sat Flow(s),veh/h/ln	427	0	1586	1011	0	1546	844	0	1735	844	0	1735
Q Serve(g_s), s	17.2	0.0	17.3	17.7	0.0	17.8	7.0	0.0	19.0	5.2	0.0	19.0
Cycle Q Clear(g_c), s	35.0	0.0	17.3	35.0	0.0	17.8	26.0	0.0	19.0	24.2	0.0	19.0
Prop In Lane	0.65		0.16	0.21		0.37	1.00		0.24	1.00		0.24
Lane Grp Cap(c), veh/h	302	0	804	576	0	784	190	0	654	190	0	654
V/C Ratio(X)	1.00	0.00	0.66	0.89	0.00	0.68	0.69	0.00	0.81	0.34	0.00	0.81
Avail Cap(c_a), veh/h	302	0	804	576	0	784	190	0	654	190	0	654
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.9	0.0	12.6	18.7	0.0	12.8	32.2	0.0	19.3	30.2	0.0	19.3
Incr Delay (d2), s/veh	51.8	0.0	4.3	18.5	0.0	4.7	10.3	0.0	8.0	1.3	0.0	8.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.1	0.0	8.4	12.7	0.0	8.5	3.0	0.0	10.5	1.3	0.0	10.5
LnGrp Delay(d),s/veh	77.7	0.0	16.9	37.2	0.0	17.4	42.5	0.0	27.3	31.5	0.0	27.3
LnGrp LOS	F		B	D		B	D		C	C		C
Approach Vol, veh/h		837			1044			662			597	
Approach Delay, s/veh		38.9			27.2			30.3			27.8	
Approach LOS		D			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		30.0		39.0		30.0		39.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		26.0		35.0		26.0		35.0
Max Q Clear Time (g_c+I1), s		28.0		37.0		26.2		37.0
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	31.1
HCM 2010 LOS	C

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HCM 2010 Signalized Intersection Summary
19: Main St & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	370	70	100	530	130	80	290	70	250	280	150
Future Volume (veh/h)	250	370	70	100	530	130	80	290	70	250	280	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1845	1845	1900	1863	1863	1863	1881	1881	1881
Adj Flow Rate, veh/h	272	402	76	109	576	141	87	315	76	272	304	163
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	3	3	3	2	2	2	1	1	1
Cap, veh/h	421	1153	216	485	988	241	314	391	327	348	496	416
Arrive On Green	0.11	0.40	0.40	0.06	0.36	0.36	0.05	0.21	0.21	0.11	0.26	0.26
Sat Flow, veh/h	1707	2852	534	1757	2779	678	1774	1863	1559	1792	1881	1577
Grp Volume(v), veh/h	272	238	240	109	363	354	87	315	76	272	304	163
Grp Sat Flow(s),veh/h/ln	1707	1703	1683	1757	1752	1705	1774	1863	1559	1792	1881	1577
Q Serve(g_s), s	6.7	6.7	6.8	2.7	11.6	11.7	2.6	11.1	2.8	7.5	9.8	5.9
Cycle Q Clear(g_c), s	6.7	6.7	6.8	2.7	11.6	11.7	2.6	11.1	2.8	7.5	9.8	5.9
Prop In Lane	1.00		0.32	1.00		0.40	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	421	688	680	485	623	606	314	391	327	348	496	416
V/C Ratio(X)	0.65	0.35	0.35	0.22	0.58	0.59	0.28	0.81	0.23	0.78	0.61	0.39
Avail Cap(c_a), veh/h	421	688	680	571	623	606	410	513	429	348	518	434
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.8	14.2	14.3	12.7	18.1	18.1	19.9	25.9	22.6	19.7	22.3	20.9
Incr Delay (d2), s/veh	2.7	1.4	1.4	0.1	3.9	4.1	0.2	5.2	0.1	10.1	1.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	3.4	3.4	1.3	6.2	6.1	1.3	6.3	1.2	2.4	5.3	2.6
LnGrp Delay(d),s/veh	15.5	15.6	15.7	12.8	22.0	22.2	20.1	31.2	22.8	29.8	23.7	21.1
LnGrp LOS	B	B	B	B	C	C	C	C	C	C	C	C
Approach Vol, veh/h		750			826			478			739	
Approach Delay, s/veh		15.6			20.9			27.8			25.3	
Approach LOS		B			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	18.5	7.6	31.9	7.3	22.2	11.0	28.5
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	3.5	4.0	3.5	4.0
Max Green Setting (Gmax), s	7.5	19.0	7.5	20.0	7.5	19.0	7.5	20.0
Max Q Clear Time (g_c+I1), s	9.5	13.1	4.7	8.8	4.6	11.8	8.7	13.7
Green Ext Time (p_c), s	0.0	1.3	0.0	2.5	0.0	1.4	0.0	1.9

Intersection Summary			
HCM 2010 Ctrl Delay			21.8
HCM 2010 LOS			C

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HCM Signalized Intersection Capacity Analysis
20: Wildcat Way & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	610	90	110	710	30	110	170	130	30	110	150
Future Volume (vph)	100	610	90	110	710	30	110	170	130	30	110	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.98			0.99		1.00	0.94		1.00	0.91	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3527			3568		1805	1777		1805	1736	
Flt Permitted		0.73			0.73		0.39	1.00		0.31	1.00	
Satd. Flow (perm)		2606			2632		733	1777		590	1736	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	663	98	120	772	33	120	185	141	33	120	163
RTOR Reduction (vph)	0	11	0	0	3	0	0	46	0	0	82	0
Lane Group Flow (vph)	0	859	0	0	922	0	120	280	0	33	201	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		44.2			44.2		16.8	16.8		16.8	16.8	
Effective Green, g (s)		44.2			44.2		16.8	16.8		16.8	16.8	
Actuated g/C Ratio		0.64			0.64		0.24	0.24		0.24	0.24	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		0.2			0.2		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1669			1686		178	432		143	422	
v/s Ratio Prot								0.16			0.12	
v/s Ratio Perm		0.33			c0.35		c0.16			0.06		
v/c Ratio		0.51			0.55		0.67	0.65		0.23	0.48	
Uniform Delay, d1		6.6			6.9		23.6	23.4		20.9	22.3	
Progression Factor		0.88			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0			1.3		9.7	3.3		0.8	0.8	
Delay (s)		6.9			8.1		33.3	26.8		21.7	23.2	
Level of Service		A			A		C	C		C	C	
Approach Delay (s)		6.9			8.1			28.5			23.0	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: Walnut Street & University Way

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1010	60	30	1000	40	40
Future Volume (vph)	1010	60	30	1000	40	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.5	
Lane Util. Factor	0.95			0.95	1.00	
Frt	0.99			1.00	0.93	
Flt Protected	1.00			1.00	0.98	
Satd. Flow (prot)	3510			3534	1695	
Flt Permitted	1.00			0.90	0.98	
Satd. Flow (perm)	3510			3173	1695	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1098	65	33	1087	43	43
RTOR Reduction (vph)	3	0	0	0	39	0
Lane Group Flow (vph)	1160	0	0	1120	47	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			2	8	
Permitted Phases			2			
Actuated Green, G (s)	55.5			55.5	6.5	
Effective Green, g (s)	55.5			55.5	6.5	
Actuated g/C Ratio	0.79			0.79	0.09	
Clearance Time (s)	4.0			4.0	4.5	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	2763			2497	156	
v/s Ratio Prot	0.33				c0.03	
v/s Ratio Perm				c0.35		
v/c Ratio	0.42			0.45	0.30	
Uniform Delay, d1	2.4			2.5	29.9	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.5			0.6	1.1	
Delay (s)	2.9			3.1	31.0	
Level of Service	A			A	C	
Approach Delay (s)	2.9			3.1	31.0	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	70.5	Sum of lost time (s)	8.5
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

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HCM 2010 Signalized Intersection Summary
22: Chestnut Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	310	580	10	80	720	110	100	80	80	110	40	380
Future Volume (veh/h)	310	580	10	80	720	110	100	80	80	110	40	380
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.98	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1881	1881	1900	1900	1900	1900	1881	1881	1900
Adj Flow Rate, veh/h	337	630	11	87	783	120	109	87	87	120	43	413
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	1	1	1	0	0	0	1	1	1
Cap, veh/h	401	1626	28	467	1293	198	150	279	279	398	49	471
Arrive On Green	0.09	0.46	0.46	0.06	0.42	0.42	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1774	3557	62	1792	3087	473	946	862	862	1209	151	1452
Grp Volume(v), veh/h	337	313	328	87	453	450	109	0	174	120	0	456
Grp Sat Flow(s),veh/h/ln	1774	1770	1849	1792	1787	1773	946	0	1723	1209	0	1603
Q Serve(g_s), s	7.0	8.6	8.6	2.0	14.6	14.6	4.1	0.0	5.6	6.1	0.0	19.9
Cycle Q Clear(g_c), s	7.0	8.6	8.6	2.0	14.6	14.6	24.0	0.0	5.6	11.7	0.0	19.9
Prop In Lane	1.00		0.03	1.00		0.27	1.00		0.50	1.00		0.91
Lane Grp Cap(c), veh/h	401	809	846	467	749	743	150	0	559	398	0	520
V/C Ratio(X)	0.84	0.39	0.39	0.19	0.61	0.61	0.73	0.00	0.31	0.30	0.00	0.88
Avail Cap(c_a), veh/h	401	809	846	730	749	743	150	0	559	398	0	520
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.1	13.2	13.2	11.0	16.7	16.7	36.0	0.0	18.8	23.2	0.0	23.6
Incr Delay (d2), s/veh	14.7	1.4	1.3	0.2	3.6	3.6	17.4	0.0	0.4	0.6	0.0	15.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	4.5	4.7	1.0	7.9	7.9	2.9	0.0	2.7	2.1	0.0	11.0
LnGrp Delay(d),s/veh	30.7	14.6	14.6	11.2	20.4	20.4	53.4	0.0	19.2	23.8	0.0	39.6
LnGrp LOS	C	B	B	B	C	C	D		B	C		D
Approach Vol, veh/h		978			990			283			576	
Approach Delay, s/veh		20.2			19.6			32.4			36.3	
Approach LOS		C			B			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	37.8		28.0	11.0	35.0		28.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	15.0	23.0		24.0	7.0	31.0		24.0
Max Q Clear Time (g_c+I1), s	4.0	10.6		21.9	9.0	16.6		26.0
Green Ext Time (p_c), s	0.2	7.6		1.2	0.0	8.4		0.0

Intersection Summary			
HCM 2010 Ctrl Delay			24.5
HCM 2010 LOS			C

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HCM 2010 Signalized Intersection Summary
23: Alder Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱			✥			↰	↱
Traffic Volume (veh/h)	260	680	10	10	520	260	20	0	10	180	10	240
Future Volume (veh/h)	260	680	10	10	520	260	20	0	10	180	10	240
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	283	739	11	11	565	283	22	0	11	196	11	261
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	322	1821	27	367	1166	583	322	16	129	626	33	633
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.39	0.00	0.39	0.39	0.39	0.39
Sat Flow, veh/h	660	3641	54	723	2332	1167	615	41	328	1357	83	1615
Grp Volume(v), veh/h	283	366	384	11	437	411	33	0	0	207	0	261
Grp Sat Flow(s),veh/h/ln	660	1805	1890	723	1805	1694	984	0	0	1440	0	1615
Q Serve(g_s), s	25.2	9.4	9.4	0.7	11.8	11.8	0.2	0.0	0.0	0.0	0.0	8.7
Cycle Q Clear(g_c), s	37.0	9.4	9.4	10.1	11.8	11.8	7.8	0.0	0.0	7.6	0.0	8.7
Prop In Lane	1.00		0.03	1.00		0.69	0.67		0.33	0.95		1.00
Lane Grp Cap(c), veh/h	322	903	945	367	903	847	467	0	0	659	0	633
V/C Ratio(X)	0.88	0.41	0.41	0.03	0.48	0.49	0.07	0.00	0.00	0.31	0.00	0.41
Avail Cap(c_a), veh/h	322	903	945	367	903	847	467	0	0	659	0	633
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.0	11.6	11.6	14.8	12.2	12.2	14.2	0.0	0.0	16.0	0.0	16.3
Incr Delay (d2), s/veh	27.2	1.4	1.3	0.2	1.9	2.0	0.3	0.0	0.0	1.2	0.0	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.2	5.0	5.2	0.2	6.3	5.9	0.5	0.0	0.0	3.2	0.0	4.2
LnGrp Delay(d),s/veh	54.3	13.0	12.9	14.9	14.1	14.2	14.5	0.0	0.0	17.2	0.0	18.3
LnGrp LOS	D	B	B	B	B	B	B			B		B
Approach Vol, veh/h		1033			859			33			468	
Approach Delay, s/veh		24.3			14.1			14.5			17.8	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		41.0		33.0		41.0		33.0
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		37.0		29.0		37.0		29.0
Max Q Clear Time (g_c+I1), s		39.0		9.8		13.8		10.7
Green Ext Time (p_c), s		0.0		2.1		17.0		2.1

Intersection Summary	
HCM 2010 Ctrl Delay	19.2
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
24: Pfenning Rd & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	400	140	90	260	30	100	360	110	70	120	50
Future Volume (veh/h)	70	400	140	90	260	30	100	360	110	70	120	50
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	76	435	152	98	283	33	109	391	120	76	130	54
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	453	530	185	249	657	77	182	453	130	216	338	118
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	1059	1320	461	825	1638	191	220	1139	326	282	850	297
Grp Volume(v), veh/h	76	0	587	98	0	316	620	0	0	260	0	0
Grp Sat Flow(s),veh/h/ln	1059	0	1781	825	0	1829	1686	0	0	1428	0	0
Q Serve(g_s), s	2.5	0.0	13.2	4.8	0.0	5.6	11.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	8.1	0.0	13.2	18.0	0.0	5.6	15.6	0.0	0.0	4.6	0.0	0.0
Prop In Lane	1.00		0.26	1.00		0.10	0.18		0.19	0.29		0.21
Lane Grp Cap(c), veh/h	453	0	715	249	0	734	765	0	0	672	0	0
V/C Ratio(X)	0.17	0.00	0.82	0.39	0.00	0.43	0.81	0.00	0.00	0.39	0.00	0.00
Avail Cap(c_a), veh/h	453	0	715	249	0	734	771	0	0	677	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.7	0.0	12.0	20.3	0.0	9.7	12.7	0.0	0.0	9.5	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	7.6	1.0	0.0	0.4	6.5	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	7.9	1.2	0.0	2.9	8.6	0.0	0.0	2.3	0.0	0.0
LnGrp Delay(d),s/veh	12.8	0.0	19.6	21.3	0.0	10.1	19.2	0.0	0.0	9.9	0.0	0.0
LnGrp LOS	B		B	C		B	B			A		
Approach Vol, veh/h		663			414			620			260	
Approach Delay, s/veh		18.8			12.8			19.2			9.9	
Approach LOS		B			B			B			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.4		22.5		22.4		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		17.6		15.2		6.6		20.0				
Green Ext Time (p_c), s		0.2		1.7		4.7		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			16.5									
HCM 2010 LOS			B									

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HCM 2010 TWSC
25: 5th Avenue & Railroad Avenue

Intersection												
Int Delay, s/veh	22											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	40	0	100	80	270	0	130	150	250	180	20
Future Vol, veh/h	20	40	0	100	80	270	0	130	150	250	180	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	0	-	-	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	43	0	109	87	293	0	141	163	272	196	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1163	1054	207	995	984	223	217	0	0	304	0	0
Stage 1	750	750	-	223	223	-	-	-	-	-	-	-
Stage 2	413	304	-	772	761	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	172	226	833	224	248	817	1353	-	-	1257	-	-
Stage 1	403	419	-	780	719	-	-	-	-	-	-	-
Stage 2	616	663	-	392	414	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	61	177	833	153	194	817	1353	-	-	1257	-	-
Mov Cap-2 Maneuver	61	177	-	153	194	-	-	-	-	-	-	-
Stage 1	403	328	-	780	719	-	-	-	-	-	-	-
Stage 2	347	663	-	266	324	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	79.6	45.2	0	4.8
HCM LOS	F	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1353	-	-	108	153	471	1257	-	-
HCM Lane V/C Ratio	-	-	-	0.604	0.71	0.808	0.216	-	-
HCM Control Delay (s)	0	-	-	79.6	71.9	37.6	8.7	-	-
HCM Lane LOS	A	-	-	F	F	E	A	-	-
HCM 95th %tile Q(veh)	0	-	-	2.9	4.2	7.6	0.8	-	-

HCM 2010 Signalized Intersection Summary
26: Water Street & 5th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	130	110	60	120	40	110	500	60	60	510	90
Future Volume (veh/h)	120	130	110	60	120	40	110	500	60	60	510	90
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1743	1743	1900	1881	1881	1900	1863	1863	1900
Adj Flow Rate, veh/h	130	141	120	65	130	43	120	543	65	65	554	98
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	9	9	9	1	1	1	2	2	2
Cap, veh/h	311	236	201	235	331	109	424	1022	122	455	956	169
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.62	0.62	0.62	0.62	0.62	0.62
Sat Flow, veh/h	1158	893	760	1041	1253	414	785	1648	197	809	1541	273
Grp Volume(v), veh/h	130	0	261	65	0	173	120	0	608	65	0	652
Grp Sat Flow(s),veh/h/ln	1158	0	1653	1041	0	1667	785	0	1846	809	0	1814
Q Serve(g_s), s	7.2	0.0	9.5	4.0	0.0	5.9	7.4	0.0	12.9	3.4	0.0	14.7
Cycle Q Clear(g_c), s	13.0	0.0	9.5	13.5	0.0	5.9	22.1	0.0	12.9	16.3	0.0	14.7
Prop In Lane	1.00		0.46	1.00		0.25	1.00		0.11	1.00		0.15
Lane Grp Cap(c), veh/h	311	0	436	235	0	440	424	0	1145	455	0	1125
V/C Ratio(X)	0.42	0.00	0.60	0.28	0.00	0.39	0.28	0.00	0.53	0.14	0.00	0.58
Avail Cap(c_a), veh/h	408	0	575	323	0	580	424	0	1145	455	0	1125
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.2	0.0	22.2	28.1	0.0	20.9	14.3	0.0	7.4	12.0	0.0	7.8
Incr Delay (d2), s/veh	1.3	0.0	1.9	0.9	0.0	0.8	1.7	0.0	1.8	0.7	0.0	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	4.6	1.2	0.0	2.8	1.8	0.0	7.0	0.8	0.0	7.9
LnGrp Delay(d),s/veh	27.5	0.0	24.1	29.0	0.0	21.7	16.0	0.0	9.2	12.7	0.0	10.0
LnGrp LOS	C		C	C		C	B		A	B		A
Approach Vol, veh/h		391			238			728			717	
Approach Delay, s/veh		25.2			23.7			10.3			10.2	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		46.8		22.2		46.8		22.2
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		37.0		24.0		37.0		24.0
Max Q Clear Time (g_c+I1), s		24.1		15.0		18.3		15.5
Green Ext Time (p_c), s		6.2		2.8		7.5		2.7

Intersection Summary	
HCM 2010 Ctrl Delay	14.6
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
27: Main St & 5th Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	180	70	100	210	70	50	600	50	60	480	70
Future Volume (veh/h)	110	180	70	100	210	70	50	600	50	60	480	70
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	120	196	76	109	228	76	54	652	54	65	522	76
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	3	3	3	2	2	2	2	2	2
Cap, veh/h	326	318	123	348	327	109	307	837	69	238	784	114
Arrive On Green	0.07	0.26	0.26	0.07	0.25	0.25	0.49	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	1740	1242	482	1757	1309	436	817	1693	140	739	1584	231
Grp Volume(v), veh/h	120	0	272	109	0	304	54	0	706	65	0	598
Grp Sat Flow(s),veh/h/ln	1740	0	1724	1757	0	1745	817	0	1833	739	0	1815
Q Serve(g_s), s	3.4	0.0	9.5	3.1	0.0	10.8	3.6	0.0	21.5	5.4	0.0	16.9
Cycle Q Clear(g_c), s	3.4	0.0	9.5	3.1	0.0	10.8	20.5	0.0	21.5	26.9	0.0	16.9
Prop In Lane	1.00		0.28	1.00		0.25	1.00		0.08	1.00		0.13
Lane Grp Cap(c), veh/h	326	0	442	348	0	436	307	0	907	238	0	898
V/C Ratio(X)	0.37	0.00	0.62	0.31	0.00	0.70	0.18	0.00	0.78	0.27	0.00	0.67
Avail Cap(c_a), veh/h	330	0	442	362	0	436	307	0	907	238	0	898
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.8	0.0	22.3	17.7	0.0	23.2	20.7	0.0	14.1	25.2	0.0	12.9
Incr Delay (d2), s/veh	0.7	0.0	6.3	0.5	0.0	8.9	1.2	0.0	6.5	2.8	0.0	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	5.2	1.5	0.0	6.2	0.9	0.0	12.4	1.3	0.0	9.3
LnGrp Delay(d),s/veh	18.5	0.0	28.6	18.2	0.0	32.1	21.9	0.0	20.7	28.0	0.0	16.8
LnGrp LOS	B		C	B		C	C		C	C		B
Approach Vol, veh/h		392			413			760			663	
Approach Delay, s/veh		25.5			28.4			20.8			17.9	
Approach LOS		C			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.9	21.4		37.6	9.4	21.0		37.6
Change Period (Y+Rc), s	4.5	4.0		4.0	4.5	4.0		4.0
Max Green Setting (Gmax), s	5.0	17.0		33.0	5.0	17.0		33.0
Max Q Clear Time (g_c+I1), s	5.1	11.5		28.9	5.4	12.8		23.5
Green Ext Time (p_c), s	0.0	1.3		2.6	0.0	1.0		5.0

Intersection Summary	
HCM 2010 Ctrl Delay	22.2
HCM 2010 LOS	C

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HCM 2010 AWSC
28: Ruby Street & 5th Avenue

Intersection	
Intersection Delay, s/veh	62.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	30	190	80	110	190	30	170	200	80	60	200	50
Future Vol, veh/h	30	190	80	110	190	30	170	200	80	60	200	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	33	207	87	120	207	33	185	217	87	65	217	54
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	36.7	45.5	107.8	39.2
HCM LOS	E	E	F	E

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	10%	33%	19%
Vol Thru, %	44%	63%	58%	65%
Vol Right, %	18%	27%	9%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	450	300	330	310
LT Vol	170	30	110	60
Through Vol	200	190	190	200
RT Vol	80	80	30	50
Lane Flow Rate	489	326	359	337
Geometry Grp	1	1	1	1
Degree of Util (X)	1.118	0.772	0.847	0.797
Departure Headway (Hd)	8.228	9.027	8.997	8.981
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	440	404	405	404
Service Time	6.315	7.027	6.997	6.981
HCM Lane V/C Ratio	1.111	0.807	0.886	0.834
HCM Control Delay	107.8	36.7	45.5	39.2
HCM Lane LOS	F	E	E	E
HCM 95th-tile Q	17	6.5	8.1	7

HCM 2010 TWSC
29: Chestnut Street & 5th Avenue

Intersection												
Int Delay, s/veh	3.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	20	20	20	20	50	20	450	20	30	440	20
Future Vol, veh/h	20	20	20	20	20	50	20	450	20	30	440	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	22	22	22	22	54	22	489	22	33	478	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1136	1108	489	1119	1108	500	500	0	0	511	0	0
Stage 1	554	554	-	543	543	-	-	-	-	-	-	-
Stage 2	582	554	-	576	565	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	179	210	579	184	210	571	1064	-	-	1054	-	-
Stage 1	517	514	-	524	520	-	-	-	-	-	-	-
Stage 2	499	514	-	503	508	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	143	199	579	156	199	571	1064	-	-	1054	-	-
Mov Cap-2 Maneuver	143	199	-	156	199	-	-	-	-	-	-	-
Stage 1	506	498	-	513	509	-	-	-	-	-	-	-
Stage 2	423	503	-	448	492	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.3	24.1	0.3	0.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1064	-	-	143	296	285	1054	-	-
HCM Lane V/C Ratio	0.02	-	-	0.152	0.147	0.343	0.031	-	-
HCM Control Delay (s)	8.5	-	-	34.6	19.2	24.1	8.5	-	-
HCM Lane LOS	A	-	-	D	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.5	1.5	0.1	-	-

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HCM 2010 Signalized Intersection Summary
30: Water Street & 3rd Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	110	100	60	110	60	30	430	80	80	550	20
Future Volume (veh/h)	10	110	100	60	110	60	30	430	80	80	550	20
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1863	1863	1900	1827	1827	1900
Adj Flow Rate, veh/h	11	120	109	65	120	65	33	467	87	87	598	22
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	4	4	4
Cap, veh/h	261	200	182	223	254	137	490	1006	187	528	1153	42
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.66	0.66	0.66	0.66	0.66	0.66
Sat Flow, veh/h	1177	888	806	1130	1124	609	800	1527	285	834	1751	64
Grp Volume(v), veh/h	11	0	229	65	0	185	33	0	554	87	0	620
Grp Sat Flow(s),veh/h/ln	1177	0	1694	1130	0	1732	800	0	1812	834	0	1815
Q Serve(g_s), s	0.6	0.0	8.4	3.8	0.0	6.4	1.5	0.0	10.4	4.0	0.0	12.2
Cycle Q Clear(g_c), s	7.0	0.0	8.4	12.1	0.0	6.4	13.8	0.0	10.4	14.3	0.0	12.2
Prop In Lane	1.00		0.48	1.00		0.35	1.00		0.16	1.00		0.04
Lane Grp Cap(c), veh/h	261	0	382	223	0	391	490	0	1193	528	0	1195
V/C Ratio(X)	0.04	0.00	0.60	0.29	0.00	0.47	0.07	0.00	0.46	0.16	0.00	0.52
Avail Cap(c_a), veh/h	320	0	466	279	0	477	490	0	1193	528	0	1195
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.2	0.0	23.9	29.4	0.0	23.2	9.7	0.0	5.8	9.3	0.0	6.1
Incr Delay (d2), s/veh	0.1	0.0	2.1	1.0	0.0	1.3	0.3	0.0	1.3	0.7	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	4.1	1.2	0.0	3.2	0.4	0.0	5.5	1.0	0.0	6.6
LnGrp Delay(d),s/veh	26.3	0.0	26.1	30.4	0.0	24.4	9.9	0.0	7.1	10.0	0.0	7.7
LnGrp LOS	C		C	C		C	A		A	A		A
Approach Vol, veh/h		240			250			587			707	
Approach Delay, s/veh		26.1			26.0			7.3			8.0	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		49.4		19.6		49.4		19.6
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		42.0		19.0		42.0		19.0
Max Q Clear Time (g_c+I1), s		15.8		10.4		16.3		14.1
Green Ext Time (p_c), s		7.1		2.0		7.1		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	12.7
HCM 2010 LOS	B

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HCM Signalized Intersection Capacity Analysis
31: Main St & 3rd Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	130	50	120	130	100	50	710	80	80	640	30
Future Volume (vph)	50	130	50	120	130	100	50	710	80	80	640	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1760	1769		1782	1737		1767	1829		1770	1848	
Flt Permitted	0.45	1.00		0.55	1.00		0.27	1.00		0.19	1.00	
Satd. Flow (perm)	836	1769		1032	1737		505	1829		363	1848	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	141	54	130	141	109	54	772	87	87	696	33
RTOR Reduction (vph)	0	21	0	0	43	0	0	5	0	0	2	0
Lane Group Flow (vph)	54	174	0	130	207	0	54	854	0	87	727	0
Confl. Peds. (#/hr)	4		4	2		3	3		4	2		2
Confl. Bikes (#/hr)			3			1			4			3
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			2			2	
Permitted Phases	1			1			2			2		
Actuated Green, G (s)	17.2	17.2		17.2	17.2		43.8	43.8		43.8	43.8	
Effective Green, g (s)	17.2	17.2		17.2	17.2		43.8	43.8		43.8	43.8	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.63	0.63		0.63	0.63	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	208	440		257	432		320	1161		230	1173	
v/s Ratio Prot		0.10			0.12			c0.47			0.39	
v/s Ratio Perm	0.06			c0.13			0.11			0.24		
v/c Ratio	0.26	0.40		0.51	0.48		0.17	0.74		0.38	0.62	
Uniform Delay, d1	20.8	21.6		22.2	22.1		5.2	8.6		6.1	7.6	
Progression Factor	1.28	1.28		1.00	1.00		0.46	0.72		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.6	0.3		0.9	3.4		4.7	2.5	
Delay (s)	26.8	27.7		22.8	22.4		3.3	9.7		10.7	10.0	
Level of Service	C	C		C	C		A	A		B	B	
Approach Delay (s)		27.5			22.5			9.3			10.1	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	104.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

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HCM 2010 AWSC
32: Ruby Street & 3rd Avenue

Intersection	
Intersection Delay, s/veh	93.2
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Traffic Vol, veh/h	160	190	80	30	160	40	70	250	40	50	280	140
Future Vol, veh/h	160	190	80	30	160	40	70	250	40	50	280	140
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	174	207	87	33	174	43	76	272	43	54	304	152
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	106	30.5	64.1	134.4
HCM LOS	F	D	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	19%	37%	13%	11%
Vol Thru, %	69%	44%	70%	60%
Vol Right, %	11%	19%	17%	30%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	360	430	230	470
LT Vol	70	160	30	50
Through Vol	250	190	160	280
RT Vol	40	80	40	140
Lane Flow Rate	391	467	250	511
Geometry Grp	1	1	1	1
Degree of Util (X)	0.941	1.102	0.648	1.187
Departure Headway (Hd)	9.514	9.095	10.335	8.818
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	383	402	353	414
Service Time	7.514	7.095	8.335	6.818
HCM Lane V/C Ratio	1.021	1.162	0.708	1.234
HCM Control Delay	64.1	106	30.5	134.4
HCM Lane LOS	F	F	D	F
HCM 95th-tile Q	10.2	15.6	4.3	19.1

