CITY OF CHELAN

COMPREHENSIVE PLAN UPDATE 2017

Existing Conditions and Trends Report

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1.0 INTRODUCTION

1.1 Purpose

In accordance with the Growth Management Act (GMA), the City of Chelan (City) is required to adopt and maintain a Comprehensive Plan. A comprehensive plan guides a community's physical development (land use) over the long-term, addresses the entire community and all its values, activities, or functions – housing, employment, transportation, recreation, utilities, etc. – and provides a statement of policy guiding how the community's desires for growth and character are to be achieved.

GMA requires the City to address the following elements in its plan: land use, housing, capital facilities, utilities, transportation, economic development, and parks and recreation. Optional elements include subarea plans or other element topics.

For each required element, GMA requires an inventory of conditions. This Existing Conditions Report presents current built and natural environment conditions for land use (including the natural environment), housing, economic development, utilities, capital facilities, and transportation. This Existing Conditions Report is intended to provide a base of information to support the preparation of the Covington Comprehensive Plan and associated State Environmental Policy Act (SEPA) review documents. This information has been revised as the Comprehensive Plan Update progresses through a public review process in 2015 and adoption in early 2016.

1.2 Planning Area

As of 2016, the State Office of Financial Management (OFM) measures the city limits at about 7.89 square miles or 5,047 acres, excluding waterbodies. Based on Chelan County Assessor parcel acres there are about 4,065 acres; parcel acres exclude rights of way, but include some water areas where parcels extend into Lake Chelan or the Chelan River.

In consultation with the City, Chelan County has assigned an Urban Growth Area (UGA) around the city limits. The UGA includes unincorporated territory that is characterized by urban growth or lands that can be served by urban facilities and services such as sewer, water, and others. Within this area, willing property owners may choose to annex to the City of Chelan. The 2016 UGA boundaries encompass about 6,065 parcel acres or 3.68 square miles (some parcels are split across the UGA/rural boundary and acres include some rural territory). The city limits and UGA encompass 9.48 square miles in total adding parcel acres.

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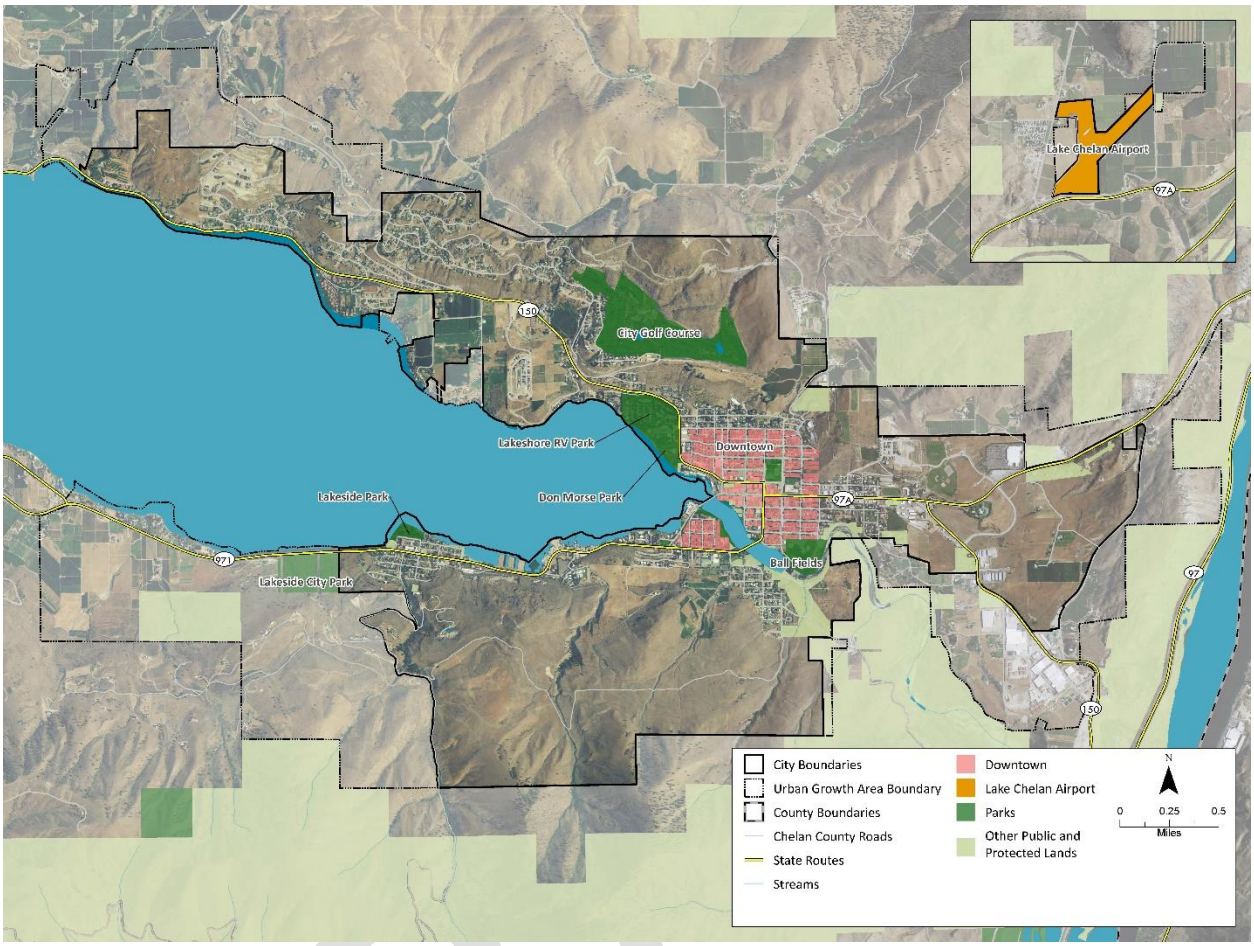
Exhibit 1-1. Chelan Planning Area Map: 2016



Source: City of Chelan, Chelan County Assessor, BERK Consulting 2017

The City of Chelan and Chelan County are considering changes to the UGA boundary with the 2017 Comprehensive Plan Update. Areas proposed for exclusion are identified in the map below. If the three areas are excluded, UGA acres would be reduced by about 1.1 square miles (the northern boundary includes parcels split across UGA/rural boundary).

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