HCM 2010 AWSC
33: Chestnut Street & 3rd Avenue

Intersection	
Intersection Delay, s/veh	22.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	90	40	20	50	70	40	340	20	80	350	60
Future Vol, veh/h	50	90	40	20	50	70	40	340	20	80	350	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	98	43	22	54	76	43	370	22	87	380	65
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	14.6	13.2	23.8	27.5
HCM LOS	B	B	C	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	28%	14%	100%	0%
Vol Thru, %	0%	94%	50%	36%	0%	85%
Vol Right, %	0%	6%	22%	50%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	40	360	180	140	80	410
LT Vol	40	0	50	20	80	0
Through Vol	0	340	90	50	0	350
RT Vol	0	20	40	70	0	60
Lane Flow Rate	43	391	196	152	87	446
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.087	0.727	0.385	0.299	0.172	0.803
Departure Headway (Hd)	7.238	6.687	7.087	7.069	7.103	6.487
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	494	540	507	507	504	557
Service Time	4.995	4.443	5.151	5.137	4.857	4.241
HCM Lane V/C Ratio	0.087	0.724	0.387	0.3	0.173	0.801
HCM Control Delay	10.7	25.3	14.6	13.2	11.3	30.7
HCM Lane LOS	B	D	B	B	B	D
HCM 95th-tile Q	0.3	6	1.8	1.2	0.6	7.8

HCM 2010 Signalized Intersection Summary
34: Water Street & Capitol Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	90	80	20	90	120	30	290	30	70	500	90
Future Volume (veh/h)	60	90	80	20	90	120	30	290	30	70	500	90
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1900	1900	1827	1827	1900	1900	1863	1863
Adj Flow Rate, veh/h	65	98	87	22	98	130	33	315	33	76	543	98
Adj No. of Lanes	0	1	1	1	1	0	1	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	144	187	374	191	174	231	471	1057	111	157	1032	1029
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	302	800	1599	1218	742	984	770	1626	170	152	1588	1583
Grp Volume(v), veh/h	163	0	87	22	0	228	33	0	348	619	0	98
Grp Sat Flow(s),veh/h/ln	1102	0	1599	1218	0	1726	770	0	1797	1740	0	1583
Q Serve(g_s), s	3.2	0.0	3.0	1.2	0.0	8.0	1.6	0.0	5.8	0.0	0.0	1.6
Cycle Q Clear(g_c), s	11.3	0.0	3.0	12.4	0.0	8.0	13.6	0.0	5.8	12.0	0.0	1.6
Prop In Lane	0.40		1.00	1.00		0.57	1.00		0.09	0.12		1.00
Lane Grp Cap(c), veh/h	331	0	374	191	0	404	471	0	1168	1189	0	1029
V/C Ratio(X)	0.49	0.00	0.23	0.12	0.00	0.56	0.07	0.00	0.30	0.52	0.00	0.10
Avail Cap(c_a), veh/h	481	0	533	312	0	575	471	0	1168	1189	0	1029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.2	0.0	21.4	30.3	0.0	23.3	9.9	0.0	5.2	6.3	0.0	4.5
Incr Delay (d2), s/veh	1.4	0.0	0.4	0.3	0.0	1.5	0.3	0.0	0.7	1.6	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	0.0	1.4	0.4	0.0	4.0	0.4	0.0	3.0	6.6	0.0	0.7
LnGrp Delay(d),s/veh	25.6	0.0	21.8	30.6	0.0	24.8	10.2	0.0	5.9	8.0	0.0	4.7
LnGrp LOS	C		C	C		C	B		A	A		A
Approach Vol, veh/h		250			250			381			717	
Approach Delay, s/veh		24.3			25.3			6.3			7.5	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		48.8		20.2		48.8		20.2
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		38.0		23.0		38.0		23.0
Max Q Clear Time (g_c+I1), s		15.6		13.3		14.0		14.4
Green Ext Time (p_c), s		5.4		1.9		5.5		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	12.6
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
35: Main St & Capitol Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	120	30	110	100	60	50	720	40	70	580	40
Future Volume (veh/h)	60	120	30	110	100	60	50	720	40	70	580	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1881	1881	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	65	130	33	120	109	65	54	783	43	76	630	43
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	3	3	3	3	3	3
Cap, veh/h	267	317	80	279	242	144	459	1153	63	359	1136	78
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.67	0.67	0.67	0.67	0.67	0.67
Sat Flow, veh/h	1218	1449	368	1230	1106	659	755	1733	95	654	1708	117
Grp Volume(v), veh/h	65	0	163	120	0	174	54	0	826	76	0	673
Grp Sat Flow(s),veh/h/ln	1218	0	1816	1230	0	1765	755	0	1828	654	0	1824
Q Serve(g_s), s	3.4	0.0	5.3	6.4	0.0	5.9	2.8	0.0	19.0	5.5	0.0	13.5
Cycle Q Clear(g_c), s	9.3	0.0	5.3	11.7	0.0	5.9	16.3	0.0	19.0	24.6	0.0	13.5
Prop In Lane	1.00		0.20	1.00		0.37	1.00		0.05	1.00		0.06
Lane Grp Cap(c), veh/h	267	0	397	279	0	386	459	0	1216	359	0	1214
V/C Ratio(X)	0.24	0.00	0.41	0.43	0.00	0.45	0.12	0.00	0.68	0.21	0.00	0.55
Avail Cap(c_a), veh/h	371	0	553	384	0	537	459	0	1216	359	0	1214
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.4	0.0	23.1	28.2	0.0	23.4	10.4	0.0	7.0	14.5	0.0	6.1
Incr Delay (d2), s/veh	0.5	0.0	0.7	1.1	0.0	0.8	0.5	0.0	3.1	1.3	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	2.7	2.2	0.0	2.9	0.7	0.0	10.4	1.1	0.0	7.3
LnGrp Delay(d),s/veh	27.9	0.0	23.8	29.2	0.0	24.2	11.0	0.0	10.1	15.9	0.0	8.0
LnGrp LOS	C		C	C		C	B		B	B		A
Approach Vol, veh/h		228			294			880			749	
Approach Delay, s/veh		25.0			26.2			10.2			8.8	
Approach LOS		C			C			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		49.9		19.1		49.9		19.1
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0		40.0		21.0
Max Q Clear Time (g_c+I1), s		21.0		11.3		26.6		13.7
Green Ext Time (p_c), s		8.9		1.6		7.3		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	13.4
HCM 2010 LOS	B

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HCM 2010 AWSC
36: Chestnut Street & Capitol Avenue

Intersection	
Intersection Delay, s/veh	32.1
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Vol, veh/h	50	210	20	30	140	110	30	240	40	80	280	30
Future Vol, veh/h	50	210	20	30	140	110	30	240	40	80	280	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	228	22	33	152	120	33	261	43	87	304	33
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	26.1	24.7	28.5	44.7
HCM LOS	D	C	D	E

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	10%	18%	11%	21%
Vol Thru, %	77%	75%	50%	72%
Vol Right, %	13%	7%	39%	8%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	310	280	280	390
LT Vol	30	50	30	80
Through Vol	240	210	140	280
RT Vol	40	20	110	30
Lane Flow Rate	337	304	304	424
Geometry Grp	1	1	1	1
Degree of Util (X)	0.722	0.673	0.658	0.881
Departure Headway (Hd)	7.717	7.959	7.778	7.485
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	468	453	463	483
Service Time	5.797	6.039	5.857	5.56
HCM Lane V/C Ratio	0.72	0.671	0.657	0.878
HCM Control Delay	28.5	26.1	24.7	44.7
HCM Lane LOS	D	D	C	E
HCM 95th-tile Q	5.7	4.9	4.7	9.5

HCM 2010 TWSC
37: Willow Street & Capitol Avenue

Intersection	
Int Delay, s/veh	4.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	120	170	140	190	30	170
Future Vol, veh/h	120	170	140	190	30	170
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	185	152	207	33	185

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	315	0	734	223
Stage 1	-	-	-	-	223	-
Stage 2	-	-	-	-	511	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1245	-	387	817
Stage 1	-	-	-	-	814	-
Stage 2	-	-	-	-	602	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1245	-	340	817
Mov Cap-2 Maneuver	-	-	-	-	340	-
Stage 1	-	-	-	-	814	-
Stage 2	-	-	-	-	529	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	675	-	-	1245	-
HCM Lane V/C Ratio	0.322	-	-	0.122	-
HCM Control Delay (s)	12.8	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1.4	-	-	0.4	-

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HCM 2010 Signalized Intersection Summary
38: Main Street & Manitoba Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	160	330	70	110	40	170	850	20	40	720	30
Future Volume (veh/h)	40	160	330	70	110	40	170	850	20	40	720	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1900	1900	1900	1900	1900	1881	1881	1900
Adj Flow Rate, veh/h	43	174	359	76	120	43	185	924	22	43	783	33
Adj No. of Lanes	0	1	1	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	0	0	0	1	1	1
Cap, veh/h	122	419	429	144	209	62	296	1138	27	242	865	36
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.08	0.62	0.62	0.48	0.48	0.48
Sat Flow, veh/h	220	1561	1599	279	780	232	1810	1848	44	596	1792	76
Grp Volume(v), veh/h	217	0	359	239	0	0	185	0	946	43	0	816
Grp Sat Flow(s),veh/h/ln	1782	0	1599	1291	0	0	1810	0	1892	596	0	1868
Q Serve(g_s), s	0.0	0.0	14.6	5.3	0.0	0.0	3.2	0.0	26.5	4.1	0.0	27.7
Cycle Q Clear(g_c), s	6.6	0.0	14.6	11.9	0.0	0.0	3.2	0.0	26.5	21.4	0.0	27.7
Prop In Lane	0.20		1.00	0.32		0.18	1.00		0.02	1.00		0.04
Lane Grp Cap(c), veh/h	540	0	429	415	0	0	296	0	1165	242	0	901
V/C Ratio(X)	0.40	0.00	0.84	0.58	0.00	0.00	0.63	0.00	0.81	0.18	0.00	0.91
Avail Cap(c_a), veh/h	602	0	487	464	0	0	343	0	1165	242	0	901
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.9	0.0	23.8	22.5	0.0	0.0	14.8	0.0	10.2	21.9	0.0	16.4
Incr Delay (d2), s/veh	0.6	0.0	11.4	1.7	0.0	0.0	2.8	0.0	6.2	1.6	0.0	14.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	7.8	4.3	0.0	0.0	2.0	0.0	15.7	0.8	0.0	17.6
LnGrp Delay(d),s/veh	21.5	0.0	35.2	24.1	0.0	0.0	17.5	0.0	16.4	23.5	0.0	30.7
LnGrp LOS	C		D	C			B		B	C		C
Approach Vol, veh/h		576			239			1131			859	
Approach Delay, s/veh		30.0			24.1			16.6			30.4	
Approach LOS		C			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		46.5		22.5	9.2	37.3		22.5
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0	7.0	29.0		21.0
Max Q Clear Time (g_c+I1), s		28.5		16.6	5.2	29.7		13.9
Green Ext Time (p_c), s		9.0		1.9	0.1	0.0		2.7

Intersection Summary	
HCM 2010 Ctrl Delay	24.2
HCM 2010 LOS	C

HCM 2010 TWSC
39: Manitoba Avenue

Intersection	
Int Delay, s/veh	72

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	573	24	239	216	39	442
Future Vol, veh/h	573	24	239	216	39	442
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	623	26	260	235	42	480

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	649	0	1390	636
Stage 1	-	-	-	-	636	-
Stage 2	-	-	-	-	754	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	937	-	157	~ 478
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	465	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	937	-	107	~ 478
Mov Cap-2 Maneuver	-	-	-	-	107	-
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	317	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.4	224.4
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	373	-	-	937	-
HCM Lane V/C Ratio	1.402	-	-	0.277	-
HCM Control Delay (s)	224.4	-	-	10.3	0
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	26.2	-	-	1.1	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

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HCM 2010 TWSC
40: Manitoba Avenue & Ruby Street

Intersection	
Int Delay, s/veh	22

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	138	877	218	19	70	237
Future Vol, veh/h	138	877	218	19	70	237
Conflicting Peds, #/hr	1	0	0	0	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	1	0	0	0	0
Mvmt Flow	150	953	237	21	76	258

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	259	0	-	0	1502	249
Stage 1	-	-	-	-	248	-
Stage 2	-	-	-	-	1254	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1311	-	-	-	135	795
Stage 1	-	-	-	-	798	-
Stage 2	-	-	-	-	271	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1310	-	-	-	102	793
Mov Cap-2 Maneuver	-	-	-	-	102	-
Stage 1	-	-	-	-	797	-
Stage 2	-	-	-	-	205	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	108.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1310	-	-	-	312
HCM Lane V/C Ratio	0.115	-	-	-	1.07
HCM Control Delay (s)	8.1	0	-	-	108.3
HCM Lane LOS	A	A	-	-	F
HCM 95th %tile Q(veh)	0.4	-	-	-	12.6

HCM 2010 Signalized Intersection Summary
41: Canyon Rd/Main St & Mountain View Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	30	10	230	50	300	20	710	100	270	750	20
Future Volume (veh/h)	30	30	10	230	50	300	20	710	100	270	750	20
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1900	1827	1827	1900	1810	1810	1900	1827	1827	1900
Adj Flow Rate, veh/h	33	33	11	250	54	0	22	772	0	293	815	22
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	4	4	4	5	5	5	4	4	4
Cap, veh/h	382	306	102	397	438	0	263	1165	0	363	1002	27
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.00	0.02	0.64	0.00	0.57	0.57	0.57
Sat Flow, veh/h	1282	1276	425	1331	1827	0	1723	1810	0	681	1771	48
Grp Volume(v), veh/h	33	0	44	250	54	0	22	772	0	293	0	837
Grp Sat Flow(s),veh/h/ln	1282	0	1701	1331	1827	0	1723	1810	0	681	0	1818
Q Serve(g_s), s	1.4	0.0	1.4	12.5	1.6	0.0	0.3	18.3	0.0	26.2	0.0	25.5
Cycle Q Clear(g_c), s	3.0	0.0	1.4	13.8	1.6	0.0	0.3	18.3	0.0	39.1	0.0	25.5
Prop In Lane	1.00		0.25	1.00		0.00	1.00		0.00	1.00		0.03
Lane Grp Cap(c), veh/h	382	0	408	397	438	0	263	1165	0	363	0	1030
V/C Ratio(X)	0.09	0.00	0.11	0.63	0.12	0.00	0.08	0.66	0.00	0.81	0.00	0.81
Avail Cap(c_a), veh/h	465	0	518	482	556	0	429	1165	0	363	0	1030
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.7	0.0	20.5	25.9	20.5	0.0	10.9	7.6	0.0	23.0	0.0	12.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.2	0.2	0.0	0.1	3.0	0.0	17.3	0.0	7.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.7	4.8	0.8	0.0	0.2	10.0	0.0	7.3	0.0	14.6
LnGrp Delay(d),s/veh	21.8	0.0	20.5	28.1	20.7	0.0	11.0	10.6	0.0	40.3	0.0	19.0
LnGrp LOS	C		C	C	C		B	B		D		B
Approach Vol, veh/h		77			304			794			1130	
Approach Delay, s/veh		21.0			26.7			10.6			24.6	
Approach LOS		C			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		48.4		20.6	5.4	43.1		20.6
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0	8.0	28.0		21.0
Max Q Clear Time (g_c+I1), s		20.3		5.0	2.3	41.1		15.8
Green Ext Time (p_c), s		13.3		1.4	0.0	0.0		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	19.9
HCM 2010 LOS	B

HCM 2010 Signalized Intersection Summary
42: Ruby Street & Mountain View Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	410	50	150	430	50	50	140	510	50	70	40
Future Volume (veh/h)	20	410	50	150	430	50	50	140	510	50	70	40
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1900	1900	1900	1900	1863	1900	1900	1900	1900
Adj Flow Rate, veh/h	22	446	54	163	467	54	54	152	554	54	76	43
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	2	2	2	0	0	0
Cap, veh/h	433	748	91	477	845	98	77	107	349	138	183	84
Arrive On Green	0.03	0.45	0.45	0.08	0.51	0.51	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1792	1647	199	1810	1672	193	78	360	1179	240	620	285
Grp Volume(v), veh/h	22	0	500	163	0	521	760	0	0	173	0	0
Grp Sat Flow(s),veh/h/ln	1792	0	1846	1810	0	1866	1618	0	0	1145	0	0
Q Serve(g_s), s	0.5	0.0	14.4	3.1	0.0	13.6	14.4	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.5	0.0	14.4	3.1	0.0	13.6	21.0	0.0	0.0	6.2	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.10	0.07		0.73	0.31		0.25
Lane Grp Cap(c), veh/h	433	0	838	477	0	943	533	0	0	405	0	0
V/C Ratio(X)	0.05	0.00	0.60	0.34	0.00	0.55	1.43	0.00	0.00	0.43	0.00	0.00
Avail Cap(c_a), veh/h	632	0	838	535	0	943	533	0	0	405	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.3	0.0	14.5	9.8	0.0	12.0	26.0	0.0	0.0	19.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	3.1	0.2	0.0	2.3	202.5	0.0	0.0	0.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	7.9	1.6	0.0	7.6	40.3	0.0	0.0	2.7	0.0	0.0
LnGrp Delay(d),s/veh	10.3	0.0	17.6	10.0	0.0	14.4	228.6	0.0	0.0	20.4	0.0	0.0
LnGrp LOS	B		B	A		B	F			C		
Approach Vol, veh/h		522			684			760			173	
Approach Delay, s/veh		17.3			13.3			228.6			20.4	
Approach LOS		B			B			F			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.8	36.2		25.0	6.1	39.9		25.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	8.0	28.0		21.0	10.0	28.0		21.0
Max Q Clear Time (g_c+I1), s	5.1	16.4		8.2	2.5	15.6		23.0
Green Ext Time (p_c), s	0.1	5.2		5.1	0.0	5.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	91.3
HCM 2010 LOS	F

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HCM 2010 Signalized Intersection Summary
43: Chestnut Street & Mountain View Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	400	140	180	330	40	150	180	180	40	50	20
Future Volume (veh/h)	10	400	140	180	330	40	150	180	180	40	50	20
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1827	1827	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	435	152	196	359	43	163	196	196	43	54	0
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	2	2	2
Cap, veh/h	520	687	240	378	849	102	526	261	261	243	578	0
Arrive On Green	0.52	0.52	0.52	0.52	0.52	0.52	0.31	0.31	0.31	0.31	0.31	0.00
Sat Flow, veh/h	979	1320	461	825	1633	196	1319	839	839	988	1863	0
Grp Volume(v), veh/h	11	0	587	196	0	402	163	0	392	43	54	0
Grp Sat Flow(s),veh/h/ln	979	0	1781	825	0	1828	1319	0	1679	988	1863	0
Q Serve(g_s), s	0.4	0.0	11.8	11.2	0.0	6.8	5.0	0.0	10.5	2.1	1.0	0.0
Cycle Q Clear(g_c), s	7.1	0.0	11.8	23.0	0.0	6.8	6.1	0.0	10.5	12.6	1.0	0.0
Prop In Lane	1.00		0.26	1.00		0.11	1.00		0.50	1.00		0.00
Lane Grp Cap(c), veh/h	520	0	927	378	0	951	526	0	521	243	578	0
V/C Ratio(X)	0.02	0.00	0.63	0.52	0.00	0.42	0.31	0.00	0.75	0.18	0.09	0.00
Avail Cap(c_a), veh/h	528	0	941	385	0	966	642	0	669	330	743	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	9.6	0.0	8.6	16.8	0.0	7.4	14.4	0.0	15.6	21.2	12.3	0.0
Incr Delay (d2), s/veh	0.0	0.0	1.6	1.6	0.0	0.4	0.1	0.0	2.4	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	6.1	2.7	0.0	3.5	1.8	0.0	5.1	0.6	0.5	0.0
LnGrp Delay(d),s/veh	9.6	0.0	10.2	18.5	0.0	7.8	14.6	0.0	18.0	21.4	12.3	0.0
LnGrp LOS	A		B	B		A	B		B	C	B	
Approach Vol, veh/h		598			598			555			97	
Approach Delay, s/veh		10.2			11.3			17.0			16.3	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		30.6		19.6		30.6		19.6
Change Period (Y+Rc), s		4.5		4.0		4.5		4.0
Max Green Setting (Gmax), s		26.5		20.0		26.5		20.0
Max Q Clear Time (g_c+I1), s		13.8		12.5		25.0		14.6
Green Ext Time (p_c), s		6.8		1.2		1.1		1.0

Intersection Summary			
HCM 2010 Ctrl Delay			12.9
HCM 2010 LOS			B

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HCM 2010 TWSC
44: Bull Road/Willow Street & Mountain View Avenue

Intersection	
Int Delay, s/veh	19.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	120	370	80	40	180	90	60	90	30	20	10	30
Future Vol, veh/h	120	370	80	40	180	90	60	90	30	20	10	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	0	-	-	-	-	-	-	-	0
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	130	402	87	43	196	98	65	98	33	22	11	33

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	293	0	0	489	0	0	1044	1087	446	1104	1082	245
Stage 1	-	-	-	-	-	-	707	707	-	332	332	-
Stage 2	-	-	-	-	-	-	337	380	-	772	750	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1269	-	-	1074	-	-	207	216	612	188	217	794
Stage 1	-	-	-	-	-	-	426	438	-	681	644	-
Stage 2	-	-	-	-	-	-	677	614	-	392	419	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1269	-	-	1074	-	-	170	186	612	94	187	794
Mov Cap-2 Maneuver	-	-	-	-	-	-	170	186	-	94	187	-
Stage 1	-	-	-	-	-	-	382	393	-	611	618	-
Stage 2	-	-	-	-	-	-	612	589	-	250	376	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.7	1.1	102.7	29.5
HCM LOS			F	D

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	203	1269	-	-	1074	-	-	113	794
HCM Lane V/C Ratio	0.964	0.103	-	-	0.04	-	-	0.289	0.041
HCM Control Delay (s)	102.7	8.2	-	-	8.5	-	-	49.3	9.7
HCM Lane LOS	F	A	-	-	A	-	-	E	A
HCM 95th %tile Q(veh)	8.1	0.3	-	-	0.1	-	-	1.1	0.1

HCM 2010 TWSC
45: Umptanum Road & Railroad Ave

Intersection						
Int Delay, s/veh	5.7					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	20	130	200	160	170	80
Future Vol, veh/h	20	130	200	160	170	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	141	217	174	185	87

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	391	0	-	0	489	304
Stage 1	-	-	-	-	304	-
Stage 2	-	-	-	-	185	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1168	-	-	-	538	736
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	847	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1168	-	-	-	528	736
Mov Cap-2 Maneuver	-	-	-	-	528	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	831	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	16.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1168	-	-	-	580
HCM Lane V/C Ratio	0.019	-	-	-	0.469
HCM Control Delay (s)	8.1	-	-	-	16.6
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	2.5

HCM 2010 Signalized Intersection Summary
46: Canyon Road & Umptanum Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	190	190	180	210	130	220	610	270	190	740	50
Future Volume (veh/h)	40	190	190	180	210	130	220	610	270	190	740	50
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1900	1827	1827	1900	1810	1810	1810	1827	1827	1900
Adj Flow Rate, veh/h	43	207	207	196	228	141	239	663	0	207	804	54
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	4	4	4	5	5	5	4	4	4
Cap, veh/h	247	276	276	204	357	221	268	789	670	188	1261	85
Arrive On Green	0.34	0.34	0.34	0.34	0.34	0.34	0.16	0.44	0.00	0.11	0.38	0.38
Sat Flow, veh/h	962	816	816	950	1058	654	1723	1810	1538	1740	3302	222
Grp Volume(v), veh/h	43	0	414	196	0	369	239	663	0	207	423	435
Grp Sat Flow(s),veh/h/ln	962	0	1632	950	0	1712	1723	1810	1538	1740	1736	1788
Q Serve(g_s), s	2.9	0.0	16.7	8.3	0.0	13.5	10.1	24.1	0.0	8.0	14.7	14.7
Cycle Q Clear(g_c), s	16.4	0.0	16.7	25.0	0.0	13.5	10.1	24.1	0.0	8.0	14.7	14.7
Prop In Lane	1.00		0.50	1.00		0.38	1.00		1.00	1.00		0.12
Lane Grp Cap(c), veh/h	247	0	551	204	0	578	268	789	670	188	663	683
V/C Ratio(X)	0.17	0.00	0.75	0.96	0.00	0.64	0.89	0.84	0.00	1.10	0.64	0.64
Avail Cap(c_a), veh/h	247	0	551	204	0	578	268	789	670	188	663	683
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.6	0.0	21.7	34.7	0.0	20.7	30.6	18.6	0.0	33.0	18.7	18.7
Incr Delay (d2), s/veh	0.3	0.0	5.7	51.2	0.0	2.3	29.2	10.5	0.0	95.1	4.6	4.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	8.3	6.9	0.0	6.7	7.0	14.3	0.0	8.8	7.9	8.1
LnGrp Delay(d),s/veh	27.9	0.0	27.5	85.9	0.0	23.0	59.9	29.1	0.0	128.1	23.3	23.2
LnGrp LOS	C		C	F		C	E	C		F	C	C
Approach Vol, veh/h		457			565			902			1065	
Approach Delay, s/veh		27.5			44.8			37.2			43.6	
Approach LOS		C			D			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.0	36.8		29.5	16.0	32.8		29.5				
Change Period (Y+Rc), s	4.0	4.5		4.5	4.5	4.5		* 4.5				
Max Green Setting (Gmax), s	8.0	28.5		24.5	11.5	24.5		* 25				
Max Q Clear Time (g_c+I1), s	10.0	26.1		18.7	12.1	16.7		27.0				
Green Ext Time (p_c), s	0.0	1.9		2.6	0.0	5.4		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			39.5									
HCM 2010 LOS			D									
Notes												

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HCM 2010 Signalized Intersection Summary
47: Canyon Rd & I-90 WB Ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑↱		↰	↑↑
Traffic Volume (veh/h)	30	360	480	100	170	490
Future Volume (veh/h)	30	360	480	100	170	490
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	33	391	522	109	185	533
Adj No. of Lanes	1	1	2	0	1	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	532	475	977	203	464	1846
Arrive On Green	0.30	0.30	0.33	0.33	0.11	0.52
Sat Flow, veh/h	1774	1583	3012	607	1774	3632
Grp Volume(v), veh/h	33	391	316	315	185	533
Grp Sat Flow(s),veh/h/ln	1774	1583	1770	1756	1774	1770
Q Serve(g_s), s	0.8	13.2	8.3	8.4	3.5	4.9
Cycle Q Clear(g_c), s	0.8	13.2	8.3	8.4	3.5	4.9
Prop In Lane	1.00	1.00		0.35	1.00	
Lane Grp Cap(c), veh/h	532	475	592	587	464	1846
V/C Ratio(X)	0.06	0.82	0.53	0.54	0.40	0.29
Avail Cap(c_a), veh/h	756	675	1076	1068	748	2153
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.4	18.8	15.5	15.6	10.1	7.8
Incr Delay (d2), s/veh	0.1	6.8	0.7	0.8	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	6.6	4.2	4.2	1.7	2.4
LnGrp Delay(d),s/veh	14.5	25.6	16.3	16.4	10.3	7.9
LnGrp LOS	B	C	B	B	B	A
Approach Vol, veh/h	424		631			718
Approach Delay, s/veh	24.7		16.4			8.5
Approach LOS	C		B			A

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	10.8	24.2				35.0		22.7
Change Period (Y+Rc), s	5.1	5.4				5.4		5.9
Max Green Setting (Gmax), s	14.9	34.6				34.6		24.1
Max Q Clear Time (g_c+I1), s	5.5	10.4				6.9		15.2
Green Ext Time (p_c), s	0.2	8.4				8.8		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	15.2
HCM 2010 LOS	B

Notes

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HCM 2010 TWSC
48: Canyon Road & I-90 EB Ramp

Intersection						
Int Delay, s/veh	9.3					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	130	270	410	50	140	310
Future Vol, veh/h	130	270	410	50	140	310
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	0	-	100	0	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	20	20	16	16	9	9
Mvmt Flow	141	293	446	54	152	337

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1087	-	0	0	446	0
Stage 1	446	-	-	-	-	-
Stage 2	641	-	-	-	-	-
Critical Hdwy	6.6	-	-	-	4.19	-
Critical Hdwy Stg 1	5.6	-	-	-	-	-
Critical Hdwy Stg 2	5.6	-	-	-	-	-
Follow-up Hdwy	3.68	-	-	-	2.281	-
Pot Cap-1 Maneuver	221	0	-	-	1078	-
Stage 1	609	0	-	-	-	-
Stage 2	492	0	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	190	-	-	-	1078	-
Mov Cap-2 Maneuver	190	-	-	-	-	-
Stage 1	609	-	-	-	-	-
Stage 2	423	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	64.6	0	2.8
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	190	-	1078	-
HCM Lane V/C Ratio	-	-	0.744	-	0.141	-
HCM Control Delay (s)	-	-	64.6	0	8.9	-
HCM Lane LOS	-	-	F	A	A	-
HCM 95th %tile Q(veh)	-	-	4.8	-	0.5	-

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2037 Projected Level of Service Reports – with capital improvement projects

HCM 2010 TWSC
1: I-90 WestBound Offramp/I-90 Westbound Onramp

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	570	0	0	430	450	20	10	100	0	0	0
Future Vol, veh/h	10	570	0	0	430	450	20	10	100	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	10	10	10	15	15	15	11	11	11	0	0	0
Mvmt Flow	11	620	0	0	467	489	22	11	109	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	467	0	-	-	-	0	1108	1108	620
Stage 1	-	-	-	-	-	-	641	641	-
Stage 2	-	-	-	-	-	-	467	467	-
Critical Hdwy	4.2	-	-	-	-	-	6.51	6.61	6.31
Critical Hdwy Stg 1	-	-	-	-	-	-	5.51	5.61	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.51	5.61	-
Follow-up Hdwy	2.29	-	-	-	-	-	3.599	4.099	3.399
Pot Cap-1 Maneuver	1054	-	0	0	-	-	223	202	472
Stage 1	-	-	0	0	-	-	508	456	-
Stage 2	-	-	0	0	-	-	613	547	-
Platoon blocked, %		-			-	-			
Mov Cap-1 Maneuver	1054	-	-	-	-	-	219	0	472
Mov Cap-2 Maneuver	-	-	-	-	-	-	219	0	-
Stage 1	-	-	-	-	-	-	500	0	-
Stage 2	-	-	-	-	-	-	613	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0.1	0	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR
Capacity (veh/h)	396	1054	-	-	-
HCM Lane V/C Ratio	0.357	0.01	-	-	-
HCM Control Delay (s)	19.1	8.5	0	-	-
HCM Lane LOS	C	A	A	-	-
HCM 95th %tile Q(veh)	1.6	0	-	-	-

MOVEMENT SUMMARY

Site: 101 [US-97 & Dolarway]

Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Dolarway Rd											
3	L2	196	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.7
8	T1	109	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.7
18	R2	109	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.0
Approach		413	3.0	0.623	17.1	LOS C	3.7	93.6	0.78	0.88	28.5
East: University Way											
1	L2	54	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.7
6	T1	609	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.7
16	R2	65	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.2
Approach		728	3.0	0.835	25.3	LOS D	11.7	298.5	1.00	1.24	26.6
North: US-97											
7	L2	130	3.0	0.713	18.6	LOS C	8.2	209.9	0.93	1.10	28.9
4	T1	163	3.0	0.713	18.6	LOS C	8.2	209.9	0.93	1.10	28.9
14	R2	293	3.0	0.713	17.4	LOS C	8.2	209.9	0.93	1.10	28.3
Approach		587	3.0	0.713	18.0	LOS C	8.2	209.9	0.93	1.10	28.6
West: University Way/US-97											
5	L2	152	3.0	0.153	5.0	LOS A	0.6	15.8	0.44	0.35	32.5
2	T1	554	3.0	0.732	16.5	LOS C	7.4	188.5	0.81	0.84	29.9
12	R2	174	3.0	0.732	16.5	LOS C	7.4	188.5	0.81	0.84	29.1
Approach		880	3.0	0.732	14.5	LOS B	7.4	188.5	0.75	0.75	30.1
All Vehicles		2609	3.0	0.835	18.7	LOS C	11.7	298.5	0.86	0.99	28.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

HCM 2010 Signalized Intersection Summary
3: University Way & Reecer Creek Rd

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	320	470	280	380	110	80
Future Volume (veh/h)	320	470	280	380	110	80
Number	7	4	8	18	1	16
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	348	511	304	413	120	87
Adj No. of Lanes	1	1	1	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	409	1273	490	666	384	343
Arrive On Green	0.68	0.68	0.68	0.68	0.22	0.22
Sat Flow, veh/h	731	1863	717	974	1774	1583
Grp Volume(v), veh/h	348	511	0	717	120	87
Grp Sat Flow(s),veh/h/ln	731	1863	0	1691	1774	1583
Q Serve(g_s), s	40.5	10.8	0.0	21.0	5.1	4.1
Cycle Q Clear(g_c), s	61.5	10.8	0.0	21.0	5.1	4.1
Prop In Lane	1.00			0.58	1.00	1.00
Lane Grp Cap(c), veh/h	409	1273	0	1155	384	343
V/C Ratio(X)	0.85	0.40	0.00	0.62	0.31	0.25
Avail Cap(c_a), veh/h	409	1273	0	1155	384	343
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.8	6.2	0.0	7.8	29.6	29.2
Incr Delay (d2), s/veh	15.5	0.2	0.0	1.0	2.1	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.4	5.5	0.0	9.9	2.7	2.0
LnGrp Delay(d),s/veh	41.4	6.4	0.0	8.9	31.7	31.0
LnGrp LOS	D	A		A	C	C
Approach Vol, veh/h		859	717		207	
Approach Delay, s/veh		20.6	8.9		31.4	
Approach LOS		C	A		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs				4		6		8
Phs Duration (G+Y+Rc), s				66.0		24.0		66.0
Change Period (Y+Rc), s				4.5		4.5		4.5
Max Green Setting (Gmax), s				61.5		19.5		61.5
Max Q Clear Time (g_c+I1), s				63.5		7.1		23.0
Green Ext Time (p_c), s				0.0		0.5		16.7

Intersection Summary	
HCM 2010 Ctrl Delay	17.1
HCM 2010 LOS	B

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HCM 2010 TWSC
4: Water St & Bender Rd

Intersection	
Int Delay, s/veh	5.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	160	80	80	100	80	160
Future Vol, veh/h	160	80	80	100	80	160
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	174	87	87	109	87	174

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	261	0	500	217
Stage 1	-	-	-	-	217	-
Stage 2	-	-	-	-	283	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1303	-	530	823
Stage 1	-	-	-	-	819	-
Stage 2	-	-	-	-	765	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1303	-	492	823
Mov Cap-2 Maneuver	-	-	-	-	492	-
Stage 1	-	-	-	-	819	-
Stage 2	-	-	-	-	711	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	13.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	672	-	-	1303	-
HCM Lane V/C Ratio	0.388	-	-	0.067	-
HCM Control Delay (s)	13.7	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	1.8	-	-	0.2	-

HCM 2010 Signalized Intersection Summary
5: Airport Rd & Bender Rd/Sanders Rd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	120	60	40	80	200	100	540	80	310	650	40
Future Volume (veh/h)	50	120	60	40	80	200	100	540	80	310	650	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	54	130	65	43	87	217	109	587	87	337	707	43
Adj No. of Lanes	0	1	0	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	111	212	93	86	114	243	384	1025	152	431	1124	68
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	224	912	401	138	489	1046	709	1586	235	761	1738	106
Grp Volume(v), veh/h	249	0	0	347	0	0	109	0	674	337	0	750
Grp Sat Flow(s),veh/h/ln	1538	0	0	1672	0	0	709	0	1821	761	0	1844
Q Serve(g_s), s	0.0	0.0	0.0	4.1	0.0	0.0	8.0	0.0	15.4	32.6	0.0	18.0
Cycle Q Clear(g_c), s	10.6	0.0	0.0	14.7	0.0	0.0	26.0	0.0	15.4	48.0	0.0	18.0
Prop In Lane	0.22		0.26	0.12		0.63	1.00		0.13	1.00		0.06
Lane Grp Cap(c), veh/h	416	0	0	443	0	0	384	0	1177	431	0	1192
V/C Ratio(X)	0.60	0.00	0.00	0.78	0.00	0.00	0.28	0.00	0.57	0.78	0.00	0.63
Avail Cap(c_a), veh/h	432	0	0	459	0	0	384	0	1177	431	0	1192
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.7	0.0	0.0	27.5	0.0	0.0	15.6	0.0	7.4	21.0	0.0	7.8
Incr Delay (d2), s/veh	2.1	0.0	0.0	8.3	0.0	0.0	0.4	0.0	0.7	9.0	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	0.0	7.9	0.0	0.0	1.6	0.0	7.9	7.9	0.0	9.3
LnGrp Delay(d),s/veh	27.8	0.0	0.0	35.8	0.0	0.0	16.0	0.0	8.0	30.0	0.0	8.9
LnGrp LOS	C			D			B		A	C		A
Approach Vol, veh/h		249			347			783			1087	
Approach Delay, s/veh		27.8			35.8			9.1			15.4	
Approach LOS		C			D			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		52.5		21.8		52.5		21.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		48.0		18.0		48.0		18.0
Max Q Clear Time (g_c+I1), s		28.0		12.6		50.0		16.7
Green Ext Time (p_c), s		13.6		1.8		0.0		0.5

Intersection Summary			
HCM 2010 Ctrl Delay			17.6
HCM 2010 LOS			B

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HCM 2010 AWSC
6: Alder St & Sanders Rd

Intersection	
Intersection Delay, s/veh	19
Intersection LOS	C

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↰↑	↰	↱
Traffic Vol, veh/h	440	150	80	260	150	50
Future Vol, veh/h	440	150	80	260	150	50
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	478	163	87	283	163	54
Number of Lanes	1	1	0	1	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	
Opposing Lanes	1	2	0
Conflicting Approach Left		NB	EB
Conflicting Lanes Left	0	2	2
Conflicting Approach Right	NB		WB
Conflicting Lanes Right	2	0	1
HCM Control Delay	21.5	18.1	13.1
HCM LOS	C	C	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1
Vol Left, %	100%	0%	0%	0%	24%
Vol Thru, %	0%	0%	100%	0%	76%
Vol Right, %	0%	100%	0%	100%	0%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	150	50	440	150	340
LT Vol	150	0	0	0	80
Through Vol	0	0	440	0	260
RT Vol	0	50	0	150	0
Lane Flow Rate	163	54	478	163	370
Geometry Grp	7	7	7	7	4
Degree of Util (X)	0.341	0.095	0.773	0.231	0.613
Departure Headway (Hd)	7.538	6.314	5.817	5.108	5.971
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	476	567	622	703	606
Service Time	5.289	4.063	3.555	2.846	4.011
HCM Lane V/C Ratio	0.342	0.095	0.768	0.232	0.611
HCM Control Delay	14.2	9.7	25.6	9.4	18.1
HCM Lane LOS	B	A	D	A	C
HCM 95th-tile Q	1.5	0.3	7.2	0.9	4.2

HCM 2010 AWSC
7: Water Street & Idaho St

Intersection	
Intersection Delay, s/veh	11.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	10	20	20	0	10	60	320	60	20	170	20
Future Vol, veh/h	10	10	20	20	0	10	60	320	60	20	170	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	11	22	22	0	11	65	348	65	22	185	22
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	8.7	8.8	13.1	9.5
HCM LOS	A	A	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	25%	67%	10%
Vol Thru, %	73%	25%	0%	81%
Vol Right, %	14%	50%	33%	10%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	440	40	30	210
LT Vol	60	10	20	20
Through Vol	320	10	0	170
RT Vol	60	20	10	20
Lane Flow Rate	478	43	33	228
Geometry Grp	1	1	1	1
Degree of Util (X)	0.575	0.064	0.05	0.291
Departure Headway (Hd)	4.329	5.272	5.476	4.59
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	832	676	651	781
Service Time	2.358	3.331	3.536	2.626
HCM Lane V/C Ratio	0.575	0.064	0.051	0.292
HCM Control Delay	13.1	8.7	8.8	9.5
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	3.7	0.2	0.2	1.2

HCM 2010 AWSC
8: Water Street & Helena Avenue

Intersection	
Intersection Delay, s/veh	13.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	20	10	260	20	20	30	120	240	70	180	20
Future Vol, veh/h	20	20	10	260	20	20	30	120	240	70	180	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	22	22	11	283	22	22	33	130	261	76	196	22
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay	10.2	15.9	11.6	14.1
HCM LOS	B	C	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	0%	40%	87%	26%
Vol Thru, %	80%	0%	40%	7%	67%
Vol Right, %	0%	100%	20%	7%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	150	240	50	300	270
LT Vol	30	0	20	260	70
Through Vol	120	0	20	20	180
RT Vol	0	240	10	20	20
Lane Flow Rate	163	261	54	326	293
Geometry Grp	7	7	2	2	5
Degree of Util (X)	0.283	0.393	0.097	0.54	0.474
Departure Headway (Hd)	6.24	5.427	6.447	5.966	5.82
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	574	660	552	603	616
Service Time	4.003	3.189	4.538	4.025	3.884
HCM Lane V/C Ratio	0.284	0.395	0.098	0.541	0.476
HCM Control Delay	11.5	11.7	10.2	15.9	14.1
HCM Lane LOS	B	B	B	C	B
HCM 95th-tile Q	1.2	1.9	0.3	3.2	2.5

HCM 2010 Signalized Intersection Summary
9: Walnut Street/Airport Rd & Helena Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	90	80	10	90	90	70	630	110	100	350	40
Future Volume (veh/h)	120	90	80	10	90	90	70	630	110	100	350	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1881	1900	1900	1881	1900
Adj Flow Rate, veh/h	130	98	87	11	98	98	76	685	120	109	380	43
Adj No. of Lanes	0	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	1	1	1
Cap, veh/h	202	139	99	379	251	251	122	805	136	179	591	62
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.57	0.57	0.57	0.57	0.57	0.57
Sat Flow, veh/h	418	483	344	1218	873	873	104	1418	240	193	1041	109
Grp Volume(v), veh/h	315	0	0	11	0	196	881	0	0	532	0	0
Grp Sat Flow(s),veh/h/ln	1245	0	0	1218	0	1746	1762	0	0	1343	0	0
Q Serve(g_s), s	9.9	0.0	0.0	0.0	0.0	5.6	11.5	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	15.5	0.0	0.0	0.6	0.0	5.6	26.2	0.0	0.0	14.7	0.0	0.0
Prop In Lane	0.41		0.28	1.00		0.50	0.09		0.14	0.20		0.08
Lane Grp Cap(c), veh/h	440	0	0	379	0	501	1063	0	0	832	0	0
V/C Ratio(X)	0.72	0.00	0.00	0.03	0.00	0.39	0.83	0.00	0.00	0.64	0.00	0.00
Avail Cap(c_a), veh/h	456	0	0	393	0	521	1265	0	0	994	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	22.0	0.0	0.0	15.9	0.0	17.7	11.2	0.0	0.0	8.4	0.0	0.0
Incr Delay (d2), s/veh	5.1	0.0	0.0	0.0	0.0	0.5	4.1	0.0	0.0	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.8	0.0	0.0	0.1	0.0	2.7	13.7	0.0	0.0	6.2	0.0	0.0
LnGrp Delay(d),s/veh	27.1	0.0	0.0	16.0	0.0	18.2	15.3	0.0	0.0	9.4	0.0	0.0
LnGrp LOS	C			B		B	B			A		
Approach Vol, veh/h		315			207			881			532	
Approach Delay, s/veh		27.1			18.1			15.3			9.4	
Approach LOS		C			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		39.7		22.3		39.7		22.3
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		42.5		18.5		42.5		18.5
Max Q Clear Time (g_c+I1), s		28.2		17.5		16.7		7.6
Green Ext Time (p_c), s		7.0		0.3		9.2		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	15.9
HCM 2010 LOS	B

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HCM Signalized Intersection Capacity Analysis
10: Wildcat Way & 18th Avenue

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	100	470	140	40	60	500
Future Volume (vph)	100	470	140	40	60	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	0.97		1.00	1.00	0.97	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.89		1.00	1.00	0.88	
Flt Protected	1.00		0.95	1.00	0.99	
Satd. Flow (prot)	1493		1805	1900	1616	
Flt Permitted	1.00		0.19	1.00	0.99	
Satd. Flow (perm)	1493		364	1900	1616	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	511	152	43	65	543
RTOR Reduction (vph)	331	0	0	0	285	0
Lane Group Flow (vph)	289	0	152	43	323	0
Confl. Peds. (#/hr)		5	3		3	4
Confl. Bikes (#/hr)		3				4
Heavy Vehicles (%)	10%	10%	0%	0%	0%	0%
Turn Type	NA		pm+pt	NA	Perm	
Protected Phases	4		3	8		
Permitted Phases			8		2	
Actuated Green, G (s)	16.4		24.9	24.9	30.6	
Effective Green, g (s)	16.4		24.9	24.9	30.6	
Actuated g/C Ratio	0.25		0.39	0.39	0.47	
Clearance Time (s)	4.5		4.5	4.5	4.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	379		229	733	766	
v/s Ratio Prot	0.19		c0.04	0.02		
v/s Ratio Perm			c0.21		c0.20	
v/c Ratio	0.76		0.66	0.06	0.42	
Uniform Delay, d1	22.2		15.7	12.4	11.1	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	8.8		7.1	0.0	1.7	
Delay (s)	31.0		22.7	12.5	12.8	
Level of Service	C		C	B	B	
Approach Delay (s)	31.0			20.5	12.8	
Approach LOS	C			C	B	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	64.5	Sum of lost time (s)	13.5
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

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HCM 2010 Signalized Intersection Summary
11: Walnut Street & 18th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	280	220	30	80	200	330	40	290	130	140	100	220
Future Volume (veh/h)	280	220	30	80	200	330	40	290	130	140	100	220
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		0.97	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1881	1900	1900	1881	1900
Adj Flow Rate, veh/h	304	239	33	87	217	359	43	315	141	152	109	239
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	1	1	1
Cap, veh/h	247	665	92	507	258	427	121	458	193	244	156	268
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	848	1628	225	1121	632	1046	84	1182	498	354	401	692
Grp Volume(v), veh/h	304	0	272	87	0	576	499	0	0	500	0	0
Grp Sat Flow(s),veh/h/ln	848	0	1853	1121	0	1678	1764	0	0	1448	0	0
Q Serve(g_s), s	4.4	0.0	4.5	2.6	0.0	13.6	0.0	0.0	0.0	3.4	0.0	0.0
Cycle Q Clear(g_c), s	18.0	0.0	4.5	7.1	0.0	13.6	10.5	0.0	0.0	13.9	0.0	0.0
Prop In Lane	1.00		0.12	1.00		0.62	0.09		0.28	0.30		0.48
Lane Grp Cap(c), veh/h	247	0	757	507	0	685	772	0	0	668	0	0
V/C Ratio(X)	1.23	0.00	0.36	0.17	0.00	0.84	0.65	0.00	0.00	0.75	0.00	0.00
Avail Cap(c_a), veh/h	247	0	757	507	0	685	807	0	0	696	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.3	0.0	9.0	11.5	0.0	11.8	11.5	0.0	0.0	12.3	0.0	0.0
Incr Delay (d2), s/veh	133.2	0.0	0.3	0.2	0.0	9.2	1.7	0.0	0.0	4.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	12.1	0.0	2.3	0.8	0.0	8.0	5.5	0.0	0.0	6.4	0.0	0.0
LnGrp Delay(d),s/veh	154.5	0.0	9.3	11.7	0.0	21.0	13.2	0.0	0.0	16.6	0.0	0.0
LnGrp LOS	F		A	B		C	B			B		
Approach Vol, veh/h		576			663			499			500	
Approach Delay, s/veh		86.0			19.7			13.2			16.6	
Approach LOS		F			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		21.6		22.5		21.6		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		12.5		20.0		15.9		15.6
Green Ext Time (p_c), s		2.5		0.0		1.1		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	34.6
HCM 2010 LOS	C

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HCM 2010 AWSC
12: Alder Street & 18th Avenue

Intersection	
Intersection Delay, s/veh	17.6
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	30	100	40	30	10	200	240	40	10	150	60
Future Vol, veh/h	60	30	100	40	30	10	200	240	40	10	150	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	65	33	109	43	33	11	217	261	43	11	163	65
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	12.2	10.6	23.5	11.8
HCM LOS	B	B	C	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	42%	32%	100%	0%	5%
Vol Thru, %	50%	16%	0%	75%	68%
Vol Right, %	8%	53%	0%	25%	27%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	480	190	40	40	220
LT Vol	200	60	40	0	10
Through Vol	240	30	0	30	150
RT Vol	40	100	0	10	60
Lane Flow Rate	522	207	43	43	239
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.765	0.345	0.09	0.082	0.367
Departure Headway (Hd)	5.278	6.008	7.489	6.798	5.519
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	683	595	476	524	648
Service Time	3.328	4.079	5.272	4.581	3.583
HCM Lane V/C Ratio	0.764	0.348	0.09	0.082	0.369
HCM Control Delay	23.5	12.2	11	10.2	11.8
HCM Lane LOS	C	B	B	B	B
HCM 95th-tile Q	7.2	1.5	0.3	0.3	1.7

HCM 2010 Signalized Intersection Summary
13: Water Street & 15th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱			✥		↰	↱			✥	
Traffic Volume (veh/h)	90	40	180	10	50	120	110	260	10	50	270	80
Future Volume (veh/h)	90	40	180	10	50	120	110	260	10	50	270	80
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1893	1900	1900	1863	1900	1900	1899	1900	1900	1895	1900
Adj Flow Rate, veh/h	98	43	196	11	54	130	120	283	11	54	293	87
Adj No. of Lanes	1	1	0	0	1	0	1	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	2	2	2	2	0	0	0	0	0	0
Cap, veh/h	466	68	309	93	116	250	765	1039	40	158	728	199
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.57	0.57	0.57	0.57	0.57	0.57
Sat Flow, veh/h	1219	297	1354	38	511	1097	1018	1815	71	118	1272	349
Grp Volume(v), veh/h	98	0	239	195	0	0	120	0	294	434	0	0
Grp Sat Flow(s),veh/h/ln	1219	0	1651	1645	0	0	1018	0	1886	1739	0	0
Q Serve(g_s), s	0.0	0.0	5.9	0.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.4	0.0	5.9	4.6	0.0	0.0	2.2	0.0	3.6	6.0	0.0	0.0
Prop In Lane	1.00		0.82	0.06		0.67	1.00		0.04	0.12		0.20
Lane Grp Cap(c), veh/h	466	0	376	460	0	0	765	0	1079	1085	0	0
V/C Ratio(X)	0.21	0.00	0.64	0.42	0.00	0.00	0.16	0.00	0.27	0.40	0.00	0.00
Avail Cap(c_a), veh/h	676	0	660	737	0	0	765	0	1079	1085	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.3	0.0	15.7	15.2	0.0	0.0	4.6	0.0	4.9	5.4	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.8	0.6	0.0	0.0	0.4	0.0	0.6	1.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	2.8	2.2	0.0	0.0	0.8	0.0	2.0	3.3	0.0	0.0
LnGrp Delay(d),s/veh	14.6	0.0	17.5	15.8	0.0	0.0	5.0	0.0	5.5	6.5	0.0	0.0
LnGrp LOS	B		B	B			A		A	A		
Approach Vol, veh/h		337			195			414			434	
Approach Delay, s/veh		16.6			15.8			5.4			6.5	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		30.2		14.8		30.2		14.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		5.6		7.9		8.0		6.6
Green Ext Time (p_c), s		3.3		2.3		2.9		2.5

Intersection Summary	
HCM 2010 Ctrl Delay	10.0
HCM 2010 LOS	A

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HCM 2010 AWSC
14: Main St & 14th Avenue

Intersection	
Intersection Delay, s/veh	15.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	70	60	210	80	120	20	50	350	30	60	10
Future Vol, veh/h	10	70	60	210	80	120	20	50	350	30	60	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	76	65	228	87	130	22	54	380	33	65	11
Number of Lanes	0	1	0	0	1	1	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	2	1
HCM Control Delay	12.7	16.7	16.6	12.3
HCM LOS	B	C	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	29%	0%	7%	72%	0%	30%
Vol Thru, %	71%	0%	50%	28%	0%	60%
Vol Right, %	0%	100%	43%	0%	100%	10%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	70	350	140	290	120	100
LT Vol	20	0	10	210	0	30
Through Vol	50	0	70	80	0	60
RT Vol	0	350	60	0	120	10
Lane Flow Rate	76	380	152	315	130	109
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.142	0.618	0.291	0.6	0.209	0.22
Departure Headway (Hd)	6.706	5.849	6.874	6.855	5.776	7.288
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	531	613	525	523	616	495
Service Time	4.498	3.64	4.88	4.647	3.566	5.3
HCM Lane V/C Ratio	0.143	0.62	0.29	0.602	0.211	0.22
HCM Control Delay	10.6	17.8	12.7	19.5	10.1	12.3
HCM Lane LOS	B	C	B	C	B	B
HCM 95th-tile Q	0.5	4.2	1.2	3.9	0.8	0.8

HCM 2010 Signalized Intersection Summary
15: Wildcat Way & 14th Avenue/Dean Nicholson Blvd

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	360	40	220	210	30	90	340	70	30	410	170
Future Volume (veh/h)	140	360	40	220	210	30	90	340	70	30	410	170
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	152	391	43	239	228	33	98	370	76	33	446	185
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	503	673	74	372	649	94	223	612	126	360	511	212
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	1136	1682	185	970	1624	235	808	1530	314	959	1277	530
Grp Volume(v), veh/h	152	0	434	239	0	261	98	0	446	33	0	631
Grp Sat Flow(s),veh/h/ln	1136	0	1867	970	0	1859	808	0	1845	959	0	1807
Q Serve(g_s), s	4.9	0.0	8.2	9.8	0.0	4.4	3.5	0.0	8.6	1.3	0.0	14.5
Cycle Q Clear(g_c), s	9.3	0.0	8.2	18.0	0.0	4.4	18.0	0.0	8.6	9.9	0.0	14.5
Prop In Lane	1.00		0.10	1.00		0.13	1.00		0.17	1.00		0.29
Lane Grp Cap(c), veh/h	503	0	747	372	0	743	223	0	738	360	0	723
V/C Ratio(X)	0.30	0.00	0.58	0.64	0.00	0.35	0.44	0.00	0.60	0.09	0.00	0.87
Avail Cap(c_a), veh/h	503	0	747	372	0	743	223	0	738	360	0	723
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.7	0.0	10.6	18.1	0.0	9.4	21.4	0.0	10.7	14.6	0.0	12.4
Incr Delay (d2), s/veh	0.3	0.0	1.1	3.8	0.0	0.3	6.2	0.0	3.7	0.5	0.0	13.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	0.0	4.3	3.3	0.0	2.3	1.6	0.0	5.1	0.4	0.0	9.8
LnGrp Delay(d),s/veh	13.0	0.0	11.7	21.9	0.0	9.7	27.6	0.0	14.3	15.1	0.0	26.3
LnGrp LOS	B		B	C		A	C		B	B		C
Approach Vol, veh/h		586			500			544			664	
Approach Delay, s/veh		12.0			15.5			16.7			25.7	
Approach LOS		B			B			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		20.0		11.3		16.5		20.0
Green Ext Time (p_c), s		0.0		3.0		0.9		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	17.9
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
16: Alder Street & Dean Nicholson Blvd/14th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	20	120	30	30	40	80	490	10	10	280	40
Future Volume (veh/h)	80	20	120	30	30	40	80	490	10	10	280	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.97	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1900	1900	1900	1900	1900	1900	1900	1863	1900
Adj Flow Rate, veh/h	87	22	130	33	33	43	87	533	11	11	304	43
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	0	0	0	2	2	2
Cap, veh/h	185	51	171	155	146	138	180	983	19	81	982	135
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.63	0.63	0.63	0.63	0.63	0.63
Sat Flow, veh/h	454	253	844	327	720	682	163	1569	31	16	1568	216
Grp Volume(v), veh/h	239	0	0	109	0	0	631	0	0	358	0	0
Grp Sat Flow(s),veh/h/ln	1551	0	0	1728	0	0	1763	0	0	1800	0	0
Q Serve(g_s), s	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.5	0.0	0.0	2.8	0.0	0.0	9.8	0.0	0.0	4.8	0.0	0.0
Prop In Lane	0.36		0.54	0.30		0.39	0.14		0.02	0.03		0.12
Lane Grp Cap(c), veh/h	407	0	0	439	0	0	1182	0	0	1198	0	0
V/C Ratio(X)	0.59	0.00	0.00	0.25	0.00	0.00	0.53	0.00	0.00	0.30	0.00	0.00
Avail Cap(c_a), veh/h	619	0	0	657	0	0	1182	0	0	1198	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	19.6	0.0	0.0	17.8	0.0	0.0	5.5	0.0	0.0	4.6	0.0	0.0
Incr Delay (d2), s/veh	1.3	0.0	0.0	0.3	0.0	0.0	1.7	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.4	0.0	0.0	1.4	0.0	0.0	5.7	0.0	0.0	2.6	0.0	0.0
LnGrp Delay(d),s/veh	20.9	0.0	0.0	18.1	0.0	0.0	7.2	0.0	0.0	5.2	0.0	0.0
LnGrp LOS	C			B			A			A		
Approach Vol, veh/h		239			109			631			358	
Approach Delay, s/veh		20.9			18.1			7.2			5.2	
Approach LOS		C			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		37.4		15.1		37.4		15.1
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		32.9		18.1		32.9		18.1
Max Q Clear Time (g_c+I1), s		11.8		9.5		6.8		4.8
Green Ext Time (p_c), s		4.8		1.0		5.0		1.2

Intersection Summary	
HCM 2010 Ctrl Delay	10.0
HCM 2010 LOS	B

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HCM Signalized Intersection Capacity Analysis
17: Wenas Street & University Way

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	630	60	70	750	110	70
Future Volume (vph)	630	60	70	750	110	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5		4.5	4.5	4.5	4.5
Lane Util. Factor	1.00		1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00		1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.99		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	1820		1770	1863	1787	1579
Flt Permitted	1.00		0.17	1.00	0.95	1.00
Satd. Flow (perm)	1820		318	1863	1787	1579
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	685	65	76	815	120	76
RTOR Reduction (vph)	6	0	0	0	0	50
Lane Group Flow (vph)	744	0	76	815	120	26
Confl. Peds. (#/hr)		1				
Confl. Bikes (#/hr)						1
Heavy Vehicles (%)	3%	3%	2%	2%	1%	1%
Turn Type	NA		Perm	NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases			8		2	2
Actuated Green, G (s)	30.3		30.3	30.3	20.7	20.7
Effective Green, g (s)	30.3		30.3	30.3	20.7	20.7
Actuated g/C Ratio	0.51		0.51	0.51	0.34	0.34
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	919		160	940	616	544
v/s Ratio Prot	0.41			c0.44		
v/s Ratio Perm			0.24		c0.07	0.02
v/c Ratio	0.81		0.47	0.87	0.19	0.05
Uniform Delay, d1	12.4		9.7	13.1	13.8	13.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.3		2.2	8.5	0.7	0.2
Delay (s)	17.8		11.9	21.6	14.5	13.3
Level of Service	B		B	C	B	B
Approach Delay (s)	17.8			20.7	14.0	
Approach LOS	B			C	B	

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2010 Signalized Intersection Summary
18: Water Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	180	510	80	100	680	180	120	370	120	60	370	120
Future Volume (veh/h)	180	510	80	100	680	180	120	370	120	60	370	120
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1792	1900	1900	1810	1900	1810	1810	1900	1810	1810	1900
Adj Flow Rate, veh/h	196	554	87	109	739	196	130	402	130	65	402	130
Adj No. of Lanes	0	2	0	0	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	5	5	5	5	5	5	5	5	5
Cap, veh/h	208	768	131	140	931	290	190	494	160	190	494	160
Arrive On Green	0.51	0.51	0.51	0.51	0.51	0.51	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	240	1514	258	151	1836	571	844	1311	424	844	1311	424
Grp Volume(v), veh/h	302	0	535	513	0	531	130	0	532	65	0	532
Grp Sat Flow(s),veh/h/ln	427	0	1586	1011	0	1546	844	0	1735	844	0	1735
Q Serve(g_s), s	17.2	0.0	17.3	17.7	0.0	17.8	7.0	0.0	19.0	5.2	0.0	19.0
Cycle Q Clear(g_c), s	35.0	0.0	17.3	35.0	0.0	17.8	26.0	0.0	19.0	24.2	0.0	19.0
Prop In Lane	0.65		0.16	0.21		0.37	1.00		0.24	1.00		0.24
Lane Grp Cap(c), veh/h	302	0	804	576	0	784	190	0	654	190	0	654
V/C Ratio(X)	1.00	0.00	0.66	0.89	0.00	0.68	0.69	0.00	0.81	0.34	0.00	0.81
Avail Cap(c_a), veh/h	302	0	804	576	0	784	190	0	654	190	0	654
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.58	0.00	0.58	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.9	0.0	12.6	18.7	0.0	12.8	32.2	0.0	19.3	30.2	0.0	19.3
Incr Delay (d2), s/veh	39.4	0.0	2.5	18.5	0.0	4.7	10.3	0.0	8.0	1.3	0.0	8.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.0	0.0	8.0	12.7	0.0	8.5	3.0	0.0	10.5	1.3	0.0	10.5
LnGrp Delay(d),s/veh	65.3	0.0	15.2	37.2	0.0	17.4	42.5	0.0	27.3	31.5	0.0	27.3
LnGrp LOS	F		B	D		B	D		C	C		C
Approach Vol, veh/h		837			1044			662			597	
Approach Delay, s/veh		33.3			27.2			30.3			27.8	
Approach LOS		C			C			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		30.0		39.0		30.0		39.0				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		26.0		35.0		26.0		35.0				
Max Q Clear Time (g_c+I1), s		28.0		37.0		26.2		37.0				
Green Ext Time (p_c), s		0.0		0.0		0.0		0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			29.6									
HCM 2010 LOS			C									

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HCM 2010 Signalized Intersection Summary
19: Main St & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	250	370	70	100	530	130	80	290	70	250	280	150
Future Volume (veh/h)	250	370	70	100	530	130	80	290	70	250	280	150
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		0.98	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1845	1845	1900	1863	1863	1863	1881	1881	1881
Adj Flow Rate, veh/h	272	402	76	109	576	141	87	315	76	272	304	163
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	3	3	3	2	2	2	1	1	1
Cap, veh/h	421	1153	216	485	988	241	314	391	327	348	496	416
Arrive On Green	0.11	0.40	0.40	0.06	0.36	0.36	0.05	0.21	0.21	0.11	0.26	0.26
Sat Flow, veh/h	1707	2852	534	1757	2779	678	1774	1863	1559	1792	1881	1577
Grp Volume(v), veh/h	272	238	240	109	363	354	87	315	76	272	304	163
Grp Sat Flow(s),veh/h/ln	1707	1703	1683	1757	1752	1705	1774	1863	1559	1792	1881	1577
Q Serve(g_s), s	6.7	6.7	6.8	2.7	11.6	11.7	2.6	11.1	2.8	7.5	9.8	5.9
Cycle Q Clear(g_c), s	6.7	6.7	6.8	2.7	11.6	11.7	2.6	11.1	2.8	7.5	9.8	5.9
Prop In Lane	1.00		0.32	1.00		0.40	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	421	688	680	485	623	606	314	391	327	348	496	416
V/C Ratio(X)	0.65	0.35	0.35	0.22	0.58	0.59	0.28	0.81	0.23	0.78	0.61	0.39
Avail Cap(c_a), veh/h	421	688	680	571	623	606	410	513	429	348	518	434
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.8	14.2	14.3	12.7	18.1	18.1	19.9	25.9	22.6	19.7	22.3	20.9
Incr Delay (d2), s/veh	2.7	1.4	1.4	0.1	3.9	4.1	0.2	5.2	0.1	10.1	1.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.3	3.4	3.4	1.3	6.2	6.1	1.3	6.3	1.2	2.4	5.3	2.6
LnGrp Delay(d),s/veh	15.5	15.6	15.7	12.8	22.0	22.2	20.1	31.2	22.8	29.8	23.7	21.1
LnGrp LOS	B	B	B	B	C	C	C	C	C	C	C	C
Approach Vol, veh/h		750			826			478			739	
Approach Delay, s/veh		15.6			20.9			27.8			25.3	
Approach LOS		B			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	18.5	7.6	31.9	7.3	22.2	11.0	28.5
Change Period (Y+Rc), s	3.5	4.0	3.5	4.0	3.5	4.0	3.5	4.0
Max Green Setting (Gmax), s	7.5	19.0	7.5	20.0	7.5	19.0	7.5	20.0
Max Q Clear Time (g_c+I1), s	9.5	13.1	4.7	8.8	4.6	11.8	8.7	13.7
Green Ext Time (p_c), s	0.0	1.3	0.0	2.5	0.0	1.4	0.0	1.9

Intersection Summary	
HCM 2010 Ctrl Delay	21.8
HCM 2010 LOS	C

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HCM Signalized Intersection Capacity Analysis
20: Wildcat Way & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	610	90	110	710	30	110	170	130	30	110	150
Future Volume (vph)	100	610	90	110	710	30	110	170	130	30	110	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95			0.95		1.00	1.00		1.00	1.00	
Frt		0.98			0.99		1.00	0.94		1.00	0.91	
Flt Protected		0.99			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3527			3568		1805	1777		1805	1736	
Flt Permitted		0.75			0.75		0.46	1.00		0.38	1.00	
Satd. Flow (perm)		2673			2697		865	1777		726	1736	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	663	98	120	772	33	120	185	141	33	120	163
RTOR Reduction (vph)	0	15	0	0	4	0	0	66	0	0	88	0
Lane Group Flow (vph)	0	855	0	0	921	0	120	260	0	33	195	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			2			1			1	
Permitted Phases	2			2			1			1		
Actuated Green, G (s)		29.0			29.0		13.0	13.0		13.0	13.0	
Effective Green, g (s)		29.0			29.0		13.0	13.0		13.0	13.0	
Actuated g/C Ratio		0.58			0.58		0.26	0.26		0.26	0.26	
Clearance Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)		0.2			0.2		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		1550			1564		224	462		188	451	
v/s Ratio Prot								c0.15			0.11	
v/s Ratio Perm		0.32			c0.34		0.14			0.05		
v/c Ratio		0.55			0.59		0.54	0.56		0.18	0.43	
Uniform Delay, d1		6.5			6.7		15.9	16.0		14.3	15.4	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.4			1.6		2.5	1.6		0.4	0.7	
Delay (s)		7.9			8.3		18.4	17.6		14.8	16.1	
Level of Service		A			A		B	B		B	B	
Approach Delay (s)		7.9			8.3			17.8			16.0	
Approach LOS		A			A			B			B	

Intersection Summary			
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
21: Walnut Street & University Way

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1010	60	30	1000	40	40
Future Volume (vph)	1010	60	30	1000	40	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0			4.0	4.5	
Lane Util. Factor	0.95			0.95	1.00	
Frt	0.99			1.00	0.93	
Flt Protected	1.00			1.00	0.98	
Satd. Flow (prot)	3510			3534	1695	
Flt Permitted	1.00			0.90	0.98	
Satd. Flow (perm)	3510			3173	1695	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1098	65	33	1087	43	43
RTOR Reduction (vph)	3	0	0	0	39	0
Lane Group Flow (vph)	1160	0	0	1120	47	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	2			2	8	
Permitted Phases			2			
Actuated Green, G (s)	55.5			55.5	6.5	
Effective Green, g (s)	55.5			55.5	6.5	
Actuated g/C Ratio	0.79			0.79	0.09	
Clearance Time (s)	4.0			4.0	4.5	
Vehicle Extension (s)	3.0			3.0	3.0	
Lane Grp Cap (vph)	2763			2497	156	
v/s Ratio Prot	0.33				c0.03	
v/s Ratio Perm				c0.35		
v/c Ratio	0.42			0.45	0.30	
Uniform Delay, d1	2.4			2.5	29.9	
Progression Factor	1.00			1.00	1.00	
Incremental Delay, d2	0.5			0.6	1.1	
Delay (s)	2.9			3.1	31.0	
Level of Service	A			A	C	
Approach Delay (s)	2.9			3.1	31.0	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	70.5	Sum of lost time (s)	8.5
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

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HCM 2010 Signalized Intersection Summary
22: Chestnut Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	310	580	10	80	720	110	100	80	80	110	40	380
Future Volume (veh/h)	310	580	10	80	720	110	100	80	80	110	40	380
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.98	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1881	1881	1900	1900	1900	1900	1881	1881	1900
Adj Flow Rate, veh/h	337	630	11	87	783	120	109	87	87	120	43	413
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	1	1	1	0	0	0	1	1	1
Cap, veh/h	401	1626	28	467	1293	198	150	279	279	398	49	471
Arrive On Green	0.09	0.46	0.46	0.06	0.42	0.42	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1774	3557	62	1792	3087	473	946	862	862	1209	151	1452
Grp Volume(v), veh/h	337	313	328	87	453	450	109	0	174	120	0	456
Grp Sat Flow(s),veh/h/ln	1774	1770	1849	1792	1787	1773	946	0	1723	1209	0	1603
Q Serve(g_s), s	7.0	8.6	8.6	2.0	14.6	14.6	4.1	0.0	5.6	6.1	0.0	19.9
Cycle Q Clear(g_c), s	7.0	8.6	8.6	2.0	14.6	14.6	24.0	0.0	5.6	11.7	0.0	19.9
Prop In Lane	1.00		0.03	1.00		0.27	1.00		0.50	1.00		0.91
Lane Grp Cap(c), veh/h	401	809	846	467	749	743	150	0	559	398	0	520
V/C Ratio(X)	0.84	0.39	0.39	0.19	0.61	0.61	0.73	0.00	0.31	0.30	0.00	0.88
Avail Cap(c_a), veh/h	401	809	846	730	749	743	150	0	559	398	0	520
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.1	13.2	13.2	11.0	16.7	16.7	36.0	0.0	18.8	23.2	0.0	23.6
Incr Delay (d2), s/veh	14.7	1.4	1.3	0.2	3.6	3.6	17.4	0.0	0.4	0.6	0.0	15.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.5	4.5	4.7	1.0	7.9	7.9	2.9	0.0	2.7	2.1	0.0	11.0
LnGrp Delay(d),s/veh	30.7	14.6	14.6	11.2	20.4	20.4	53.4	0.0	19.2	23.8	0.0	39.6
LnGrp LOS	C	B	B	B	C	C	D		B	C		D
Approach Vol, veh/h		978			990			283			576	
Approach Delay, s/veh		20.2			19.6			32.4			36.3	
Approach LOS		C			B			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	37.8		28.0	11.0	35.0		28.0
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	15.0	23.0		24.0	7.0	31.0		24.0
Max Q Clear Time (g_c+I1), s	4.0	10.6		21.9	9.0	16.6		26.0
Green Ext Time (p_c), s	0.2	7.6		1.2	0.0	8.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	24.5
HCM 2010 LOS	C

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HCM 2010 Signalized Intersection Summary
23: Alder Street & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	260	680	10	10	520	260	20	0	10	180	10	240
Future Volume (veh/h)	260	680	10	10	520	260	20	0	10	180	10	240
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	283	739	11	11	565	283	22	0	11	196	11	261
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	481	2263	34	421	1043	522	196	16	66	452	20	436
Arrive On Green	0.11	0.62	0.62	0.45	0.45	0.45	0.27	0.00	0.27	0.27	0.27	0.27
Sat Flow, veh/h	1810	3641	54	723	2332	1167	427	60	243	1323	74	1615
Grp Volume(v), veh/h	283	366	384	11	437	411	33	0	0	207	0	261
Grp Sat Flow(s),veh/h/ln	1810	1805	1890	723	1805	1694	729	0	0	1398	0	1615
Q Serve(g_s), s	5.7	7.1	7.1	0.6	13.1	13.1	0.3	0.0	0.0	0.0	0.0	10.4
Cycle Q Clear(g_c), s	5.7	7.1	7.1	0.6	13.1	13.1	10.0	0.0	0.0	9.8	0.0	10.4
Prop In Lane	1.00		0.03	1.00		0.69	0.67		0.33	0.95		1.00
Lane Grp Cap(c), veh/h	481	1122	1175	421	807	758	278	0	0	472	0	436
V/C Ratio(X)	0.59	0.33	0.33	0.03	0.54	0.54	0.12	0.00	0.00	0.44	0.00	0.60
Avail Cap(c_a), veh/h	699	1122	1175	421	807	758	278	0	0	472	0	436
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.1	6.6	6.6	11.5	14.9	14.9	20.7	0.0	0.0	23.3	0.0	23.5
Incr Delay (d2), s/veh	1.1	0.8	0.7	0.1	2.6	2.8	0.9	0.0	0.0	2.9	0.0	5.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.9	3.7	3.9	0.1	7.0	6.6	0.6	0.0	0.0	4.0	0.0	5.4
LnGrp Delay(d),s/veh	11.3	7.4	7.4	11.6	17.5	17.7	21.6	0.0	0.0	26.2	0.0	29.4
LnGrp LOS	B	A	A	B	B	B	C			C		C
Approach Vol, veh/h		1033			859			33			468	
Approach Delay, s/veh		8.5			17.5			21.6			28.0	
Approach LOS		A			B			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		50.0		24.0	12.9	37.1		24.0
Change Period (Y+Rc), s		4.0		4.0	4.5	4.0		4.0
Max Green Setting (Gmax), s		46.0		20.0	17.3	24.2		20.0
Max Q Clear Time (g_c+I1), s		9.1		12.0	7.7	15.1		12.4
Green Ext Time (p_c), s		17.6		1.4	0.8	6.8		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	15.7
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
24: Pfenning Rd & University Way

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	400	140	90	260	30	100	360	110	70	120	50
Future Volume (veh/h)	70	400	140	90	260	30	100	360	110	70	120	50
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	76	435	152	98	283	33	109	391	120	76	130	54
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	453	530	185	249	657	77	182	453	130	216	338	118
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	1059	1320	461	825	1638	191	220	1139	326	282	850	297
Grp Volume(v), veh/h	76	0	587	98	0	316	620	0	0	260	0	0
Grp Sat Flow(s),veh/h/ln	1059	0	1781	825	0	1829	1686	0	0	1428	0	0
Q Serve(g_s), s	2.5	0.0	13.2	4.8	0.0	5.6	11.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	8.1	0.0	13.2	18.0	0.0	5.6	15.6	0.0	0.0	4.6	0.0	0.0
Prop In Lane	1.00		0.26	1.00		0.10	0.18		0.19	0.29		0.21
Lane Grp Cap(c), veh/h	453	0	715	249	0	734	765	0	0	672	0	0
V/C Ratio(X)	0.17	0.00	0.82	0.39	0.00	0.43	0.81	0.00	0.00	0.39	0.00	0.00
Avail Cap(c_a), veh/h	453	0	715	249	0	734	771	0	0	677	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.7	0.0	12.0	20.3	0.0	9.7	12.7	0.0	0.0	9.5	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	7.6	1.0	0.0	0.4	6.5	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	7.9	1.2	0.0	2.9	8.6	0.0	0.0	2.3	0.0	0.0
LnGrp Delay(d),s/veh	12.8	0.0	19.6	21.3	0.0	10.1	19.2	0.0	0.0	9.9	0.0	0.0
LnGrp LOS	B		B	C		B	B			A		
Approach Vol, veh/h		663			414			620			260	
Approach Delay, s/veh		18.8			12.8			19.2			9.9	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.4		22.5		22.4		22.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		17.6		15.2		6.6		20.0
Green Ext Time (p_c), s		0.2		1.7		4.7		0.0

Intersection Summary			
HCM 2010 Ctrl Delay			16.5
HCM 2010 LOS			B

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HCM Signalized Intersection Capacity Analysis
25: 5th Avenue & Railroad Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	40	0	100	80	270	0	130	150	250	180	20
Future Volume (vph)	20	40	0	100	80	270	0	130	150	250	180	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		4.5	4.5			4.5		4.5	4.5	
Lane Util. Factor		1.00		1.00	1.00			1.00		1.00	1.00	
Frt		1.00		1.00	0.88			0.92		1.00	0.98	
Flt Protected		0.98		0.95	1.00			1.00		0.95	1.00	
Satd. Flow (prot)		1832		1770	1647			1713		1770	1835	
Flt Permitted		0.76		0.71	1.00			1.00		0.95	1.00	
Satd. Flow (perm)		1418		1331	1647			1713		1770	1835	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	43	0	109	87	293	0	141	163	272	196	22
RTOR Reduction (vph)	0	0	0	0	217	0	0	77	0	0	7	0
Lane Group Flow (vph)	0	65	0	109	163	0	0	227	0	272	211	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Prot	NA	
Protected Phases		4			8			2!		6!		
Permitted Phases	4			8			2				6	
Actuated Green, G (s)		9.6		9.6	9.6			18.6		18.6	18.6	
Effective Green, g (s)		9.6		9.6	9.6			18.6		18.6	18.6	
Actuated g/C Ratio		0.26		0.26	0.26			0.50		0.50	0.50	
Clearance Time (s)		4.5		4.5	4.5			4.5		4.5	4.5	
Vehicle Extension (s)		3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)		365		343	425			856		885	917	
v/s Ratio Prot					c0.10			0.13		c0.15		
v/s Ratio Perm		0.05		0.08							0.11	
v/c Ratio		0.18		0.32	0.38			0.27		0.31	0.23	
Uniform Delay, d1		10.7		11.2	11.4			5.4		5.5	5.3	
Progression Factor		1.00		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2		0.2		0.5	0.6			0.8		0.9	0.6	
Delay (s)		11.0		11.7	11.9			6.1		6.4	5.8	
Level of Service		B		B	B			A		A	A	
Approach Delay (s)		11.0			11.9			6.1			6.1	
Approach LOS		B			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	8.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	37.2	Sum of lost time (s)	9.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
! Phase conflict between lane groups.			
c Critical Lane Group			

HCM 2010 Signalized Intersection Summary
26: Water Street & 5th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	130	110	60	120	40	110	500	60	60	510	90
Future Volume (veh/h)	120	130	110	60	120	40	110	500	60	60	510	90
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1743	1743	1900	1881	1881	1900	1863	1863	1900
Adj Flow Rate, veh/h	130	141	120	65	130	43	120	543	65	65	554	98
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	6	6	6	9	9	9	1	1	1	2	2	2
Cap, veh/h	311	236	201	235	331	109	424	1022	122	455	956	169
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.62	0.62	0.62	0.62	0.62	0.62
Sat Flow, veh/h	1158	893	760	1041	1253	414	785	1648	197	809	1541	273
Grp Volume(v), veh/h	130	0	261	65	0	173	120	0	608	65	0	652
Grp Sat Flow(s),veh/h/ln	1158	0	1653	1041	0	1667	785	0	1846	809	0	1814
Q Serve(g_s), s	7.2	0.0	9.5	4.0	0.0	5.9	7.4	0.0	12.9	3.4	0.0	14.7
Cycle Q Clear(g_c), s	13.0	0.0	9.5	13.5	0.0	5.9	22.1	0.0	12.9	16.3	0.0	14.7
Prop In Lane	1.00		0.46	1.00		0.25	1.00		0.11	1.00		0.15
Lane Grp Cap(c), veh/h	311	0	436	235	0	440	424	0	1145	455	0	1125
V/C Ratio(X)	0.42	0.00	0.60	0.28	0.00	0.39	0.28	0.00	0.53	0.14	0.00	0.58
Avail Cap(c_a), veh/h	408	0	575	323	0	580	424	0	1145	455	0	1125
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.2	0.0	22.2	28.1	0.0	20.9	14.3	0.0	7.4	12.0	0.0	7.8
Incr Delay (d2), s/veh	1.3	0.0	1.9	0.9	0.0	0.8	1.7	0.0	1.8	0.7	0.0	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	4.6	1.2	0.0	2.8	1.8	0.0	7.0	0.8	0.0	7.9
LnGrp Delay(d),s/veh	27.5	0.0	24.1	29.0	0.0	21.7	16.0	0.0	9.2	12.7	0.0	10.0
LnGrp LOS	C		C	C		C	B		A	B		A
Approach Vol, veh/h		391			238			728			717	
Approach Delay, s/veh		25.2			23.7			10.3			10.2	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		46.8		22.2		46.8		22.2
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		37.0		24.0		37.0		24.0
Max Q Clear Time (g_c+I1), s		24.1		15.0		18.3		15.5
Green Ext Time (p_c), s		6.2		2.8		7.5		2.7

Intersection Summary	
HCM 2010 Ctrl Delay	14.6
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
27: Main St & 5th Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	180	70	100	210	70	50	600	50	60	480	70
Future Volume (veh/h)	110	180	70	100	210	70	50	600	50	60	480	70
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		0.96	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	120	196	76	109	228	76	54	652	54	65	522	76
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	3	3	3	2	2	2	2	2	2
Cap, veh/h	326	318	123	348	327	109	307	837	69	238	784	114
Arrive On Green	0.07	0.26	0.26	0.07	0.25	0.25	0.49	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	1740	1242	482	1757	1309	436	817	1693	140	739	1584	231
Grp Volume(v), veh/h	120	0	272	109	0	304	54	0	706	65	0	598
Grp Sat Flow(s),veh/h/ln	1740	0	1724	1757	0	1745	817	0	1833	739	0	1815
Q Serve(g_s), s	3.4	0.0	9.5	3.1	0.0	10.8	3.6	0.0	21.5	5.4	0.0	16.9
Cycle Q Clear(g_c), s	3.4	0.0	9.5	3.1	0.0	10.8	20.5	0.0	21.5	26.9	0.0	16.9
Prop In Lane	1.00		0.28	1.00		0.25	1.00		0.08	1.00		0.13
Lane Grp Cap(c), veh/h	326	0	442	348	0	436	307	0	907	238	0	898
V/C Ratio(X)	0.37	0.00	0.62	0.31	0.00	0.70	0.18	0.00	0.78	0.27	0.00	0.67
Avail Cap(c_a), veh/h	330	0	442	362	0	436	307	0	907	238	0	898
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.8	0.0	22.3	17.7	0.0	23.2	20.7	0.0	14.1	25.2	0.0	12.9
Incr Delay (d2), s/veh	0.7	0.0	6.3	0.5	0.0	8.9	1.2	0.0	6.5	2.8	0.0	3.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	5.2	1.5	0.0	6.2	0.9	0.0	12.4	1.3	0.0	9.3
LnGrp Delay(d),s/veh	18.5	0.0	28.6	18.2	0.0	32.1	21.9	0.0	20.7	28.0	0.0	16.8
LnGrp LOS	B		C	B		C	C		C	C		B
Approach Vol, veh/h		392			413			760			663	
Approach Delay, s/veh		25.5			28.4			20.8			17.9	
Approach LOS		C			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.9	21.4		37.6	9.4	21.0		37.6
Change Period (Y+Rc), s	4.5	4.0		4.0	4.5	4.0		4.0
Max Green Setting (Gmax), s	5.0	17.0		33.0	5.0	17.0		33.0
Max Q Clear Time (g_c+I1), s	5.1	11.5		28.9	5.4	12.8		23.5
Green Ext Time (p_c), s	0.0	1.3		2.6	0.0	1.0		5.0

Intersection Summary			
HCM 2010 Ctrl Delay			22.2
HCM 2010 LOS			C

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HCM 2010 Signalized Intersection Summary
28: Ruby Street & 5th Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	190	80	110	190	30	170	200	80	60	200	50
Future Volume (veh/h)	30	190	80	110	190	30	170	200	80	60	200	50
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	33	207	87	120	207	33	185	217	87	65	217	54
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	117	342	134	233	297	43	363	407	142	206	632	142
Arrive On Green	0.28	0.28	0.28	0.28	0.28	0.28	0.52	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	98	1221	478	444	1058	152	487	787	276	212	1224	275
Grp Volume(v), veh/h	327	0	0	360	0	0	489	0	0	336	0	0
Grp Sat Flow(s),veh/h/ln	1798	0	0	1654	0	0	1550	0	0	1711	0	0
Q Serve(g_s), s	0.0	0.0	0.0	1.5	0.0	0.0	4.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	6.9	0.0	0.0	8.4	0.0	0.0	8.8	0.0	0.0	4.8	0.0	0.0
Prop In Lane	0.10		0.27	0.33		0.09	0.38		0.18	0.19		0.16
Lane Grp Cap(c), veh/h	594	0	0	572	0	0	912	0	0	981	0	0
V/C Ratio(X)	0.55	0.00	0.00	0.63	0.00	0.00	0.54	0.00	0.00	0.34	0.00	0.00
Avail Cap(c_a), veh/h	812	0	0	765	0	0	912	0	0	981	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.0	0.0	0.0	14.4	0.0	0.0	7.2	0.0	0.0	6.3	0.0	0.0
Incr Delay (d2), s/veh	0.8	0.0	0.0	1.1	0.0	0.0	2.3	0.0	0.0	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.6	0.0	0.0	4.2	0.0	0.0	4.5	0.0	0.0	2.7	0.0	0.0
LnGrp Delay(d),s/veh	14.8	0.0	0.0	15.5	0.0	0.0	9.4	0.0	0.0	7.3	0.0	0.0
LnGrp LOS	B			B			A			A		
Approach Vol, veh/h		327			360			489			336	
Approach Delay, s/veh		14.8			15.5			9.4			7.3	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		27.4		16.9		27.4		16.9
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		22.9		18.1		22.9		18.1
Max Q Clear Time (g_c+I1), s		10.8		8.9		6.8		10.4
Green Ext Time (p_c), s		3.3		2.2		3.7		2.0

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B

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HCM 2010 TWSC
29: Chestnut Street & 5th Avenue

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	20	20	20	20	50	20	450	20	30	440	20
Future Vol, veh/h	20	20	20	20	20	50	20	450	20	30	440	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	0	-	-	-	-	-	0	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	22	22	22	22	54	22	489	22	33	478	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1136	1108	489	1119	1108	500	500	0	0	511	0	0
Stage 1	554	554	-	543	543	-	-	-	-	-	-	-
Stage 2	582	554	-	576	565	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	179	210	579	184	210	571	1064	-	-	1054	-	-
Stage 1	517	514	-	524	520	-	-	-	-	-	-	-
Stage 2	499	514	-	503	508	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	143	199	579	156	199	571	1064	-	-	1054	-	-
Mov Cap-2 Maneuver	143	199	-	156	199	-	-	-	-	-	-	-
Stage 1	506	498	-	513	509	-	-	-	-	-	-	-
Stage 2	423	503	-	448	492	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.3	24.1	0.3	0.5
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1064	-	-	143	296	285	1054	-	-
HCM Lane V/C Ratio	0.02	-	-	0.152	0.147	0.343	0.031	-	-
HCM Control Delay (s)	8.5	-	-	34.6	19.2	24.1	8.5	-	-
HCM Lane LOS	A	-	-	D	C	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.5	1.5	0.1	-	-

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HCM 2010 Signalized Intersection Summary
30: Water Street & 3rd Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	110	100	60	110	60	30	430	80	80	550	20
Future Volume (veh/h)	10	110	100	60	110	60	30	430	80	80	550	20
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1845	1845	1900	1863	1863	1900	1827	1827	1900
Adj Flow Rate, veh/h	11	120	109	65	120	65	33	467	87	87	598	22
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	4	4	4
Cap, veh/h	261	200	182	223	254	137	490	1006	187	528	1153	42
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.66	0.66	0.66	0.66	0.66	0.66
Sat Flow, veh/h	1177	888	806	1130	1124	609	800	1527	285	834	1751	64
Grp Volume(v), veh/h	11	0	229	65	0	185	33	0	554	87	0	620
Grp Sat Flow(s),veh/h/ln	1177	0	1694	1130	0	1732	800	0	1812	834	0	1815
Q Serve(g_s), s	0.6	0.0	8.4	3.8	0.0	6.4	1.5	0.0	10.4	4.0	0.0	12.2
Cycle Q Clear(g_c), s	7.0	0.0	8.4	12.1	0.0	6.4	13.8	0.0	10.4	14.3	0.0	12.2
Prop In Lane	1.00		0.48	1.00		0.35	1.00		0.16	1.00		0.04
Lane Grp Cap(c), veh/h	261	0	382	223	0	391	490	0	1193	528	0	1195
V/C Ratio(X)	0.04	0.00	0.60	0.29	0.00	0.47	0.07	0.00	0.46	0.16	0.00	0.52
Avail Cap(c_a), veh/h	320	0	466	279	0	477	490	0	1193	528	0	1195
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.2	0.0	23.9	29.4	0.0	23.2	9.7	0.0	5.8	9.3	0.0	6.1
Incr Delay (d2), s/veh	0.1	0.0	2.1	1.0	0.0	1.3	0.3	0.0	1.3	0.7	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	4.1	1.2	0.0	3.2	0.4	0.0	5.5	1.0	0.0	6.6
LnGrp Delay(d),s/veh	26.3	0.0	26.1	30.4	0.0	24.4	9.9	0.0	7.1	10.0	0.0	7.7
LnGrp LOS	C		C	C		C	A		A	A		A
Approach Vol, veh/h		240			250			587			707	
Approach Delay, s/veh		26.1			26.0			7.3			8.0	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		49.4		19.6		49.4		19.6
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		42.0		19.0		42.0		19.0
Max Q Clear Time (g_c+I1), s		15.8		10.4		16.3		14.1
Green Ext Time (p_c), s		7.1		2.0		7.1		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	12.7
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HCM Signalized Intersection Capacity Analysis
31: Main St & 3rd Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	130	50	120	130	100	50	710	80	80	640	30
Future Volume (vph)	50	130	50	120	130	100	50	710	80	80	640	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	0.99	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.93		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1760	1769		1782	1737		1767	1829		1770	1848	
Flt Permitted	0.45	1.00		0.55	1.00		0.27	1.00		0.20	1.00	
Satd. Flow (perm)	830	1769		1029	1737		509	1829		367	1848	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	54	141	54	130	141	109	54	772	87	87	696	33
RTOR Reduction (vph)	0	20	0	0	41	0	0	6	0	0	3	0
Lane Group Flow (vph)	54	175	0	130	209	0	54	853	0	87	726	0
Confl. Peds. (#/hr)	4		4	2		3	3		4	2		2
Confl. Bikes (#/hr)			3			1			4			3
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	2%	2%	2%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		1			1			2			2	
Permitted Phases	1			1			2			2		
Actuated Green, G (s)	17.0	17.0		17.0	17.0		44.0	44.0		44.0	44.0	
Effective Green, g (s)	17.0	17.0		17.0	17.0		44.0	44.0		44.0	44.0	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.64	0.64		0.64	0.64	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	0.2	0.2		0.2	0.2		0.2	0.2		0.2	0.2	
Lane Grp Cap (vph)	204	435		253	427		324	1166		234	1178	
v/s Ratio Prot		0.10			0.12			c0.47			0.39	
v/s Ratio Perm	0.07			c0.13			0.11			0.24		
v/c Ratio	0.26	0.40		0.51	0.49		0.17	0.73		0.37	0.62	
Uniform Delay, d1	21.0	21.7		22.4	22.3		5.1	8.5		5.9	7.5	
Progression Factor	1.11	1.10		1.00	1.00		0.64	1.04		1.00	1.00	
Incremental Delay, d2	0.2	0.2		0.7	0.3		0.9	3.3		4.5	2.4	
Delay (s)	23.6	24.2		23.2	22.6		4.2	12.2		10.4	9.9	
Level of Service	C	C		C	C		A	B		B	A	
Approach Delay (s)		24.1			22.8			11.7			9.9	
Approach LOS		C			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	104.8%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM 2010 Signalized Intersection Summary
32: Ruby Street & 3rd Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	160	190	80	30	160	40	70	250	40	50	280	140
Future Volume (veh/h)	160	190	80	30	160	40	70	250	40	50	280	140
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adj Flow Rate, veh/h	174	207	87	33	174	43	76	272	43	54	304	152
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	321	295	109	157	503	113	204	512	73	152	424	197
Arrive On Green	0.37	0.37	0.37	0.37	0.37	0.37	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	497	808	298	116	1377	310	217	1342	193	105	1113	517
Grp Volume(v), veh/h	468	0	0	250	0	0	391	0	0	510	0	0
Grp Sat Flow(s),veh/h/ln	1603	0	0	1804	0	0	1752	0	0	1734	0	0
Q Serve(g_s), s	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0
Cycle Q Clear(g_c), s	9.0	0.0	0.0	3.5	0.0	0.0	5.9	0.0	0.0	8.9	0.0	0.0
Prop In Lane	0.37		0.19	0.13		0.17	0.19		0.11	0.11		0.30
Lane Grp Cap(c), veh/h	725	0	0	774	0	0	789	0	0	773	0	0
V/C Ratio(X)	0.65	0.00	0.00	0.32	0.00	0.00	0.50	0.00	0.00	0.66	0.00	0.00
Avail Cap(c_a), veh/h	939	0	0	1013	0	0	986	0	0	984	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.8	0.0	0.0	8.3	0.0	0.0	8.6	0.0	0.0	9.5	0.0	0.0
Incr Delay (d2), s/veh	1.0	0.0	0.0	0.2	0.0	0.0	0.5	0.0	0.0	1.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.2	0.0	0.0	1.8	0.0	0.0	3.0	0.0	0.0	4.5	0.0	0.0
LnGrp Delay(d),s/veh	10.8	0.0	0.0	8.5	0.0	0.0	9.1	0.0	0.0	10.6	0.0	0.0
LnGrp LOS	B			A			A			B		
Approach Vol, veh/h		468			250			391			510	
Approach Delay, s/veh		10.8			8.5			9.1			10.6	
Approach LOS		B			A			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		18.0		17.5		18.0		17.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		7.9		11.0		10.9		5.5
Green Ext Time (p_c), s		3.2		2.0		2.6		2.8

Intersection Summary			
HCM 2010 Ctrl Delay			10.0
HCM 2010 LOS			A

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HCM 2010 AWSC
33: Chestnut Street & 3rd Avenue

Intersection	
Intersection Delay, s/veh	22.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	90	40	20	50	70	40	340	20	80	350	60
Future Vol, veh/h	50	90	40	20	50	70	40	340	20	80	350	60
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	98	43	22	54	76	43	370	22	87	380	65
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	14.6	13.2	23.8	27.5
HCM LOS	B	B	C	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	28%	14%	100%	0%
Vol Thru, %	0%	94%	50%	36%	0%	85%
Vol Right, %	0%	6%	22%	50%	0%	15%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	40	360	180	140	80	410
LT Vol	40	0	50	20	80	0
Through Vol	0	340	90	50	0	350
RT Vol	0	20	40	70	0	60
Lane Flow Rate	43	391	196	152	87	446
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.087	0.727	0.385	0.299	0.172	0.803
Departure Headway (Hd)	7.238	6.687	7.087	7.069	7.103	6.487
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	494	540	507	507	504	557
Service Time	4.995	4.443	5.151	5.137	4.857	4.241
HCM Lane V/C Ratio	0.087	0.724	0.387	0.3	0.173	0.801
HCM Control Delay	10.7	25.3	14.6	13.2	11.3	30.7
HCM Lane LOS	B	D	B	B	B	D
HCM 95th-tile Q	0.3	6	1.8	1.2	0.6	7.8

HCM 2010 Signalized Intersection Summary
34: Water Street & Capitol Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	90	80	20	90	120	30	290	30	70	500	90
Future Volume (veh/h)	60	90	80	20	90	120	30	290	30	70	500	90
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1900	1900	1827	1827	1900	1900	1863	1863
Adj Flow Rate, veh/h	65	98	87	22	98	130	33	315	33	76	543	98
Adj No. of Lanes	0	1	1	1	1	0	1	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	4	4	4	2	2	2
Cap, veh/h	144	187	374	191	174	231	471	1057	111	157	1032	1029
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	302	800	1599	1218	742	984	770	1626	170	152	1588	1583
Grp Volume(v), veh/h	163	0	87	22	0	228	33	0	348	619	0	98
Grp Sat Flow(s),veh/h/ln	1102	0	1599	1218	0	1726	770	0	1797	1740	0	1583
Q Serve(g_s), s	3.2	0.0	3.0	1.2	0.0	8.0	1.6	0.0	5.8	0.0	0.0	1.6
Cycle Q Clear(g_c), s	11.3	0.0	3.0	12.4	0.0	8.0	13.6	0.0	5.8	12.0	0.0	1.6
Prop In Lane	0.40		1.00	1.00		0.57	1.00		0.09	0.12		1.00
Lane Grp Cap(c), veh/h	331	0	374	191	0	404	471	0	1168	1189	0	1029
V/C Ratio(X)	0.49	0.00	0.23	0.12	0.00	0.56	0.07	0.00	0.30	0.52	0.00	0.10
Avail Cap(c_a), veh/h	481	0	533	312	0	575	471	0	1168	1189	0	1029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.2	0.0	21.4	30.3	0.0	23.3	9.9	0.0	5.2	6.3	0.0	4.5
Incr Delay (d2), s/veh	1.4	0.0	0.4	0.3	0.0	1.5	0.3	0.0	0.7	1.6	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	0.0	1.4	0.4	0.0	4.0	0.4	0.0	3.0	6.6	0.0	0.7
LnGrp Delay(d),s/veh	25.6	0.0	21.8	30.6	0.0	24.8	10.2	0.0	5.9	8.0	0.0	4.7
LnGrp LOS	C		C	C		C	B		A	A		A
Approach Vol, veh/h		250			250			381			717	
Approach Delay, s/veh		24.3			25.3			6.3			7.5	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		48.8		20.2		48.8		20.2
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		38.0		23.0		38.0		23.0
Max Q Clear Time (g_c+I1), s		15.6		13.3		14.0		14.4
Green Ext Time (p_c), s		5.4		1.9		5.5		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	12.6
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
35: Main St & Capitol Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱		↰	↱	
Traffic Volume (veh/h)	60	120	30	110	100	60	50	720	40	70	580	40
Future Volume (veh/h)	60	120	30	110	100	60	50	720	40	70	580	40
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1881	1881	1900	1845	1845	1900	1845	1845	1900
Adj Flow Rate, veh/h	65	130	33	120	109	65	54	783	43	76	630	43
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	1	1	1	3	3	3	3	3	3
Cap, veh/h	267	317	80	279	242	144	459	1153	63	359	1136	78
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.67	0.67	0.67	0.67	0.67	0.67
Sat Flow, veh/h	1218	1449	368	1230	1106	659	755	1733	95	654	1708	117
Grp Volume(v), veh/h	65	0	163	120	0	174	54	0	826	76	0	673
Grp Sat Flow(s),veh/h/ln	1218	0	1816	1230	0	1765	755	0	1828	654	0	1824
Q Serve(g_s), s	3.4	0.0	5.3	6.4	0.0	5.9	2.8	0.0	19.0	5.5	0.0	13.5
Cycle Q Clear(g_c), s	9.3	0.0	5.3	11.7	0.0	5.9	16.3	0.0	19.0	24.6	0.0	13.5
Prop In Lane	1.00		0.20	1.00		0.37	1.00		0.05	1.00		0.06
Lane Grp Cap(c), veh/h	267	0	397	279	0	386	459	0	1216	359	0	1214
V/C Ratio(X)	0.24	0.00	0.41	0.43	0.00	0.45	0.12	0.00	0.68	0.21	0.00	0.55
Avail Cap(c_a), veh/h	371	0	553	384	0	537	459	0	1216	359	0	1214
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.4	0.0	23.1	28.2	0.0	23.4	10.4	0.0	7.0	14.5	0.0	6.1
Incr Delay (d2), s/veh	0.5	0.0	0.7	1.1	0.0	0.8	0.5	0.0	3.1	1.3	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	2.7	2.2	0.0	2.9	0.7	0.0	10.4	1.1	0.0	7.3
LnGrp Delay(d),s/veh	27.9	0.0	23.8	29.2	0.0	24.2	11.0	0.0	10.1	15.9	0.0	8.0
LnGrp LOS	C		C	C		C	B		B	B		A
Approach Vol, veh/h		228			294			880			749	
Approach Delay, s/veh		25.0			26.2			10.2			8.8	
Approach LOS		C			C			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		49.9		19.1		49.9		19.1
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0		40.0		21.0
Max Q Clear Time (g_c+I1), s		21.0		11.3		26.6		13.7
Green Ext Time (p_c), s		8.9		1.6		7.3		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	13.4
HCM 2010 LOS	B

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HCM 2010 AWSC
36: Chestnut Street & Capitol Avenue

Intersection	
Intersection Delay, s/veh	23.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	50	210	20	30	140	110	30	240	40	80	280	30
Future Vol, veh/h	50	210	20	30	140	110	30	240	40	80	280	30
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	54	228	22	33	152	120	33	261	43	87	304	33
Number of Lanes	0	1	0	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	23.4	22.2	23.6	25.1
HCM LOS	C	C	C	D

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	18%	11%	100%	0%
Vol Thru, %	0%	86%	75%	50%	0%	90%
Vol Right, %	0%	14%	7%	39%	0%	10%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	30	280	280	280	80	310
LT Vol	30	0	50	30	80	0
Through Vol	0	240	210	140	0	280
RT Vol	0	40	20	110	0	30
Lane Flow Rate	33	304	304	304	87	337
Geometry Grp	7	7	2	2	7	7
Degree of Util (X)	0.077	0.663	0.642	0.626	0.2	0.722
Departure Headway (Hd)	8.461	7.839	7.593	7.409	8.3	7.712
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	423	460	475	487	431	468
Service Time	6.229	5.607	5.665	5.484	6.067	5.479
HCM Lane V/C Ratio	0.078	0.661	0.64	0.624	0.202	0.72
HCM Control Delay	11.9	24.8	23.4	22.2	13.1	28.2
HCM Lane LOS	B	C	C	C	B	D
HCM 95th-tile Q	0.2	4.7	4.4	4.2	0.7	5.7

HCM 2010 TWSC
37: Willow Street & Capitol Avenue

Intersection						
Int Delay, s/veh	4.5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	120	170	140	190	30	170
Future Vol, veh/h	120	170	140	190	30	170
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	185	152	207	33	185

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	315	0	734	223
Stage 1	-	-	-	-	223	-
Stage 2	-	-	-	-	511	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1245	-	387	817
Stage 1	-	-	-	-	814	-
Stage 2	-	-	-	-	602	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1245	-	340	817
Mov Cap-2 Maneuver	-	-	-	-	340	-
Stage 1	-	-	-	-	814	-
Stage 2	-	-	-	-	529	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	675	-	-	1245	-
HCM Lane V/C Ratio	0.322	-	-	0.122	-
HCM Control Delay (s)	12.8	-	-	8.3	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	1.4	-	-	0.4	-

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HCM 2010 Signalized Intersection Summary
38: Main Street & Manitoba Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	160	330	70	110	40	170	850	20	40	720	30
Future Volume (veh/h)	40	160	330	70	110	40	170	850	20	40	720	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1900	1900	1900	1900	1900	1881	1881	1900
Adj Flow Rate, veh/h	43	174	359	76	120	43	185	924	22	43	783	33
Adj No. of Lanes	0	1	1	0	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	0	0	0	1	1	1
Cap, veh/h	122	419	429	144	209	62	296	1138	27	242	865	36
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.08	0.62	0.62	0.48	0.48	0.48
Sat Flow, veh/h	220	1561	1599	279	780	232	1810	1848	44	596	1792	76
Grp Volume(v), veh/h	217	0	359	239	0	0	185	0	946	43	0	816
Grp Sat Flow(s),veh/h/ln	1782	0	1599	1291	0	0	1810	0	1892	596	0	1868
Q Serve(g_s), s	0.0	0.0	14.6	5.3	0.0	0.0	3.2	0.0	26.5	4.1	0.0	27.7
Cycle Q Clear(g_c), s	6.6	0.0	14.6	11.9	0.0	0.0	3.2	0.0	26.5	21.4	0.0	27.7
Prop In Lane	0.20		1.00	0.32		0.18	1.00		0.02	1.00		0.04
Lane Grp Cap(c), veh/h	540	0	429	415	0	0	296	0	1165	242	0	901
V/C Ratio(X)	0.40	0.00	0.84	0.58	0.00	0.00	0.63	0.00	0.81	0.18	0.00	0.91
Avail Cap(c_a), veh/h	602	0	487	464	0	0	343	0	1165	242	0	901
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.80	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.9	0.0	23.8	22.5	0.0	0.0	14.8	0.0	10.2	21.9	0.0	16.4
Incr Delay (d2), s/veh	0.6	0.0	11.4	1.3	0.0	0.0	2.8	0.0	6.2	1.6	0.0	14.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	7.8	4.3	0.0	0.0	2.0	0.0	15.7	0.8	0.0	17.6
LnGrp Delay(d),s/veh	21.5	0.0	35.2	23.8	0.0	0.0	17.5	0.0	16.4	23.5	0.0	30.7
LnGrp LOS	C		D	C			B		B	C		C
Approach Vol, veh/h		576			239			1131			859	
Approach Delay, s/veh		30.0			23.8			16.6			30.4	
Approach LOS		C			C			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		46.5		22.5	9.2	37.3		22.5				
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s		40.0		21.0	7.0	29.0		21.0				
Max Q Clear Time (g_c+I1), s		28.5		16.6	5.2	29.7		13.9				
Green Ext Time (p_c), s		9.0		1.9	0.1	0.0		2.7				
Intersection Summary												
HCM 2010 Ctrl Delay			24.2									
HCM 2010 LOS			C									

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HCM 2010 Signalized Intersection Summary
40: Ruby Street & Manitoba Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	78	495	24	115	103	19	39	60	382	70	124	113
Future Volume (veh/h)	78	495	24	115	103	19	39	60	382	70	124	113
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1880	1900	1900	1882	1900	1900	1863	1900	1900	1885	1900
Adj Flow Rate, veh/h	85	538	26	125	112	21	42	65	415	76	135	123
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	2	2	2	2	2	2
Cap, veh/h	150	653	30	281	229	36	105	104	513	181	304	232
Arrive On Green	0.42	0.42	0.42	0.42	0.42	0.42	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	166	1564	72	421	549	86	70	256	1266	231	752	573
Grp Volume(v), veh/h	649	0	0	258	0	0	522	0	0	334	0	0
Grp Sat Flow(s),veh/h/ln	1802	0	0	1056	0	0	1592	0	0	1556	0	0
Q Serve(g_s), s	7.7	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	16.4	0.0	0.0	8.7	0.0	0.0	14.5	0.0	0.0	7.3	0.0	0.0
Prop In Lane	0.13		0.04	0.48		0.08	0.08		0.80	0.23		0.37
Lane Grp Cap(c), veh/h	832	0	0	546	0	0	722	0	0	717	0	0
V/C Ratio(X)	0.78	0.00	0.00	0.47	0.00	0.00	0.72	0.00	0.00	0.47	0.00	0.00
Avail Cap(c_a), veh/h	984	0	0	648	0	0	722	0	0	717	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.3	0.0	0.0	10.6	0.0	0.0	13.2	0.0	0.0	11.1	0.0	0.0
Incr Delay (d2), s/veh	3.4	0.0	0.0	0.6	0.0	0.0	6.2	0.0	0.0	2.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	0.0	0.0	2.7	0.0	0.0	7.6	0.0	0.0	3.9	0.0	0.0
LnGrp Delay(d),s/veh	16.7	0.0	0.0	11.3	0.0	0.0	19.4	0.0	0.0	13.3	0.0	0.0
LnGrp LOS	B			B			B			B		
Approach Vol, veh/h		649			258			522			334	
Approach Delay, s/veh		16.7			11.3			19.4			13.3	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.0		25.6		25.0		25.6
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		20.5		25.5		20.5		25.5
Max Q Clear Time (g_c+I1), s		16.5		18.4		9.3		10.7
Green Ext Time (p_c), s		2.1		2.7		4.6		4.1

Intersection Summary			
HCM 2010 Ctrl Delay			16.1
HCM 2010 LOS			B

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HCM 2010 Signalized Intersection Summary
41: Canyon Rd/Main St & Mountain View Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	30	10	230	50	300	20	710	100	270	750	20
Future Volume (veh/h)	30	30	10	230	50	300	20	710	100	270	750	20
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1900	1827	1827	1900	1810	1810	1900	1827	1827	1900
Adj Flow Rate, veh/h	33	33	11	250	54	0	22	772	0	293	815	22
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	4	4	4	5	5	5	4	4	4
Cap, veh/h	382	306	102	397	438	0	263	1165	0	363	1002	27
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.00	0.02	0.64	0.00	0.57	0.57	0.57
Sat Flow, veh/h	1282	1276	425	1331	1827	0	1723	1810	0	681	1771	48
Grp Volume(v), veh/h	33	0	44	250	54	0	22	772	0	293	0	837
Grp Sat Flow(s),veh/h/ln	1282	0	1701	1331	1827	0	1723	1810	0	681	0	1818
Q Serve(g_s), s	1.4	0.0	1.4	12.5	1.6	0.0	0.3	18.3	0.0	26.2	0.0	25.5
Cycle Q Clear(g_c), s	3.0	0.0	1.4	13.8	1.6	0.0	0.3	18.3	0.0	39.1	0.0	25.5
Prop In Lane	1.00		0.25	1.00		0.00	1.00		0.00	1.00		0.03
Lane Grp Cap(c), veh/h	382	0	408	397	438	0	263	1165	0	363	0	1030
V/C Ratio(X)	0.09	0.00	0.11	0.63	0.12	0.00	0.08	0.66	0.00	0.81	0.00	0.81
Avail Cap(c_a), veh/h	465	0	518	482	556	0	429	1165	0	363	0	1030
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.7	0.0	20.5	25.9	20.5	0.0	10.9	7.6	0.0	23.0	0.0	12.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	2.2	0.2	0.0	0.1	3.0	0.0	17.3	0.0	7.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	0.7	4.8	0.8	0.0	0.2	10.0	0.0	7.3	0.0	14.6
LnGrp Delay(d),s/veh	21.8	0.0	20.5	28.1	20.7	0.0	11.0	10.6	0.0	40.3	0.0	19.0
LnGrp LOS	C		C	C	C		B	B		D		B
Approach Vol, veh/h		77			304			794			1130	
Approach Delay, s/veh		21.0			26.7			10.6			24.6	
Approach LOS		C			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		48.4		20.6	5.4	43.1		20.6
Change Period (Y+Rc), s		4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s		40.0		21.0	8.0	28.0		21.0
Max Q Clear Time (g_c+I1), s		20.3		5.0	2.3	41.1		15.8
Green Ext Time (p_c), s		13.3		1.4	0.0	0.0		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	19.9
HCM 2010 LOS	B

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HCM 2010 Signalized Intersection Summary
42: Ruby Street & Mountain View Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	410	50	150	430	50	50	140	510	50	70	40
Future Volume (veh/h)	20	410	50	150	430	50	50	140	510	50	70	40
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1900	1900	1900	1900	1900	1863	1863	1900	1900	1900
Adj Flow Rate, veh/h	22	446	54	163	467	54	54	152	554	54	76	43
Adj No. of Lanes	1	1	0	1	1	0	0	1	1	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	1	1	1	0	0	0	2	2	2	0	0	0
Cap, veh/h	328	581	70	375	687	79	195	510	589	188	254	122
Arrive On Green	0.03	0.35	0.35	0.09	0.41	0.41	0.37	0.37	0.37	0.37	0.37	0.37
Sat Flow, veh/h	1792	1647	199	1810	1672	193	335	1370	1583	309	684	328
Grp Volume(v), veh/h	22	0	500	163	0	521	206	0	554	173	0	0
Grp Sat Flow(s),veh/h/ln	1792	0	1846	1810	0	1866	1705	0	1583	1321	0	0
Q Serve(g_s), s	0.5	0.0	15.4	3.4	0.0	14.7	0.0	0.0	21.7	0.1	0.0	0.0
Cycle Q Clear(g_c), s	0.5	0.0	15.4	3.4	0.0	14.7	5.0	0.0	21.7	5.1	0.0	0.0
Prop In Lane	1.00		0.11	1.00		0.10	0.26		1.00	0.31		0.25
Lane Grp Cap(c), veh/h	328	0	651	375	0	766	705	0	589	565	0	0
V/C Ratio(X)	0.07	0.00	0.77	0.44	0.00	0.68	0.29	0.00	0.94	0.31	0.00	0.00
Avail Cap(c_a), veh/h	441	0	834	384	0	843	708	0	592	567	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	13.3	0.0	18.4	12.8	0.0	15.5	14.2	0.0	19.5	14.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	3.9	0.3	0.0	2.3	0.3	0.0	23.4	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	8.5	1.7	0.0	8.0	2.6	0.0	13.3	2.2	0.0	0.0
LnGrp Delay(d),s/veh	13.4	0.0	22.4	13.1	0.0	17.8	14.5	0.0	42.9	14.4	0.0	0.0
LnGrp LOS	B		C	B		B	B		D	B		
Approach Vol, veh/h		522			684			760			173	
Approach Delay, s/veh		22.0			16.7			35.2			14.4	
Approach LOS		C			B			D			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.7	26.6		27.9	5.9	30.4		27.9
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0
Max Green Setting (Gmax), s	6.0	29.0		24.0	6.0	29.0		24.0
Max Q Clear Time (g_c+I1), s	5.4	17.4		7.1	2.5	16.7		23.7
Green Ext Time (p_c), s	0.0	5.2		5.4	0.0	5.4		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	24.4
HCM 2010 LOS	C

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HCM 2010 Signalized Intersection Summary
43: Chestnut Street & Mountain View Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	400	140	180	330	40	150	180	180	40	50	20
Future Volume (veh/h)	10	400	140	180	330	40	150	180	180	40	50	20
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1827	1827	1900	1863	1863	1900
Adj Flow Rate, veh/h	11	435	152	196	359	43	163	196	196	43	54	0
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	4	4	4	2	2	2
Cap, veh/h	520	687	240	378	849	102	526	261	261	243	578	0
Arrive On Green	0.52	0.52	0.52	0.52	0.52	0.52	0.31	0.31	0.31	0.31	0.31	0.00
Sat Flow, veh/h	979	1320	461	825	1633	196	1319	839	839	988	1863	0
Grp Volume(v), veh/h	11	0	587	196	0	402	163	0	392	43	54	0
Grp Sat Flow(s),veh/h/ln	979	0	1781	825	0	1828	1319	0	1679	988	1863	0
Q Serve(g_s), s	0.4	0.0	11.8	11.2	0.0	6.8	5.0	0.0	10.5	2.1	1.0	0.0
Cycle Q Clear(g_c), s	7.1	0.0	11.8	23.0	0.0	6.8	6.1	0.0	10.5	12.6	1.0	0.0
Prop In Lane	1.00		0.26	1.00		0.11	1.00		0.50	1.00		0.00
Lane Grp Cap(c), veh/h	520	0	927	378	0	951	526	0	521	243	578	0
V/C Ratio(X)	0.02	0.00	0.63	0.52	0.00	0.42	0.31	0.00	0.75	0.18	0.09	0.00
Avail Cap(c_a), veh/h	528	0	941	385	0	966	642	0	669	330	743	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	9.6	0.0	8.6	16.8	0.0	7.4	14.4	0.0	15.6	21.2	12.3	0.0
Incr Delay (d2), s/veh	0.0	0.0	1.6	1.6	0.0	0.4	0.1	0.0	2.4	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	6.1	2.7	0.0	3.5	1.8	0.0	5.1	0.6	0.5	0.0
LnGrp Delay(d),s/veh	9.6	0.0	10.2	18.5	0.0	7.8	14.6	0.0	18.0	21.4	12.3	0.0
LnGrp LOS	A		B	B		A	B		B	C	B	
Approach Vol, veh/h		598			598			555			97	
Approach Delay, s/veh		10.2			11.3			17.0			16.3	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		30.6		19.6		30.6		19.6
Change Period (Y+Rc), s		4.5		4.0		4.5		4.0
Max Green Setting (Gmax), s		26.5		20.0		26.5		20.0
Max Q Clear Time (g_c+I1), s		13.8		12.5		25.0		14.6
Green Ext Time (p_c), s		6.8		1.2		1.1		1.0

Intersection Summary		
HCM 2010 Ctrl Delay		12.9
HCM 2010 LOS		B

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HCM 2010 Signalized Intersection Summary
44: Bull Road/Willow Street & Mountain View Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	120	370	20	40	180	20	60	20	20	40	20	30
Future Volume (veh/h)	120	370	20	40	180	20	60	20	20	40	20	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1900	1863	1900	1900	1863	1863
Adj Flow Rate, veh/h	130	402	22	43	196	22	65	22	22	43	22	33
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	0	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	441	582	32	288	547	61	511	173	141	575	269	740
Arrive On Green	0.33	0.33	0.33	0.33	0.33	0.33	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	1158	1750	96	959	1645	185	821	370	301	946	575	1583
Grp Volume(v), veh/h	130	0	424	43	0	218	109	0	0	65	0	33
Grp Sat Flow(s),veh/h/ln	1158	0	1846	959	0	1830	1492	0	0	1520	0	1583
Q Serve(g_s), s	4.3	0.0	9.0	1.8	0.0	4.1	0.2	0.0	0.0	0.0	0.0	0.5
Cycle Q Clear(g_c), s	8.4	0.0	9.0	10.8	0.0	4.1	1.6	0.0	0.0	0.9	0.0	0.5
Prop In Lane	1.00		0.05	1.00		0.10	0.60		0.20	0.66		1.00
Lane Grp Cap(c), veh/h	441	0	614	288	0	609	825	0	0	844	0	740
V/C Ratio(X)	0.30	0.00	0.69	0.15	0.00	0.36	0.13	0.00	0.00	0.08	0.00	0.04
Avail Cap(c_a), veh/h	519	0	738	353	0	732	825	0	0	844	0	740
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.6	0.0	13.0	17.7	0.0	11.4	6.8	0.0	0.0	6.6	0.0	6.5
Incr Delay (d2), s/veh	0.4	0.0	2.1	0.2	0.0	0.4	0.3	0.0	0.0	0.2	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	4.8	0.5	0.0	2.1	0.8	0.0	0.0	0.5	0.0	0.2
LnGrp Delay(d),s/veh	14.9	0.0	15.2	17.9	0.0	11.7	7.1	0.0	0.0	6.8	0.0	6.6
LnGrp LOS	B		B	B		B	A			A		A
Approach Vol, veh/h		554			261			109			98	
Approach Delay, s/veh		15.1			12.8			7.1			6.7	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.5		19.5		25.5		19.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0
Max Q Clear Time (g_c+I1), s		3.6		11.0		2.9		12.8
Green Ext Time (p_c), s		0.9		2.7		0.9		2.2

Intersection Summary	
HCM 2010 Ctrl Delay	12.9
HCM 2010 LOS	B

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HCM 2010 TWSC
45: Umptanum Road & Railroad Ave

Intersection						
Int Delay, s/veh	4.8					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↰	↑	↱		↰	↱
Traffic Vol, veh/h	20	130	200	160	170	80
Future Vol, veh/h	20	130	200	160	170	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	141	217	174	185	87

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	391	0	-	0	489	304
Stage 1	-	-	-	-	304	-
Stage 2	-	-	-	-	185	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1168	-	-	-	538	736
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	847	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1168	-	-	-	528	736
Mov Cap-2 Maneuver	-	-	-	-	528	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	831	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	13.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1168	-	-	-	528	736
HCM Lane V/C Ratio	0.019	-	-	-	0.35	0.118
HCM Control Delay (s)	8.1	-	-	-	15.4	10.5
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1.6	0.4

HCM 2010 Signalized Intersection Summary
46: Canyon Road & Umptanum Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	40	190	190	180	210	130	220	610	270	190	740	50
Future Volume (veh/h)	40	190	190	180	210	130	220	610	270	190	740	50
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1776	1827	1827	1900	1810	1810	1810	1827	1827	1900
Adj Flow Rate, veh/h	43	207	207	196	228	141	239	663	0	207	804	54
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	7	7	7	4	4	4	5	5	5	4	4	4
Cap, veh/h	225	568	482	316	338	209	282	725	616	212	1161	78
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.16	0.40	0.00	0.12	0.35	0.35
Sat Flow, veh/h	962	1776	1509	950	1058	654	1723	1810	1538	1740	3302	222
Grp Volume(v), veh/h	43	207	207	196	0	369	239	663	0	207	423	435
Grp Sat Flow(s),veh/h/ln	962	1776	1509	950	0	1712	1723	1810	1538	1740	1736	1788
Q Serve(g_s), s	3.0	6.6	8.0	14.8	0.0	13.8	10.0	25.7	0.0	8.8	15.4	15.4
Cycle Q Clear(g_c), s	16.8	6.6	8.0	21.5	0.0	13.8	10.0	25.7	0.0	8.8	15.4	15.4
Prop In Lane	1.00		1.00	1.00		0.38	1.00		1.00	1.00		0.12
Lane Grp Cap(c), veh/h	225	568	482	316	0	547	282	725	616	212	611	629
V/C Ratio(X)	0.19	0.36	0.43	0.62	0.00	0.67	0.85	0.92	0.00	0.98	0.69	0.69
Avail Cap(c_a), veh/h	225	568	482	320	0	555	326	725	616	212	611	629
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.1	19.4	19.9	27.7	0.0	21.8	30.1	21.0	0.0	32.4	20.6	20.6
Incr Delay (d2), s/veh	0.4	0.4	0.6	3.6	0.0	3.2	17.2	18.1	0.0	55.4	6.3	6.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	3.3	3.4	4.2	0.0	6.9	6.1	16.4	0.0	7.5	8.5	8.7
LnGrp Delay(d),s/veh	29.5	19.8	20.5	31.2	0.0	25.0	47.3	39.1	0.0	87.8	26.9	26.7
LnGrp LOS	C	B	C	C		C	D	D		F	C	C
Approach Vol, veh/h		457			565			902			1065	
Approach Delay, s/veh		21.0			27.2			41.3			38.7	
Approach LOS		C			C			D			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.0	34.1		28.2	16.6	30.5		28.2
Change Period (Y+Rc), s	4.0	4.5		4.5	4.5	4.5		* 4.5
Max Green Setting (Gmax), s	9.0	28.5		23.5	14.0	23.0		* 24
Max Q Clear Time (g_c+I1), s	10.8	27.7		18.8	12.0	17.4		23.5
Green Ext Time (p_c), s	0.0	0.7		2.2	0.2	4.1		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	34.6
HCM 2010 LOS	C

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HCM 2010 Signalized Intersection Summary
47: Canyon Rd & I-90 WB Ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	30	360	480	100	170	490
Future Volume (veh/h)	30	360	480	100	170	490
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863
Adj Flow Rate, veh/h	33	391	522	109	185	533
Adj No. of Lanes	1	1	2	0	1	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	532	475	977	203	464	1846
Arrive On Green	0.30	0.30	0.33	0.33	0.11	0.52
Sat Flow, veh/h	1774	1583	3012	607	1774	3632
Grp Volume(v), veh/h	33	391	316	315	185	533
Grp Sat Flow(s),veh/h/ln	1774	1583	1770	1756	1774	1770
Q Serve(g_s), s	0.8	13.2	8.3	8.4	3.5	4.9
Cycle Q Clear(g_c), s	0.8	13.2	8.3	8.4	3.5	4.9
Prop In Lane	1.00	1.00		0.35	1.00	
Lane Grp Cap(c), veh/h	532	475	592	587	464	1846
V/C Ratio(X)	0.06	0.82	0.53	0.54	0.40	0.29
Avail Cap(c_a), veh/h	756	675	1076	1068	748	2153
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.4	18.8	15.5	15.6	10.1	7.8
Incr Delay (d2), s/veh	0.1	6.8	0.7	0.8	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	6.6	4.2	4.2	1.7	2.4
LnGrp Delay(d),s/veh	14.5	25.6	16.3	16.4	10.3	7.9
LnGrp LOS	B	C	B	B	B	A
Approach Vol, veh/h	424		631			718
Approach Delay, s/veh	24.7		16.4			8.5
Approach LOS	C		B			A

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	10.8	24.2				35.0		22.7
Change Period (Y+Rc), s	5.1	5.4				5.4		5.9
Max Green Setting (Gmax), s	14.9	34.6				34.6		24.1
Max Q Clear Time (g_c+I1), s	5.5	10.4				6.9		15.2
Green Ext Time (p_c), s	0.2	8.4				8.8		1.6

Intersection Summary		
HCM 2010 Ctrl Delay		15.2
HCM 2010 LOS		B

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HCM 2010 Signalized Intersection Summary
48: Canyon Road & I-90 EB Ramp

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	130	270	410	50	140	310
Future Volume (veh/h)	130	270	410	50	140	310
Number	3	18	2	12	1	6
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00	
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1583	1583	1638	1638	1743	1743
Adj Flow Rate, veh/h	141	0	446	54	152	337
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	20	20	16	16	9	9
Cap, veh/h	179	160	1116	948	630	1187
Arrive On Green	0.12	0.00	0.68	0.68	0.68	0.68
Sat Flow, veh/h	1508	1346	1638	1392	837	1743
Grp Volume(v), veh/h	141	0	446	54	152	337
Grp Sat Flow(s),veh/h/ln	1508	1346	1638	1392	837	1743
Q Serve(g_s), s	4.1	0.0	5.4	0.6	4.4	3.4
Cycle Q Clear(g_c), s	4.1	0.0	5.4	0.6	9.7	3.4
Prop In Lane	1.00	1.00		1.00	1.00	
Lane Grp Cap(c), veh/h	179	160	1116	948	630	1187
V/C Ratio(X)	0.79	0.00	0.40	0.06	0.24	0.28
Avail Cap(c_a), veh/h	603	538	1116	948	630	1187
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.3	0.0	3.1	2.4	5.3	2.8
Incr Delay (d2), s/veh	7.5	0.0	1.1	0.1	0.9	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.1	0.0	2.7	0.2	1.1	1.8
LnGrp Delay(d),s/veh	26.7	0.0	4.2	2.5	6.2	3.4
LnGrp LOS	C		A	A	A	A
Approach Vol, veh/h	141		500			489
Approach Delay, s/veh	26.7		4.0			4.3
Approach LOS	C		A			A

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		35.2				35.2		9.8
Change Period (Y+Rc), s		4.5				4.5		4.5
Max Green Setting (Gmax), s		18.0				18.0		18.0
Max Q Clear Time (g_c+I1), s		7.4				11.7		6.1
Green Ext Time (p_c), s		3.7				2.6		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	7.0
HCM 2010 LOS	A

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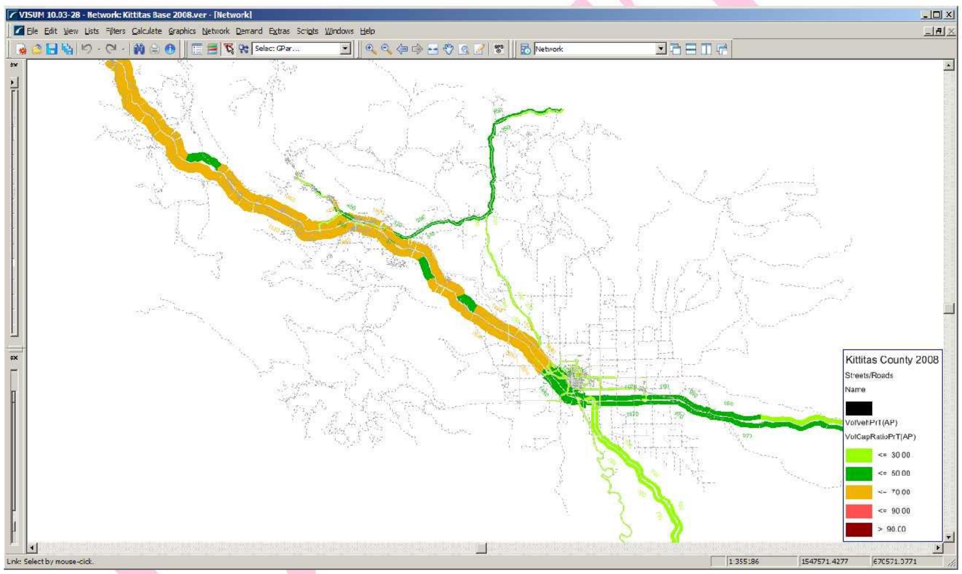
APPENDIX E TRAVEL DEMAND DOCUMENTATION

Kittitas County

Transportation Model Documentation



Prepared for

Kittitas County, Washington

Prepared by

PTV – America, Inc. - Tacoma, Washington

May 2009

Introduction

This document provides a summary of the process and the parameters used to update and develop the transportation model for Kittitas County. This model is intended to represent base year conditions for 2008. Also discussed is the methodology used in providing forecasts for the years 2030 for use in recommendations with the Kittitas County Plan and to evaluate other proposed improvements. The knowledge of the procedure used to develop the models and the forecasts is important for the future application of the models.

This model, for use by Kittitas County, will assist in the development and evaluation of future transportation improvement projects.

PTV America developed this 2008 Kittitas County model from the Kittitas County transportation model developed in 2005 and updated for the City of Ellensburg in 2007. The Kittitas County model was completed in August of 2005 and was developed by PTV America in conjunction with Valerie Southern, Transportation Consultant, LLC, and Garry Struthers and Associates, Inc. and in cooperation with Kittitas County. The 2005 Kittitas County model was based upon models for Kittitas County, Ellensburg, and CleElum/Roslyn from various earlier years. These models were developed between 1994 and 2000 using the TMODEL software package.

These previous models were converted into the VISUM software package for ease of data transfer. The new Kittitas County model network was built from NAVTEQ data. The NAVTEQ data is network definition data used in many mapping software including Mapquest, Microsoft Streets and Trips, and used for onboard vehicle navigation systems. The data includes all streets and roads (including names) and data on lanes, speeds, and turn restrictions so it can be used for routing. For purposes of the Kittitas County model this data was further enhanced with data from the previous models, data from the road deficiency reports, and field review. The data was further refined as more detailed parcel level land use data was provided for the 2008 Kittitas County model.

This transportation planning model is a representation of Kittitas County, roadway transportation facilities and the travel patterns using these facilities. The model contains inventories of the existing roadway facilities and of housing, shopping, employment, and other land use in the area. These inventories, along with model "rules" are used to generate traffic volumes for all roadways within the model. These forecast volumes are compared with current traffic counts. When the model matches the traffic counts within acceptable ranges of error, the model can then be used to test future year scenarios. These scenarios may be changes in number of housing units, employment quantities, travel behavior patterns, or roadway improvements. The transportation planner, using the transportation planning model, can project future traffic volumes without the cost of building inappropriate roadways or waiting for traffic congestion to severely impact travelers.

The 2008 Kittitas County model was developed with version 10.03+ of VISUM, part of the PTV Vision Suite of software. Most importantly, this version of the model was updated in 2009 with updated base year land use inventory and forecasts supplied by Kittitas County, new traffic count data supplied by Kittitas County and the City of Ellensburg. This update included review of the network and forecasts involving Kittitas County staff.

This document describes the methodology that PTV America, Inc. (PTV) and Kittitas County staff used to develop the model. Because modeling is a complex process, much of the theory, terminology, and concepts are also discussed.

The Modeling Process

A transportation planning model is constructed with the purposes of forecasting traffic and operating conditions. The model is first calibrated to replicate existing or base-year travel patterns. The model inputs are then modified to represent future conditions, making it possible to project traffic volumes. This gives transportation planners and engineers the ability to determine the impact of different roadway or land use scenarios on the traffic network. This, in turn, allows the professional to evaluate economic decisions on potential capital improvements and then make appropriate plans. One such use of these models is to test several forecast conditions.

Model Area Identification

The modeling process begins by determining the area to be modeled. The Kittitas County model includes major roadway facilities within the Kittitas County boundaries, including all cities. When the county model was developed, detail within the City of Ellensburg and to some extent within the Cle Elum area was included so that the model could be later refined for use by the cities. Because the model was developed with the NAVTEQ data set as its basis, the model also includes rail and trail transportation links and other points of interest such as rivers and lakes. The model area with traffic analysis zone boundaries is shown in Figure 1.

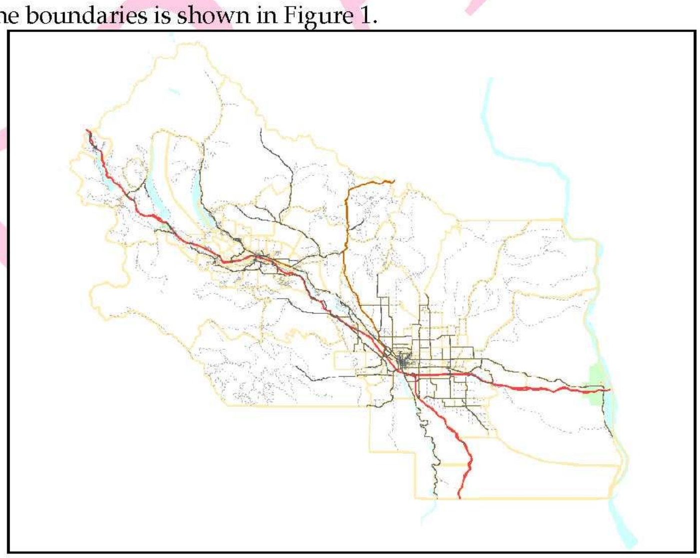


Figure 1 - Model Area with TAZ Structure

The Kittitas County model encompasses the entire county and includes all of the roadways classified as collector or greater within the county. The included network is described in more detail later in this document. The original network was based upon the cities' and county's roadway functional classification maps as determined by Kittitas County staff. Additional streets or roads were added based upon the judgment of the Kittitas County staff. Roadways included in the Kittitas County model are shown in Figure 2. It is important that the model include the major roads leading in, out, and through Kittitas County because these have an impact on traffic within Kittitas County.

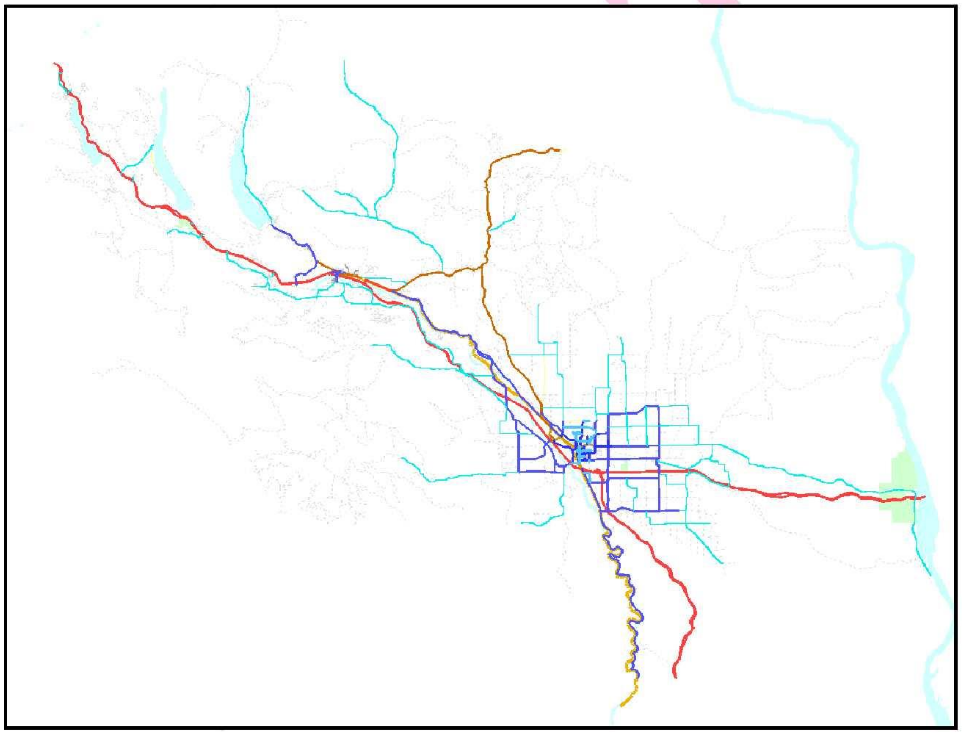


Figure 2
Kittitas County Model Network

The model Traffic Analysis Zones, also known as TAZs are areas with points where trips begin and end. These are used to inventory all of the land use or attributes that generate traffic. For the previous modeling efforts, Kittitas County supplied a TAZ system that was developed previously by county staff. For the 2008 Kittitas model, the TAZ system was reviewed and revised. Traffic Analysis Zones were subdivided in growth areas and other locations to match the detail of the network. The TAZ system used for the model was shown in Figure 1.

Two types of zones were used: *internal and external*. *Internal zones* can consist of a single parcel, a group of like land uses, or a gathering of local land uses separated by natural, physical, or political boundaries. Several factors are considered to find the best zonal design. The primary factor is related to the results expected of the model. It may be logical to place the zone in a way that groups all land uses bounded by network roadways. The second factor is how the available land use information is geographically described. Because the land use data was derived from the Kittitas County parcel layer, the TAZ structure could be defined to best match the transportation system. The Kittitas County model now consists of 300 internal zones.

External zones account for all vehicle trips that enter and leave the model area. Depending upon the desired results, it may be logical to place an external zone on each roadway that leaves the network. In other cases, local traffic conditions may establish a need to tie together several exiting roadways into a single zone so that the external destination of the trip can be simulated. For the Kittitas County model, it was decided that the external zones would be placed at the following locations:

External Zone	Location
1000	I-90 West
1001	SR 97 North
1002	I-90 East
1003	I-82 South
1004	SR-821 South

Data Collection and Coding

After the model area has been identified, the collection and entry of the necessary data to run the modeling program begins. There are two primary components to be entered: network and travel characteristics. The network data includes: roadway (link), intersection (node), turn movement penalty, link delay functions, and node delay functions. Roadway or link data includes traffic count data for links and turning movements at key intersections. Travel characteristic data includes the land use inventory, trip generation rates, external volume data (volumes entering, exiting, and traveling through the model area), and trip length frequency distributions. PTV America conducted a field review of major facilities within the county including some locations with Kittitas County staff.

Upon completion of data collection, development of the model's mathematical "rules" began by coding the information and readying it for entry into VISUM. Essentially all entered data is numeric. Each entry, such as speed limits for links, capacities for nodes, and collected land use data, is used by the model to estimate network or street volumes. The VISUM software contains many equations and algorithms that help the traffic volume computation process. Therefore, given the amount of data in the transportation planning model, it is advisable to group like data together and assign uniform values. For example, link and node capacities are assumed to be uniform for links and nodes of similar classifications and types throughout the model area. In actual practice, these capacities are unique to the location and road conditions. The method for developing these “blanket” values is considered part of the model's rule-building process.

Calibration

After all data has been collected, coded, and entered in the VISUM program, the calibration process begins. In this task, the data and the model rules are refined so that the model closely simulates existing travel patterns and volumes on the roadway network. Calibration is performed by conducting a series of simulation runs and evaluating the results. The calibration is considered complete when the results of the simulation runs are statistically similar to the traffic count volumes and other measures of travel behavior.

Distribution and *assignment* are the two steps undertaken during a typical model simulation run. *Distribution* is the process of allocating trips between various zones within the network. The product of the distribution is a trip table that lists the number of trips between the model's zones. The distribution for this model was computed with the VISUM/TMODEL form of the gravity model.

Application of the gravity model in transportation modeling is derived from earlier work with economic interaction through a study of social physics. The idea, simply put, is that more interactions (between different zones) take place when the cost of interacting is less. As with the physics of gravitation between masses, it has been found that many human interactions can be related to the distance or cost between interactors using a negative exponential function.

In the Assignment portion of the simulation run, the distributed trips on the trip table are assigned to possible paths between each zone. The assignment uses an algorithm known as "equilibrium" assignment. This algorithm assigns traffic to each path between each zone such that the travel time for each path between each path is statistically equal.

Each model run consists of multiple feedback loops from trip assignment to trip distribution. The skim matrix of travel time between zones is fed back after each assignment into the trip distribution. The skim matrix is then averaged (weighted more heavily towards the current iteration) between the previous iterations' skim matrix with this iteration's skim matrix This method of skim matrix averaging and feedback loops produces more stable results and more accurately represents the impact on travel distributions from travel times. This allows the distribution to change as travel times increase or change between zones. Trips will distribute to other zones which are easier to reach or not as congested as reflected in the skim matrix.

This model also used Multi-Point Assignment (MPA). Traditionally all trips begin or end at the zone centroid, a point in the center of the zone. In reality, trips begin at driveways, parking lots, and other places in the zone. MPA allows the modeler to define the access points for each zone. These were assigned equally for each connector, except in cases where the access would be different. For speed of the model run, the MPA function is turned off during the iterative distribution and assignment portion, and then once the final trip matrices are established, MPA is turned back on for a highly refined assignment.

The series of calibration simulation runs involves review of the assumptions used to construct the model. In the distribution portion of the simulation, the exponents to the distance function of the gravity model are examined. During the assignment portion of the simulation, the assumptions for link speeds, capacities, and delay parameters are studied. Between each run, different parameters are evaluated and necessary adjustments made to the "rules" so that the desired results (i.e., calibration) are reached.

Before any adjustments to the Kittitas County model parameters were made, they were justified either through the collected travel pattern data or the judgment of PTV America and their experience with transportation planning models and travel conditions throughout the model area.

Model Forecasts

The fourth and final step to modeling is future scenario travel forecasting. With a working calibrated transportation planning model, different land use and/or roadway projections can be entered to produce forecast results on the roadway network. Before the actual forecast can begin, this question must be raised: Are the rules established in calibration still applicable to future scenarios?

Only professional judgment can answer this question. Most rules that are questioned will involve the roadway characteristic assumptions (speed, capacity, number of lanes, etc.) and should not require any model re-calibration. To complete the forecasts, the appropriate link, node, land use and/or through trip table file is changed by entering the future scenario data.

After the forecast evaluation is complete, it is possible to make recommendations for the study area and test each recommendation to analyze its effectiveness on the roadway network. VISUM can compute link volume changes due to modifications in capacity, land uses, roadways, etc. These types of VISUM tools are a valuable resource for decision makers and transportation professionals in determining the most effective solutions for mitigating existing and potential roadway congestion. For this study, different sets of proposed improvement projects were coded into the model and tested. Each of these scenarios was evaluated with Kittitas County Staff. Furthermore, Kittitas County Staff was trained in use of the model so future alternatives can be rapidly evaluated.

Background Data and Modeling Assumptions

The primary goal of this transportation planning model is to simulate the PM peak hour of travel on the roadway network in Kittitas County. In order for this simulation to be effective, it is important to obtain all transportation related data for that peak hour (a "snapshot" of time). It was also decided that the traffic model would replicate a 2008 weekday evening (PM) peak-hour.

The following section describes the various data used to develop the model. It is subdivided into two sections corresponding to the two primary components of a transportation planning model:

- network characteristics
- travel characteristics data.

NETWORK CHARACTERISTICS DATA

After establishing the model area, the existing model was reviewed and updated. All roadways classified as collector or greater throughout Kittitas County were included. As noted previously, the network was reviewed by Kittitas County Staff and some additional network facilities were added. Data is encoded to describe both the links and the nodes. A link is a vector that describes connectivity between two nodes. A node is an end point of a link. Typically, a node can be an intersection or an intermediate point between intersections.

This model was developed using the geographically accurate NAVTEQ data set. Much of the data was already coded. This data was refined during the model development process.

Roadway (Link Data)
After establishing the model area, the existing model was reviewed and updated. In expanding the model, all roadways classified as local street or greater throughout the study area were included.
Data attributes entered for the link layer in VISUM:

- Link Type
- TSys (Transport System)
- One- or Two-way Direction
- Number of Lanes
- Capacity
- Length
- Design Speed (or posted speed limit)
- TWLTL (Two-Way Left Turn Lanes)

Link Type
Link Type is used to describe the functional classification of the network links for the Kittitas County model. The Type numbering corresponds to the FHWA roadway classification numbering system. Link Delay functions are coded to operate with these link types. It is important to code future network revisions with the correct link classifications. Link types in the model are shown described in Table 1 and shown in Figure 3.

Please note that there is no link type for centroid connector as VISUM has a special layer for centroid connectors and thus they are not coded as links. Link type 99 was used to denote the John Wayne Trail. Other links are in the model for future use but if they are not given a Type number they have not been "activated" for use in the model.

Table 1
Link Type Class
2008 Kittitas County Transportation Planning Model

Type Number	Facility Type
1	Interstate Principal Arterial (Rural Freeway)
2	Principal Arterial (Rural)
3	Freeway Ramps
6	Minor Arterial (Rural)
7	Major Collector (Rural)
8	Minor Collector (Rural)
9	Local (Rural)
11	Interstate Principal Arterial (Urban Freeway)
12	Expressway Principal Arterial (Urban)
14	Principal Arterial (Urban)
16	Minor Arterial (Urban)
17	Collector (Urban)
19	Local (Urban)
99	Trail

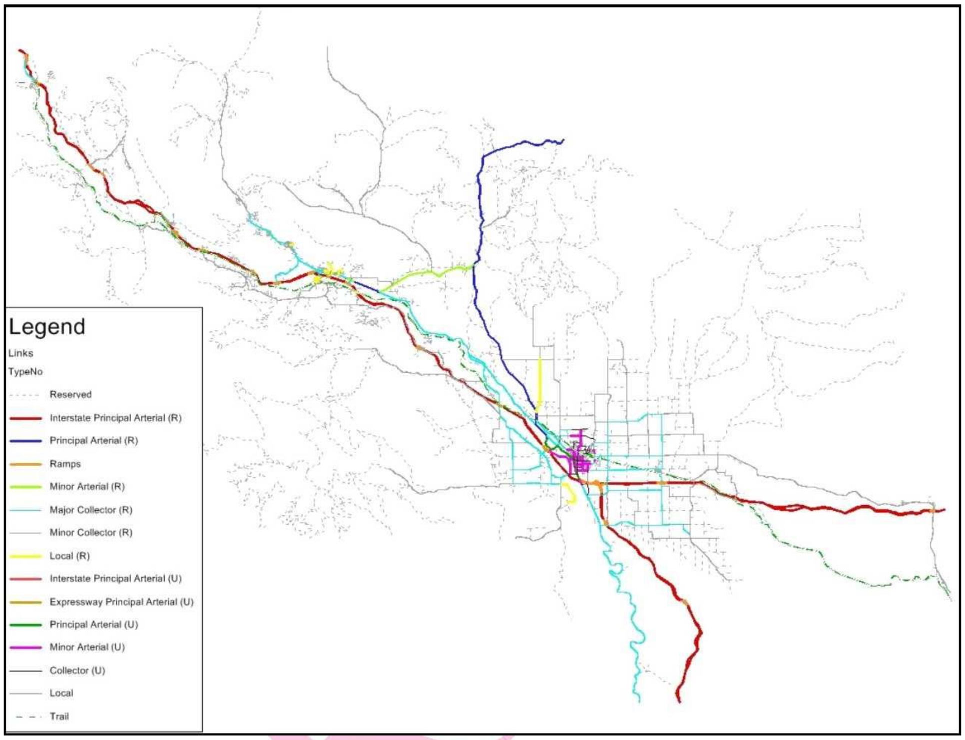


Figure 3
Kittitas County Link Types

TSys

VISUM permits the specification of Transportation Systems or TSys for short. Because the network was constructed from the NAVTEQ data, only the model links (those classifications specified with a Type 1-19 were given the ability to carry Cars and Trucks. All of these links permitted both Cars and Trucks. However, trucks were assumed to be equal to four (4) passenger car units (PCU) for capacity and delay computations. This higher value was used to reflect the situations where trucks are operating on steep grades or, when in urban areas, have a lot of starts and stops, making the impact of a truck greater. Therefore, truck assignments were kept separate from the car assignments. It is important during the testing of scenarios that the proper TSys is activated for new links as well as for turns.

Although transit was not explicitly analyzed as a part of this study, a TSys for Bus was also created for future use.

One- or Two-way Direction

All links were checked for one- or two-way entry. Interstate 90 and Interstate 82 were coded as pairs of one-way links in VISUM. Typically, freeways segments in modeling are split into a pair of one-way links so that the difference in capacities and directional splits can be modeled appropriately. On and off ramps for these facilities were also coded as one-way links.

A one-way link is entered in VISUM by permitting only the car and truck transportation systems (TSys-Car and TSys-Truck) to move in one direction and not the other.

Number of Lanes

This attribute is used in the VISUM model run to assign capacities to network links. It is also used for display and for entering intersection geometry in VISUM. All model links were checked for accuracy with this designation. Number of lanes per direction is shown as Figure 4.

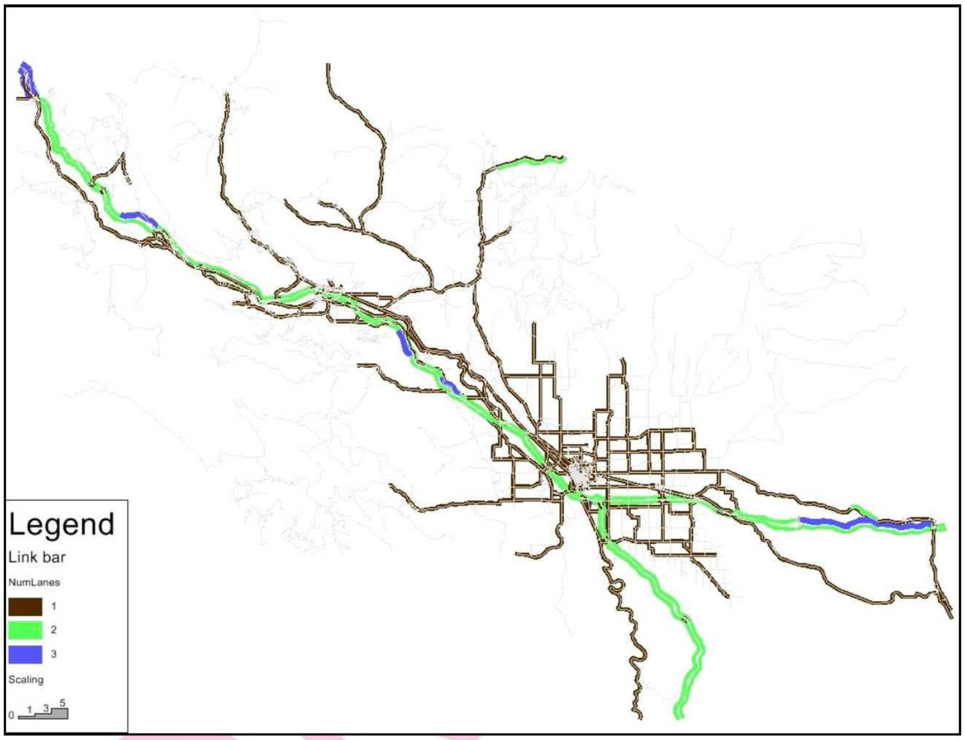


Figure 4
Kittitas County Number of Lanes

Capacity
Capacity is entered in terms of vehicles per hour per lane (vphpl) for each link, directionally. For the Kittitas County model, capacities were based upon Special Report 209 "Highway Capacity Manual", Transportation Research Board, National Research Council, Washington, D.C. 1985, updated 1994, and PTV America experience with other models.

The capacities are used for both model operation and network analysis. In the context of model operation, the capacities are used in conjunction with link speeds, link lengths, and speed-delay functions to derive a realistic travel speed to be used in the distribution of travel and the derivation of appropriate travel routes. In the context of network analysis, the capacities are used to identify deficiencies and recommend improvements. In both cases, it is desired that the capacities used in the model be as accurate and realistic as possible. These capacities were modified slightly during model calibration to better match local conditions. These were further revised during the 2009 update based upon the new traffic count and land use data, including adding 200 vehicles per hour per direction for links with Two-Way Left Turn Lanes. Table 2 represents the capacities used for the model.

Table 2
Link (Roadway) Type/Capacities
2005 Kittitas County Model

Link Type	Facility Type	Capacity (vphpl)
1	Interstate Principal Arterial (Rural Freeway)	2000
2	Principal Arterial (Rural)	1200
3	Freeway Ramps	1200
6	Minor Arterial (Rural)	1200
7	Major Collector (Rural)	1000
8	Minor Collector (Rural)	800
9	Local (Rural)	600
11	Interstate Principal Arterial (Rural Freeway)	2000
12	Expressway Principal Arterial (Urban)	1600
14	Principal Arterial (Urban)	1400
16	Minor Arterial (Urban)	1200
17	Collector (Urban)	800
19	Local (Urban)	600
99	Trail	NA

Length

In VISUM, all lengths are automatically calculated. The program will calculate lengths for each link during data entry and any subsequent future modifications. After the link lengths were calculated for the Kittitas County model, link lengths were checked to confirm that the function was working properly. Typically in a model for a county that has relatively long travel times on the externals the external link lengths are adjusted. For this model, the additional travel times in and out of the model area were coded into the centroid connectors. The model scale is set in the Network Parameters section. This assures that whenever a link is added, re-shaped, or a node is moved, the link length will be recalculated using this scale.

Design Speed
Link speeds are entered in VISUM in miles per hour. Speeds have a direct influence on the computation of travel times during simulation runs. Generally, posted speed limits are entered into the program during the initial data entry phase. However, posted limits do not always accurately depict the free-flow conditions on the roadway. For example, some state highways have 65 mph speed limits in urban areas that are often ignored. Conversely, some locations may have posted limits greater than what can be achieved (e.g., arterials in fully developed areas with numerous driveways and signalized intersections).

Speeds were entered from the NAVTEQ data and then updated with data from the previous models, the data collected during other portions of this study, and during the field review.

TWLTL
Links are coded with locations with Two-Way Left Turn Lanes (TWLTL). This adds 200 vehicles per hour to the capacity. This should be coded for both directions of a link.

Link Delay Coefficients
Travel time on each individual link typically increases as the traffic volume on the link approaches capacity. Current research has shown that the amount of travel time increase depends on the functional classification of the link as well as the region and the behavior of the drivers using that link. VISUM offers the ability to adjust the travel time increases on the link as the volume-to-capacity (V/C) ratio changes by functional classification of the link. This feature was used during the calibration process.

During calibration analysis, both link operating speeds and total (including both link and node delays) operating speeds can be analyzed. This differential analysis is used to adjust both the link and node delay coefficients. The final values used in the model calibration are shown in Table 3. These values are similar to others used in central Washington and are based upon experience with travel behavior in this area. The form of the equation is shown as:

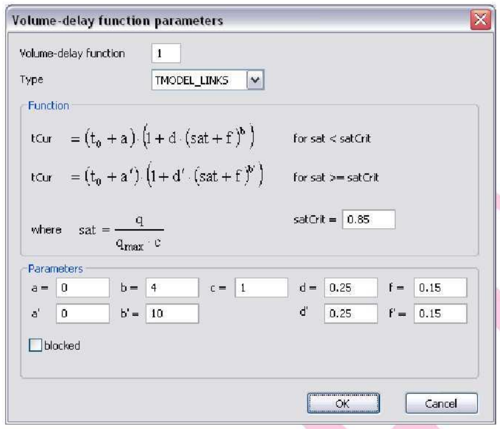


Table 3
Link Delay Coefficients
2008 Kittitas County Transportation Planning Model

Link Type	V/C < SatCrit			SatCrit	V/C => SatCrit		
	d	b	f		d′	b′	f′
1	0.25	4.0	0.05	0.95	0.25	10.0	0.05
2	0.25	4.0	0.15	0.85	0.25	10.0	0.15
3	0.25	4.0	0.15	0.85	0.25	10.0	0.15
6	0.25	4.0	0.25	0.75	0.25	10.0	0.25
7	0.25	4.0	0.25	0.75	0.25	10.0	0.25
8	0.25	4.0	0.25	0.75	0.25	10.0	0.25
9	0.25	4.0	0.25	0.75	0.25	10.0	0.25
11	0.25	4.0	0.15	0.85	0.25	10.0	0.15
12	0.25	4.0	0.15	0.85	0.25	10.0	0.15
14	0.25	4.0	0.25	0.75	0.25	10.0	0.25
16	0.25	4.0	0.25	0.75	0.25	10.0	0.25
17	0.25	4.0	0.25	0.75	0.25	10.0	0.25
19	0.25	4.0	0.25	0.75	0.25	10.0	0.25

INTERSECTION NODE DATA

Data entered for each node include the following:

- Type
- Node Capacity Factors
- Capacity
- TMODEL Special Delay Links (SDLs)
- Base Delay
- Turns

Node Type
The node classifications were coded in the model dependent upon the intersection control. Table 4 lists the node types. These were modified from the previous model structure to represent current practice.

Table 4
Node (Intersection) Type
2008 Kittitas County Transportation Planning Model

Node Type	Description
1	Not an Intersection
4	Freeway Ramp Terminal – Merges
5	Freeway Ramp Terminal – Diverges
10	All-way Stop
11	Partial Stop
20	Signal
21	Signal not at network intersection
30	Roundabout

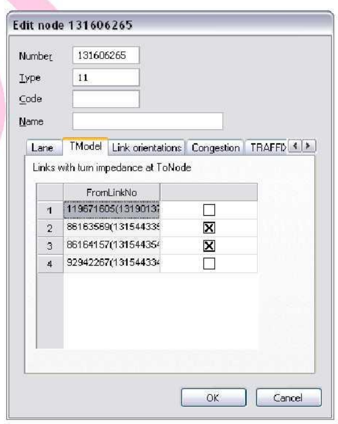
Node Capacity
Using Capacities at all nodes is one of VISUM's three options to model delays based upon traffic congestion at the intersections. This feature has been incorporated into the Kittitas County model so that delays at these critical points on the network can be

modeled to reflect the impacts upon traffic flow patterns. For the 2008 Kittitas County model, VISUM calculates node capacities using the following node equation:

Node Capacity = K1 + K4 * (Entering Link Capacity)

Node capacities for the Kittitas County model use the K1 and K4 constants. K4 was used to simulate the effect that a green time-to-cycle length (G/C) ratio has at an intersection. For modeling purposes, it was assumed that when similar link types classes meet, the G/C ratio is fairly even, and as the roadway meets lesser class roadways, the green time, or G/C ratio increases on the major facility. This effect is reflected in the increasing values of the K4 constant as the difference in entering link types or classifications is more disparate. When there are less than three (3) intersection legs, the K4 constant is increased by .05 to reflect the impact of a smaller number of conflicts. When there are five (5) or more intersection legs, the K4 constant is decreased by .05 to reflect the impact of more conflicts, which take green time, at the intersection. For shape nodes of Type 1 and Ramp Diverge nodes of Type 5 a K4 value of 1.0 should be used.

Special Delay Links (SDLs)
Another special feature in VISUM (and previously in TMODEL) is the ability to model intersections under STOP or YIELD control. SDLs at a node denote which link(s) are under two- or three-way STOP or YIELD control. If an intersection is a four-way STOP, then no SDLs are entered. SDLs are coded using the node dialog box with the TModel tab.



SDLs work in the VISUM model run. As traffic is loaded onto the network, the program calculates Volume-to-Capacity (V/C) ratios at each node. Intersection delay is calculated using the V/C ratio (more on how the program calculates the delay is presented in later sections of this report). If SDLs are specified at the nodes, then any delay calculated during the simulation run is assigned to the special delay link(s) approaching the node to simulate a STOP or YIELD condition. Under a four-way STOP condition, delay is experienced on all four legs and no SDLs are entered for this condition.

All nodes were checked to insure that SDLs were coded where appropriate for partial way stop controlled intersections.

Base Delay

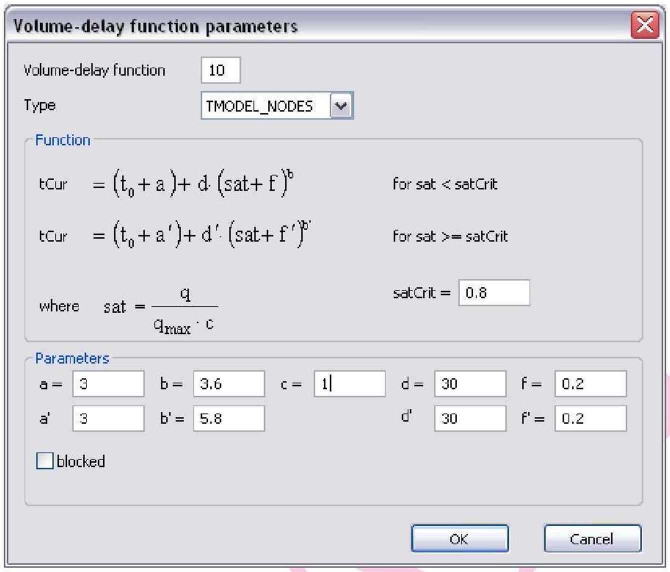
Additional delay, called t0 in VISUM, can be added to an intersection if a known condition exists. These conditions could include an all red condition at a signal, pedestrian phases, or a node representing a railroad crossing. No additional base delays have been used in the Kittitas County model.

Turn Penalty

At some locations on a network it may not be possible to execute a certain turn movement or there can be a capacity constraint due to the drivers' perception of restricted sight distance or other potential safety concerns. If a movement is not allowed, then the transportation system car is removed from the turning movement layer in VISUM. Turns were restricted as necessary. At left turns at stop and signal controlled nodes, a base delay, or t0, of 6 seconds was added. These same left turns were given a capacity of 250 vehicles per hour so the turn delay would increase as the volume of the left turn increased.

Node Delay Coefficients

The delay caused by different types of intersection control must be defined to reproduce the delays that drivers perceive. The resultant extra travel time is dependent upon the volume-to-capacity ratio (V/C) and varies by Type of the nodes. These use the TMODEL_Nodes equation as shown in this dialog box:



The final values used are shown in Table 5.

Table 5
Node Delay Coefficients
Kittitas County 2008 Transportation Planning Model

Node Types	V/C < SatCrit				SatCrit	V/C => SatCrit			
	D	b	f	a		d′	b′	f′	a′
1, 5	0	0.01	0	0	0	0	0	0	0
4	30	3.80	0.15	0	0.85	30	5.80	0.15	0
10	30	3.60	0.20	3	0.80	30	5.80	0.20	3
11	30	3.60	0.20	3	0.80	30	6.00	0.20	6
20, 21	30	3.60	0.20	1.2	0.80	30	5.00	0.20	1.2

LAND USE AND TRAVEL CHARACTERISTICS

The central point of each traffic analysis zone (TAZ), where trips begin and end on a transportation planning model network, is called a zone centroid. Zone centroids are at the center of a zone which consists of a variety of land uses bounded by either the roadway network or other geographic or municipal boundaries. The TAZ system was established from a TAZ system originally developed by Kittitas County staff. This TAZ system was revised slightly to disaggregate into smaller zones in the Suncadia and CleElum UGA area. A graphic of the TAZ boundaries is shown as Figure 1.

The Kittitas County model consists of two zone types: internal and external. Internal zones were those zones within the model area. Internal zones have associated land use data that is used to generate origins and destinations. External zones were placed along roadways entering and leaving the Kittitas County model area. Land use is not associated with external zones; rather the traffic volumes coming in and out of the area are used to describe the origins and destinations for these zones.

During this model update, a number of zones were disaggregated to allow a finer granularity of traffic assignment. The majority of the disaggregated zones were in the areas surrounding Cle Elum. As a part of this zone reorganization, the zone numbering scheme was modified throughout the network to a more intuitive numbering scheme. In general, the zone numbers in each area increase from west to east and from north to south. A record of the old zone numbers can be found within a user-defined attribute of each zone called "OLDZONENO". The new numbering scheme is as follows:

Zones	Area
1 to 71	Internal Zones - representing the Ellensburg Area.
100 to 179	Internal Zones - representing the Cle Elum-Roslyn Area.
200 to 272	Internal Zones - representing the Upper Kittitas County Area excluding zones from the Cle Elum-Roslyn Area.
300 to 313	Internal Zones - representing the Lower Kittitas County Area excluding zones from the Ellensburg Area.
400 to 461	Internal Zones – representing the Range Area of Kittitas County.
1000 to 1004	External Zones - representing the entry/exit points from the model area.

Data for each land use variable, such as numbers of dwelling units, employees, etc. is required for each TAZ. This data is required for the base year calibration as well as for each forecast scenario. When this was not available, various procedures were used to derive this data.

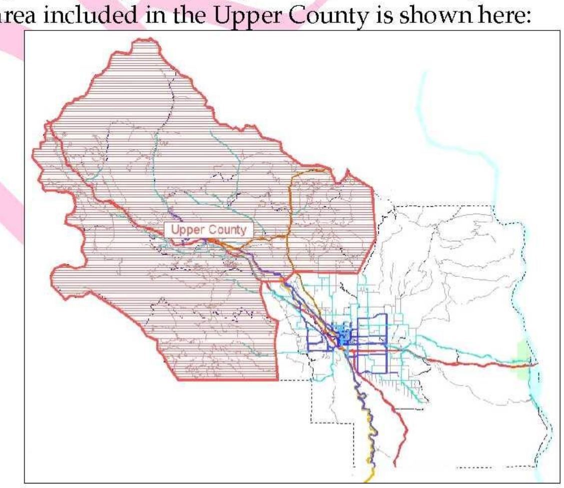
Summary of the Procedures for Compiling Kittitas County Land Use

The Kittitas County land use data was updated using data from multiple sources for both the base year and the forecast scenarios. The transportation model requires not only numbers of dwelling units but also levels of employment, as measured by floor area, by type of employment and can also include other types of land use not specifically related to dwelling units or employment.

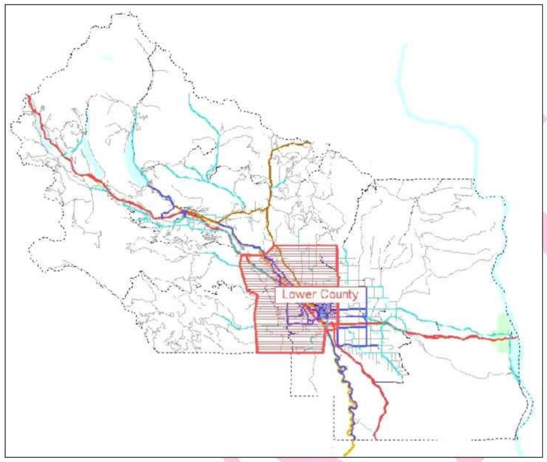
Internal Zone Data

The residential land use was further divided into residential categories for Upper County, Lower County, and Range to allow for more accurate trip generation. Much of the residential in the Upper County is vacation or recreational property and hence has a lower average trip generation rate. The Agriculture/Forestry/Mining classification was also divided to differentiate by trip generation as well. Typically irrigated agriculture has higher trip generation than range land.

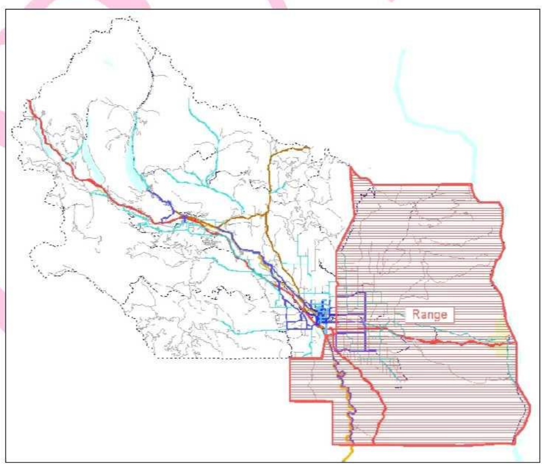
The Upper County area is typically the part of Kittitas County that is West and North of Ellensburg. The area included in the Upper County is shown here:



The Lower County includes the area around Ellensburg. This area is shown as:



The Range area of the county is shown as:



Land Use Detail

For Kittitas County, PTV America analyzed the area with using a variety of sources of information to create a credible database of land use information. This involved using the Kittitas County GIS coverage, inventorying occupancy by land use type, and computing expected numbers of dwelling units, employees, and students. These were compared with previous data and computations.

All land use data was summarized into the following:

LU1 **Single Family Residential** includes those lands occupied by either a single family home, a manufactured home, or a duplex on a single lot. Measured in dwelling units.

LU2 **Multi-Family Residential** uses three or more or more residential units on a parcel of land. Also, this category includes mobile home parks, apartment buildings, and condominiums. Measured in dwelling units.

LU3 **Hotel** includes motel rooms, hotels, and camp areas. Measured in number of rooms or designated camp areas.

LU4 **Retail Trade** includes a variety of uses identified by Kittitas County staff. Retail uses include a broad range of establishments which sell goods directly to the general public, such as restaurants, automotive dealers, home furnishings, food stores or other products. Measured in thousand square feet.

LU5 **Industrial and Manufacturing** includes a variety of uses identified by Kittitas County staff, within a broad range of general or specialty contractors: the production of food, textile, wood, furniture, paper, printing, metal, machinery, electrical and other products; and also includes Transportation, Communication and Public Utilities, such as railroads, trucking and warehouse, air transportation, pipelines, communication towers and electrical, gas and sanitary services. Measured in thousand square feet.

LU6 **Office** are those land uses which are owned, or operated by units of government and provide the administration of public programs, which are identified by Kittitas County staff. Also included are offices with minimal customer traffic. This includes the state patrol. Measured in thousand square feet.

LU7 **FIRES (Finance Insurance Real Estate and Services)** includes a variety of uses identified by Kittitas County staff. Services and offices include banks or other financial institutions, real estate and insurance offices, personal services, such as laundry or cleaning services, business services such as advertising, automotive repairs, amusements, churches, health care, medical, legal services and other assorted services. Measured in thousand square feet.

LU8 **Elementary and Middle Schools** were updated using information obtained from the Washington State Office of the Superintendent of Instruction (OSPI). The website of OSPI listed the number of students that attend each public school during the 2007-2008 school year. Measured in numbers of students.

LU9 **High Schools** were updated using information obtained from the Washington State Office of the Superintendent of Instruction (OSPI). The website of OSPI listed the number of students that attend each public school during the 2007-2008 school year. Measured in numbers of students.

LU10 **College** and University are measured in number of full time equivalent students using data obtained from Central Washington University's website on enrollment during the 2007-2008 school year.

LU11 **Agriculture/Forestry/Mining** generally relate to agricultural production and services without irrigation. Measured in acres.

LU12 **Agriculture-Upper County** is a subdivision of LU11 for those uses in the Upper County area. Typically these include forestry and mining with some limited agriculture. Measured in acres.

LU13 **Agriculture-Lower County** is a subdivision of LU11 for those uses in the Lower County area. Typically these include irrigated agriculture. Measured in acres.

LU14 **Agriculture-Range** is a subdivision of LU11 for those uses in the Range area. Typically these include range and dry agriculture. Measured in acres.

LU15 **Single Family Residential-Upper County** is a subdivision of LU1 for just the zones included in the Upper County area. Measured in dwelling units.

LU16 **Multi-Family Residential-Upper County** is a subdivision of LU2 for just the zones included in the Upper County area. Measured in dwelling units.

LU17 **Single Family Residential-Lower County** is a subdivision of LU1 for just the zones included in the Lower County area. Measured in dwelling units.

LU18 **Multi-Family Residential-Lower County** is a subdivision of LU2 for just the zones included in the Lower County area. Measured in dwelling units.

LU19 **Single Family Residential-Range** is a subdivision of LU1 for just the zones included in the Range area. Measured in dwelling units.

LU20 **Multi-Family Residential-Range** is a subdivision of LU2 for just the zones included in the Range area. Measured in dwelling units.

LU21 **Parks** are those land uses which are open space used for recreation. Measured in acres.

LU22 **Recreation** are those land uses for recreation. Measured in thousand square feet.

LU23 **Medical** are those land uses which are used for hospitals, clinics, or for medical offices. Measured in thousand square feet.

LU24 Wholesale are those land uses which are for wholesale sale or storage. Measured in thousand square feet.

Trip Generation

After the collected land use data was distributed to the model zone system, the number of trips generated by each zone was calculated. This procedure, called trip generation, is a compilation of several mathematical formulas that determine the number of trips produced and attracted to each model zone.

Many transportation engineering projects use the Institute of Transportation Engineer's (ITE) *Trip Generation* report to determine trip generation for proposed projects. Research by ITE has established a series of trip generation rates that, when multiplied by amount of proposed development (e.g., number of dwelling units, employees of commercial or industrial, etc.), produce an estimate of the total number of vehicle trips entering or exiting the development.

While the above application is suitable for many traffic engineering projects, modeling uses a more disaggregate trip generation approach. When a trip distribution model (such as the one used in VISUM) is applied to origins and destinations, different trip *purposes* exhibit different travel *characteristics*. For example, the characteristics of a home-to-work trip are different from a home-to-shopping trip. If trip generation estimates were made simply following just the ITE rates, no distinction could be made. Therefore, it is important that the model generate different trip productions (origins) and attractions (destinations) for different trip purposes so that different travel characteristics can be accounted for in the gravity model.

In its NCHRP reports 187 and 365, the Transportation Research Board (TRB) describes a methodology for trip generation that includes the following trip purposes:

- Home-Based Work (HBW) trips,
- Home-Based Other (HBO) trips, and
- Non-Home-Based (NHB) trips.

These three trip purposes are typically used with most daily transportation models. Because of the spatial structure of the Kittitas County model, it was decided to disaggregate the trip purposes. The Home-Based Work trips were divided into trips between Home-to-Work and Work-to-Home. The Home-Based-Other trips were divided into trips between Home-to-Other and Other-to-Home. By splitting the HBW and HBO trip purposes into their components; this eliminated the possibility of a problem of excessive trips between households. In addition, a Truck trip purpose was added to allow for the explicit generation and tracking of truck trips. Therefore six trip types were used:

- Home to Work (HW) trips,
- Work to Home (WH) trips,
- Home to Other (HO) trips,
- Other to Home (OH) trips, and
- Non-Home-Based (NHB) trips
- Truck trips

PTV America developed the following trip generation factors for use in the model. The base trip generation rates were taken from ITE's *Trip Generation Report*. Factors used to separate the trips into the six purposes and origins-destinations were from NCHRP reports 187 and 365 and experience by PTV America with other studies. The trip generation process used percentage control totals that correspond to data in NCHRP 365 for similar sized areas.

Trip generation rates are set at values during the beginning calibration simulations. As the calibration process is conducted, adjustments are made to the rates to better reflect the known (or base-year) travel conditions. Generated trips are compared with traffic count volumes and modified to match these volumes as closely as possible. During the process the residential and agricultural land uses were disaggregated for better definition of actual trip making characteristics. The total trips generated were adjusted for the three main county areas based upon regression analysis and observation of the behavior of the model with these adjustments. The allocations of the SFDU, MFDU, and AGFM units to the territories

During the update of the model, the trip rates were refined for use in Kittitas County. This involved making incremental changes and comparing the results with the traffic counts in the areas throughout Kittitas County. Trip rates were revised as necessary to achieve improvement of the modeled volumes within Kittitas County. Table 6 presents the final trip generation rates used for the weekday evening peak hour model. Note that land uses one and two are not listed. These are disaggregated into categories 15 - 20. Please note that there are also rates for the "externals" which generate the trips coming in and out of the external locations.

Table 6

Peak Hour Trip Rates for the Kittitas County Transportation Planning Model

			HW		WH		HO		OH		NHB		Truck		Total		
	Land Uses	Units	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest	Orig	Dest	Total
3	Hotel/Motel	Rms	0.011	0.013	0.011	0.013	0.022	0.025	0.022	0.025	0.145	0.170	0.006	0.008	0.216	0.254	0.470
4	Retail	KSF.	0.000	0.037	0.475	0.000	0.000	1.104	1.080	0.000	0.518	0.626	0.086	0.074	2.160	1.840	4.000
5	Ind/Man	KSF.	0.000	0.029	0.209	0.000	0.000	0.043	0.070	0.000	0.093	0.086	0.093	0.128	0.465	0.285	0.750
6	Service/Office	KSF.	0.000	0.051	1.232	0.000	0.000	0.506	1.177	0.000	0.246	0.405	0.082	0.051	2.738	1.013	3.750
7	FIRES	KSF.	0.000	0.050	0.905	0.000	0.000	0.495	0.804	0.000	0.241	0.396	0.060	0.050	2.010	0.990	3.000
8	El/MidSchool	Stud.	0.000	0.003	0.034	0.000	0.000	0.022	0.043	0.000	0.016	0.036	0.003	0.003	0.096	0.064	0.160
9	High School	Stud.	0.000	0.002	0.032	0.000	0.000	0.021	0.041	0.000	0.015	0.034	0.003	0.003	0.090	0.060	0.150
10	College	Stud.	0.000	0.003	0.051	0.000	0.000	0.022	0.066	0.000	0.025	0.035	0.004	0.003	0.147	0.063	0.210
11	Ag/For/Min	Acres	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	Ag-Range	Acres	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
13	Ag-Lower	Acres	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.002	0.001	0.003
14	Ag-Upper	Acres	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
15	SF-Upper	DU	0.010	0.000	0.000	0.163	0.159	0.000	0.000	0.206	0.057	0.051	0.005	0.009	0.231	0.429	0.660
16	MF-Upper	DU	0.005	0.000	0.000	0.089	0.080	0.000	0.000	0.116	0.031	0.031	0.002	0.005	0.119	0.241	0.360
17	SF-Lower	DU	0.016	0.000	0.000	0.233	0.238	0.000	0.000	0.295	0.085	0.074	0.007	0.012	0.346	0.614	0.960
18	MF-Lower	DU	0.009	0.000	0.000	0.144	0.128	0.000	0.000	0.187	0.051	0.051	0.004	0.008	0.191	0.389	0.580
19	SF-Range	DU	0.012	0.000	0.000	0.185	0.181	0.000	0.000	0.234	0.064	0.059	0.005	0.010	0.263	0.488	0.750
20	MF-Range	DU	0.007	0.000	0.000	0.112	0.099	0.000	0.000	0.145	0.039	0.039	0.003	0.006	0.149	0.302	0.450
21	Parks	Acres	0.000	0.001	0.002	0.000	0.000	0.004	0.003	0.000	0.006	0.004	0.000	0.000	0.011	0.009	0.020
22	Recreation	KSF	0.000	0.095	0.401	0.000	0.000	0.788	0.501	0.000	1.042	0.646	0.060	0.047	2.005	1.575	3.580
23	Government	KSF	0.000	0.020	0.392	0.000	0.000	0.102	0.218	0.000	0.235	0.207	0.026	0.010	0.871	0.339	1.210
24	Medical	KSF	0.000	0.046	0.205	0.000	0.000	0.228	0.171	0.000	0.287	0.169	0.021	0.014	0.684	0.456	1.140
25	Wholesale	KSF	0.000	0.010	0.120	0.000	0.000	0.050	0.051	0.000	0.103	0.057	0.068	0.050	0.342	0.168	0.510
26	External-Internal	Trips	0.050	0.000	0.260	0.000	0.150	0.000	0.210	0.000	0.230	0.000	0.100	0.000	1.000	0.000	1.000
27	Internal-External	Trips	0.000	0.050	0.000	0.220	0.000	0.260	0.000	0.200	0.000	0.170	0.000	0.100	0.000	1.000	1.000

In Table 7, a comparison is made between the generation rates used in the Kittitas County model and ITE *Trip Generation Report*.

Table 7
Trip Generation Rate Comparison
2008 Kittitas County Transportation Planning Model

Land Use		Rates used in the Model			ITE Rates		
		Orig	Dest	Total	Avg.	Low	High
3	Hotel/Motel	0.22	0.25	0.47	0.47	0.20	1.69
4	Retail	2.16	1.84	4.00	3.74	0.68	29.27
5	Ind/Man	0.47	0.29	0.75	0.75	0.09	7.85
6	Service/-Office	2.74	1.01	3.75	3.46	0.97	8.86
7	FIRES	2.01	0.99	3.00	2.85	2.82	2.86
8	Elem/Mid School	0.10	0.06	0.16	0.16	0.12	0.30
9	High School	0.09	0.06	0.15	0.15	0.03	0.38
10	College	0.15	0.06	0.21	0.21	0.20	0.43
11	Ag/For/Min	0.00	0.00	0.00	NA		
12	Ag-Range	0.00	0.00	0.00	NA		
13	Ag-Lower	0.00	0.00	0.00	NA		
14	Ag-Upper	0.00	0.00	0.00	NA		
15	SF-Upper	0.23	0.43	0.66	1.01	0.42	2.98
16	MF-Upper	0.12	0.24	0.36	0.62	0.10	1.64
17	SF-Lower	0.35	0.61	0.96	1.01	0.42	2.98
18	MF-Lower	0.19	0.39	0.58	0.62	0.10	1.64
19	SF-Range	0.26	0.49	0.75	1.01	0.42	2.98
20	MF-Range	0.15	0.30	0.45	0.62	0.10	1.64
21	Parks	0.01	0.01	0.02	0.02	0.01	0.03
22	Recreation	2.00	1.58	3.58	3.58	2.95	4.06
23	Government	0.87	0.34	1.21	1.21	1.17	1.22
24	Medical	0.68	0.46	1.14	1.14	0.70	6.94
25	Wholesale	0.34	0.17	0.51	0.51	0.50	0.55

Model rates are comparable but slightly different than ITE rates. Reasons for these differences can be occupancy or, conversely, vacancy, the aggregation of distinct land use types into more general categories, and local variations. Retail rates are based upon a medium size shopping center. Typically a smaller retail establishment will have a higher trip generation to employee ratio than a large shopping mall.

In addition, the ITE national average, or NCHRP 187 and 365 rates, assumes the same trip generation rates at each development. During the actual system peak hour, this is not necessarily the case. For example, one industrial development or office may dismiss their employees during the peak hour, while another, located elsewhere in the model area, will have a slightly earlier (or later) discharge time. Adjustments were made to the 2008 model to reduce trip generation in the residential areas that may have seasonally vacant vacation homes, homes away from the urban areas resulting in lower peak hour trip generation rates, and to increase the generation for retail, office, and service uses. Rates were adjusted slightly for balance between origins and destinations and to account for locations in the model where overall trip generation appeared too high or too low.

The factors were applied to the collected land use information and stored in the origin-destination files in VISUM. These files contain the origins and destination values for all trips generated by all land uses and external zones.

External Zones

Origin and destination totals for external zones were set at the base-year peak-hour traffic volumes. These were based upon data from the previous models and WSDOT data. As with internal zones, traffic generated externally is also apportioned among different trip purposes as show in Table 6. Trips generated by external zones fall into two categories. Traffic that travels from external zone to external zone, or through the network, is called a through trip. These movements are designated as X-X trips in VISUM, which stands for eXternal to eXternal travel. The primary characteristic of these trips is that they travel through the network but do not stop or start within an internal or perimeter zone. In the Kittitas County model the best illustration for this movement is the trip that starts in Seattle and ends in Moses Lake or Yakima without making a stop in the Kittitas County model area.

The second trip type generated by an external zone is the one that begins at an internal zone and ends in an external zone, or vice versa. These trips, often designated as I-X and X-I trips (for Internal to eXternal, eXternal to Internal) can be illustrated by the movement from Ellensburg to Yakima.

Trip distribution is typically only performed for I-I (Internal-Internal), I-X, and X-I trips. The remaining X-X trips are placed in a trip table. This trip table, listing the number of direct movements between zones, is a manual distribution of the X-X traffic based upon some known parameters. External-external traffic is difficult to simulate (or in this case, distribute) with the gravity model. Therefore, the modeling process with VISUM includes a step for "manually" distributing X-X traffic to the external stations.

For this model, the External-External traffic was derived from the previous modeling efforts and then tested in the model. These were revised in this process because several ramps with count data were too high in the model. It was determined that more through trips would reduce these to more reasonable values. The X-X trips were placed in two through trip table matrices, one for Cars and one for Trucks. The Truck matrix was derived using WSDOT ADC counter locations and an average of 25% trucks was used at all external locations except for SR 821 which assumed 10% trucks. The remaining trips associated with the external zone's I-X and X-I movements were added to the trip generation portion of the modeling stream and then combined with the model's origin-destination file for the model runs. The model stream run module used in VISUM automatically adds the manually distributed X-X trips to the trip table created from the origin-destination file during the gravity model distribution process.

Combine Productions and Attractions and Balance

Data from the external traffic zones were combined with the internal zone trips to form a complete origin-destination file for the Kittitas County model. After the I-X and X-I trips were added, origin and destination sums by trip purpose were automatically balanced to the average of the number of productions and attractions to be equal. The trip generation rates were previously checked with land use totals to insure that trips would be balanced. The primary purpose for checking equivalencies was to ensure that for each production or origin generated by the model there was an attraction or destination. (Transportation planning models are closed systems, meaning that every trip on the network must have an origin and a destination.) Care was taken to closely correlate to target percentages by trip purpose from NCHRP 365.

A trip generation rates strategy such as the one used to develop the Kittitas County model internal zone traffic does not always produce balanced origins and destinations. For example, trip generation assumes that every business within the same retail category has the same trip generating characteristic. Retail land uses include different types of development ranging from department stores to restaurants. Furthermore, had a single land use been assumed, such as grocery stores, the departure rates during the PM peak hour would vary from development to development. Therefore, with the methodology there can be some difficulty in producing equal numbers of origins and destinations in the transportation model.

A process must be followed before the first simulation run can be performed to balance the origins and destinations. Any balancing adjustments would be done to the total numbers of trips by trip purpose. First, the total differences by trip purpose were found. Then, the trip generation rates were reevaluated and appropriate changes were made to the trip rates. After this process was completed, the sums were checked for both internal and external zones, all trips were balanced by averaging the trips, and the total productions and attractions by demand strata were ready for initial VISUM distribution and assignment runs.

Calibration

Approach

Calibration is an iterative process and includes upgrading or adjusting entered data, program coefficients, or parameters and assumptions on successive simulation runs until the volumes and traffic patterns produced by the model approximate known volumes within an "acceptable level of error." The acceptable level of error for calibrated model data has been recommended in the National Cooperative Highway Research Program Report No. 255 entitled *Highway Traffic Data for Urbanized Area Project Planning and Design*. The primary premise behind these guidelines is that simulated model data should not significantly differ from actual count data thereby causing inappropriate under- or over-design of roadway facilities. Differences between modeled volumes and actual counts may look significant; however, in everyday practice, these differences should not cause unsuitable roadway facility planning.

There are three significant points to consider. The first is "acceptable level of error" and "How good are the counts?" Given that this is the basis for calibration, are these counts good enough for the process? If some count data is questionable, can the model be asked to simulate a condition better than the condition is known?

Considering these questions, it has been found through experience in modeling that an "acceptable level of error" is directly related to the existing traffic volumes on a certain link. Through the course of calibration, higher volume streets can be expected to have better results. Acceptable limits may be that a 20% error can be expected on heavily used arterials, 40% on primary collectors, and perhaps as high as 200% on little-used rural collectors. Although the latter level of error may seem high, a variation of 200% on little-used roadways may mean a difference of 25 to 100 vehicles, insufficient to cause inappropriate facility planning when the model results are used.

The second point to consider is the adjustment of entered data, program parameters, and model assumptions. After entering all the data and making the initial model assumptions, the simulation distribution and assignment run is made. The desired outcome is that the results will perfectly match all the counts and the model will be calibrated. Usually, though, some data or assumptions (the "rules" of the model) are incorrect. On locating the errors from the distribution and assignment, causes are identified. The rules are reconsidered and adjusted.

Each change in data, parameters, or assumptions represents a refinement or upgrade of the rules. Each refinement **must be backed** by a reason. No changes are made to simply get better volumes. To apply the model to alternate scenarios, especially future year forecasts, each justification must be questioned for its continued application. If the rule still holds for the scenario, then it can be applied. If the rule is not applicable, then adjustments must be made in rules for that scenario.

Finally, it must be emphasized that the simulation being run with the model is one of human interaction with the transportation system. To do this, the program uses the gravity model to simulate the distribution of trips between zones and selects "shortest paths" for the assignment of trips. Human behavior is equated to a series of mathematical formulas that assume that all humans behave logically. While people do not always behave in a logical and rational manner, under most situations these assumptions are valid. Keeping this in mind, the calibration process is carried out.

Model Calibration Process

Essentially, calibration is comprised of three stages. First, working from outside to inside and large to small, all volumes that lead to the outside world through external zones are calibrated. Analyzing the model for general trends of trips is the next step. The third step is to evaluate the individual count locations and individual routes. Changes at any level may affect operations at another stage in calibration. That is, a proper allocation of trips to the right route may affect the general trends. Therefore, the calibration process is one of always looking back and continually monitoring each step until the procedure is complete.

External Zones

In VISUM, zones are differentiated between "internal" and "external." Internal zones are those in which all the land use is known and all generated trips will go to and arrive from other zones in the modeled system. An external zone interacts with other zones in the modeled system and with the external world that surrounds the network. (Traffic count data, collected on the roadway leading in or out of an external zone, is used.) It is impossible to describe fully the land uses outside the modeled area that interact with the internal zones. Therefore, an external zone is described in the model as having origins and destinations to produce the appropriate volume of traffic on the roadways that connect it with the rest of the network.

VISUM automatically adjusts the distribution to match the I-X and X-I origins and destinations at the external zones. It also automatically distributes the proper number of destinations to each zone based upon the values derived during the trip generation process. However, the distribution of those trips within the model can be modified by changing the apparent distance traveled either approaching or departing the model area. These were adjusted to get an expected distribution from the externals.

From these results, analyses are performed and potential changes or upgrades to the entered data are made for the following simulation run. Overall high or low trends can suggest that information needs to be upgraded concerning dwelling units, employment, trip generation rates, and/or gravity model-spatial behavior coefficients. Throughout the calibration of overall trends, each segment of entered data is questioned and necessary changes are made. In addition, ground count data is also scrutinized.

Final Calibration Values

Changes were made to the parameters in an iterative fashion based upon judgment. The final values used in the calibration are the following:

- Car impedance is weighted 0.985 on time and 0.15 on distance.
- Truck impedance is weighted 0.980 on time and .020 on distance
- Iterative distribution and assignment with equilibrium assignment was used. The skim matrix (a measure of travel impedance) was averaged for each iteration for up to 3 iterations after the initial step. Specification of this option meant that the gravity model distributions are based upon recalculated travel impedances in subsequent assignments.
- Table 8 illustrates the gravity model exponents set at the following:

Table 8
Gravity Model Parameters
2008 Kittitas County Transportation Planning Model

Trip Purpose	Beta Exponent	Alpha Exponent	Constant
HW	2.00	-0.2	100
WH	2.00	-0.2	100
HO	2.70	-0.2	100
OH	2.70	-0.2	100
NHB	2.80	-0.1	100
Truck	2.2	-0.5	100

The volumes and volume/capacity ratios for links or streets were plotted for comparison with the future year alternatives. These colors range light green through dark green, orange, red, and dark red to show increasing amounts of congestion.

2008 Base Conditions

Finally, the "calibrated" model is verified against the base-year traffic counts. The verification process is a series of post-simulation run analyses that are designed to analyze the accuracy and degree of confidence presented in the calibrated results. Included in these analyses are verification of the trip distribution characteristics and comparisons of the traffic count data vs. modeled link volumes. These are typically analyzed with screenlines and scattergrams.

Screenlines

Nine (9) Screenlines were established showing major movements within the County. These were chosen at locations were counts were also available. The screenlines were summarized and analyzed for trends and acceptability. These are shown in Figure 5.

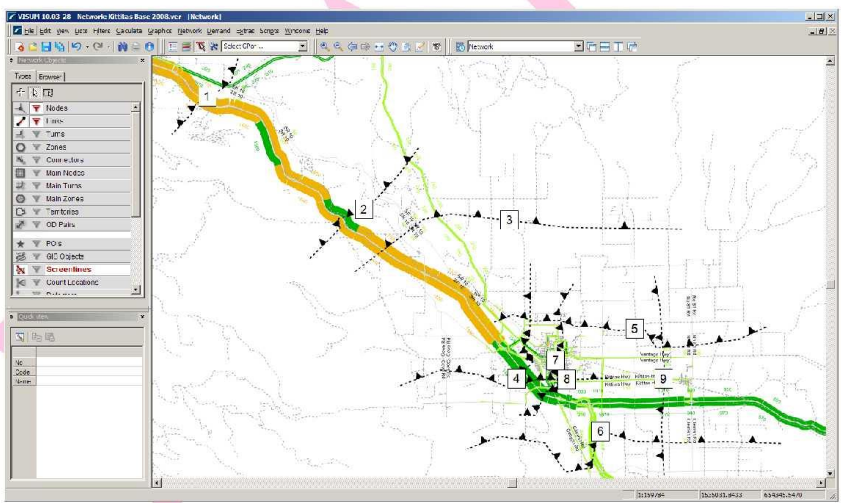


Figure 5
Kittitas County Screenline Locations

NCHRP 255 establishes standards for allowable deviation based upon traffic count volumes. Lower volume screenlines are allowed more deviation because of the increased amount of variation in count data and the lesser importance of lower volumes. The screenline results are summarized in Table 8. Locations with counts so low that they are less than the evaluation criteria are shown as "NA." All screenlines and the total of all screenlines are within acceptable standards. It should be noted that not all crossings of a screenline had count volumes. Therefore, there may be some variations that are not completely explained by this table. It is felt that all screenlines are within acceptable ranges.

Table 8
Screenline Analysis

No.	NAME	Tot Vol	Tot Count	% Deviation	% Allow
1	CleElum	128	76	68%	NA
2	West of Ellensburg	69	55	25%	NA
3	North of Ellensburg	116	84	38%	NA
4	West Ellensburg	3207	2388	34%	47%
5	North Ellensburg	474	442	7%	70%
6	South of Ellensburg	488	451	8%	69%
7	Central Ellensburg	5041	5522	-9%	33%
8	EW Central Ellensburg	3184	2841	12%	43%
9	East of Ellensburg	577	629	-8%	67%
	Total	13284	12488	6%	23%

Scattergram Analysis
Several analyses of scattergram plots showing the correlation between traffic count observations and model volumes were conducted. Figures 6 and 7 show comparisons for ALL traffic counts and counts on just Freeways, Ramps, and Principal and Minor Arterials, respectively. Typical standards are usually compared on roads classified as Principal Arterial and higher classifications. More deviation is expected when analyzing lower classification facilities such as collectors and local roads due to the variation in traffic count data and the lower volumes. Both figures show link ground counts on the X axis and assigned volumes on the Y axis. On the green 'goal' line the assignment volume is equal to the ground count. The red linear 'regression' line shows the best straight line estimate of the assignment volume for any count. The blue 'allowable' curves show the maximum allowable errors according to the graph discussed from NCHRP 255. In both graphs there is one significant outlier. This is the westbound I-90 on-ramp at Cascade/University Way. This is an older count and

may not have an actual deviation of this magnitude. This comparison also affects screenline number 4.

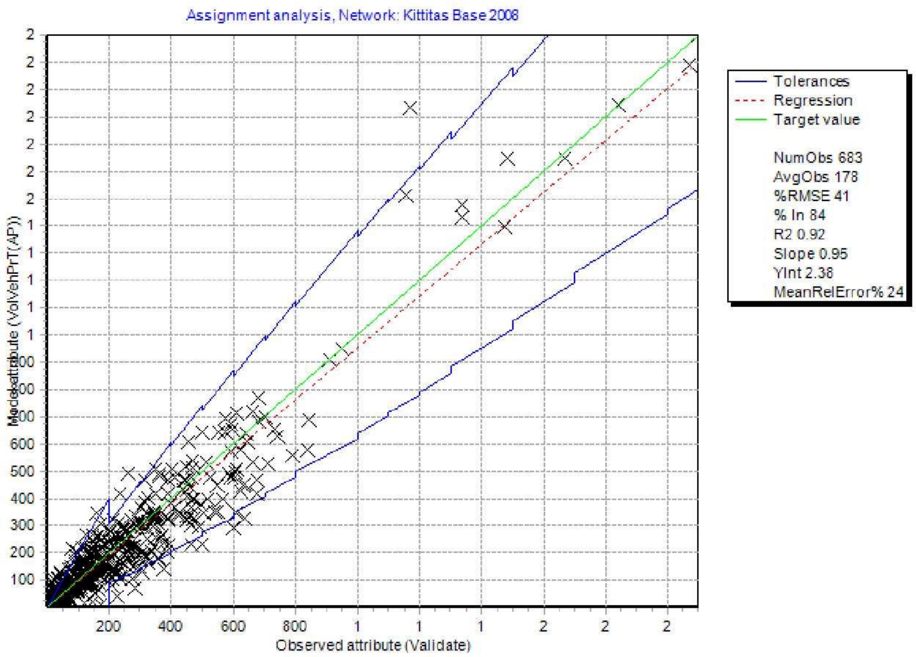


Figure 6
Kittitas County Scattergram for ALL Links

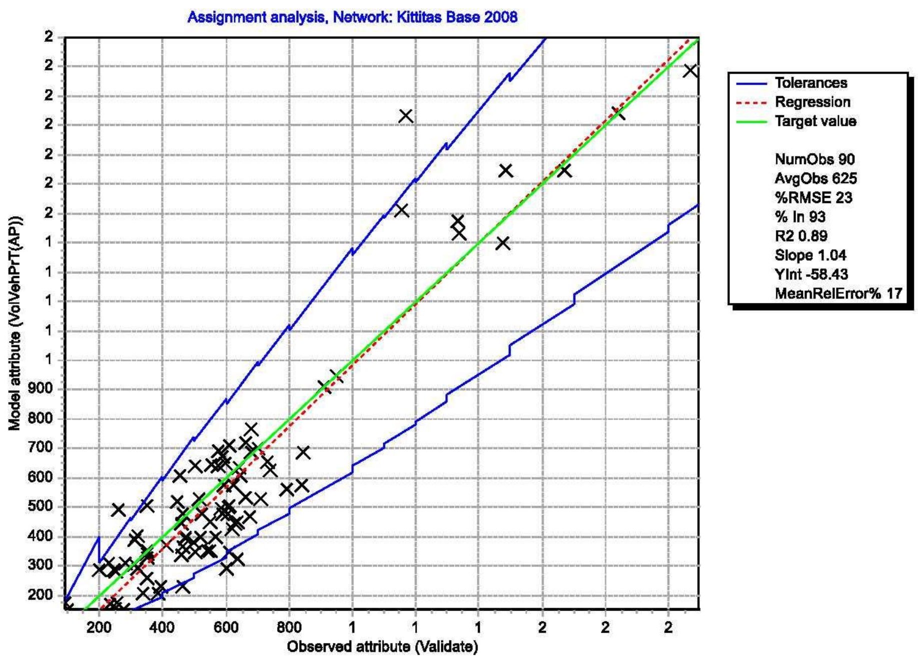


Figure 7
Kittitas County Scattergram for Freeway, All Arterials, and Ramps

As can be seen, the majority of the deviations fall between the curves. Other statistics calculated are:

AvgObs is the average assignment volume for all analyzed links.

%RMSE, the percent root mean square error, a summary statistic representing the average assignment error, disregarding sign, in percent.

$$\%\ \text{RMSE} = 100 \times \frac{\sqrt{\dfrac{\sum(\text{Assignment Errors})^2}{\text{Number of Links}}}}{\text{Average Count}}$$

%In shows the percent of assigned volumes within allowable errors specifications.

R^2, the coefficient of determination or 'goodness of fit' statistic, shows how well the regression line represents the assignment data.

There are no national standards for R^2 or RMSE. However, there are guidelines that have been established by Caltrans for data used in air quality analysis. The guidelines recommend an R^2 of 0.88, a maximum RMSE of 35%, and a minimum %In of 75% for links classified as Principal Arterials and above.

Analysis of all links shows an R^2 of 0.92 and of Arterials and above shows an R^2 of 0.89, which are both better than the guideline of 0.88. Typically we see higher values of R^2 when there is a broader range of counts. If analyzing just higher volume facilities, the counts are more clustered and thus it is more difficult to plot these in a straight line.

The model also shows a %RMSE of 41% for all links and a %RMSE of only 23% for Arterials and above. The guideline of 35% or less is only applicable for Principal Arterials and above, so the 23% looks very good.

Analyzing all link classes shows the 84% of the count locations within acceptable bounds. The analysis of Arterials and above shows 93% of the count locations are within bounds. This is much better than the recommended standard of 75% for only links classified as Principal Arterial or above.

Slope of the line in both cases is very close to 1.0, with values ranging from 0.95 to 1.04. This is considered to be very good.

The 2008 Kittitas County model is well calibrated and can be used for forecasts.

Forecasts

Forecast Process

The traffic volume forecasts are based upon projected changes in land use, changes in interaction with the area outside of the model, changes in travel behavior, and changes in the transportation system. Typically, as the number of households and jobs increase, the traffic will increase as well. The calibration can be looked at as building and checking the "rules" for traffic generation, distribution, and assignment in the Kittitas County area. Then, as changes are made these same "rules" are used to project the change in traffic volumes and resulting changes in congestion, travel time, and emissions. The forecast process requires the projected number of housing units, projected number of employees by land use classification, number of acres of agricultural land, etc. It also requires a forecast of interaction with the area outside of the models. Information is needed to project the trips that enter and leave the model area. Finally, any planned transportation improvement projects should be included to properly assess the future operation of the transportation system. Each of these items is discussed.

Land Use Forecasts

Several sources were used to compile the forecast land use scenario. Previous work on forecast land use had been done by Studio Cascade, a land use planning consulting firm. Studio Cascade examined land use in Ellensburg during 2005 and compiled a forecast scenario for Ellensburg zones. Kittitas County also supplied PTV America, Inc. with a forecast scenario using growth factors with three ranges. It was decided to use a combination of these sources of forecast information to produce a detailed and more accurate land use forecast. The general methodology included using forecast data from Studio Cascade for all Ellensburg zones while using Kittitas County forecast data for all other zones with some exceptions.

External growth was similarly adjusted. Typically external growth is based upon trends analysis. The area surrounding a model study area is usually not experiencing congestion or volume-to-capacity problems. It is usually sufficient to analyze historical trends based upon traffic counts and extrapolate these trends into the future. Caution should be used if any of the trend extrapolation pushes the traffic volume on any external close to its capacity. WSDOT ATR count data was used from 1997 to 2007 to establish trends. The growth rates were between 2.5% per year (for I-90) to less than

0.5% per year (for SR 97). Each external was factored with the appropriate rate and external-external trips were adjusted with the combined rates for both Car and Truck trips.

Trips were generated for the alternative scenario forecasts with the same rates as used for the calibrated 2008 model. Once the total productions and attractions were computed the totals were balanced for each trip purpose or demand strata. These were averaged before use in the gravity distribution model. The same procedure was used for distribution and assignment as in the base year calibration.

Transportation System Improvements

The forecast models were run for the future horizon year of 2030. The models were run with no-build and groups of assumed improvements to test the impacts of various improvements. The assumed network improvements included these 21 proposed corridors.

Alliance Rd to 6th Street
Bender Road to Dry Creek Road
Bowers Road to Look Road
Bowers Road to US 97
Exit 85 to Lower Peoh Point
Fowler Creek to Lund Lane
FS Rd 2600 to FS Rd 4930
Godawa Ln to Upper Peoh Point
Graham Road to Upper Peoh Point Road
Hidden Valley Road to US 97
Judge Ronald Road to Fields Road
Pasco Road to Westside Road
Pasco Road to Woods & Steele Road
Pays Rd to Godawa Ln
Pfenning Road to Kittitas Highway
Reecer Creek Rd to Tipton Rd
Silverton Road to Weaver Road
Smithson Road to Wilson Creek Road
Strande Road to Hanson Road
Winston Rd to Exit 78

Woods & Steele Road to Graham Road

No improvements are assumed for I-90 or other state facilities.

All network coding was checked for the revisions. Capacities were recomputed for the links and nodes. The Multi-Point Assignment (MPA) equivalencies were checked and revised as necessary. Turn penalties were checked and revised as necessary.

Growth Scenarios

The four growth scenarios were analyzed run for both the no-build and build conditions. PM Peak hour volumes were forecast and the links were plotted with colors depicting ranges of volume/capacity ratios for the roads. Similar to the previously displayed base year conditions, these colors range light green through dark green, orange, red, and dark red to show increasing amounts of congestion.

Also, relative amounts of delay are shown for nodes or intersections using red dot. The larger the red dot the more delay computed by the model. Intersections with large red dots indicate potential problem locations. Graphics of each of the scenarios are shown below with traffic volumes.

A comparison was made between alternatives to show the differences between land use scenarios and the Build/No-Build conditions. Vehicle Miles of Travel (VMT) and Vehicle Hours of Travel (VHT) were summarized for the Kittitas County. The average speed (VMT/VHT) was computed for each of the scenarios also to facilitate comparisons.

Summary Comparison of Alternatives

Scenario	VMT	VHT	VMT/VHT
No Build			
Full Corridor Development			
Medium Corridor Development			
Low Corridor			

Development			

Vehicle Miles of Travel (VMT) increased by approximately for Scenario XX for Scenario YY. Vehicle Hours of Travel (VHT) increased by approximately Scenario XX No-Build and for Scenario YY etc.

Conclusions

As with all models, these are tools to evaluate the impacts of future change. The results should be used with caution. A model is only as good as the data and assumptions that were used to develop the model and the forecasts of the future year inputs. Caution should especially be used when evaluating the future. Will the forecast land use really occur as projected? Will travel behavior stay essentially the same? Should adjustments be made to account for these changes?

These models should be considered working tools. They are now completed and ready for application and use. When they are used for specific studies, the results should be examined and analyzed. If conditions have changed in an area or the existing data is out of date, compensation or improvements should be made in the model and its result.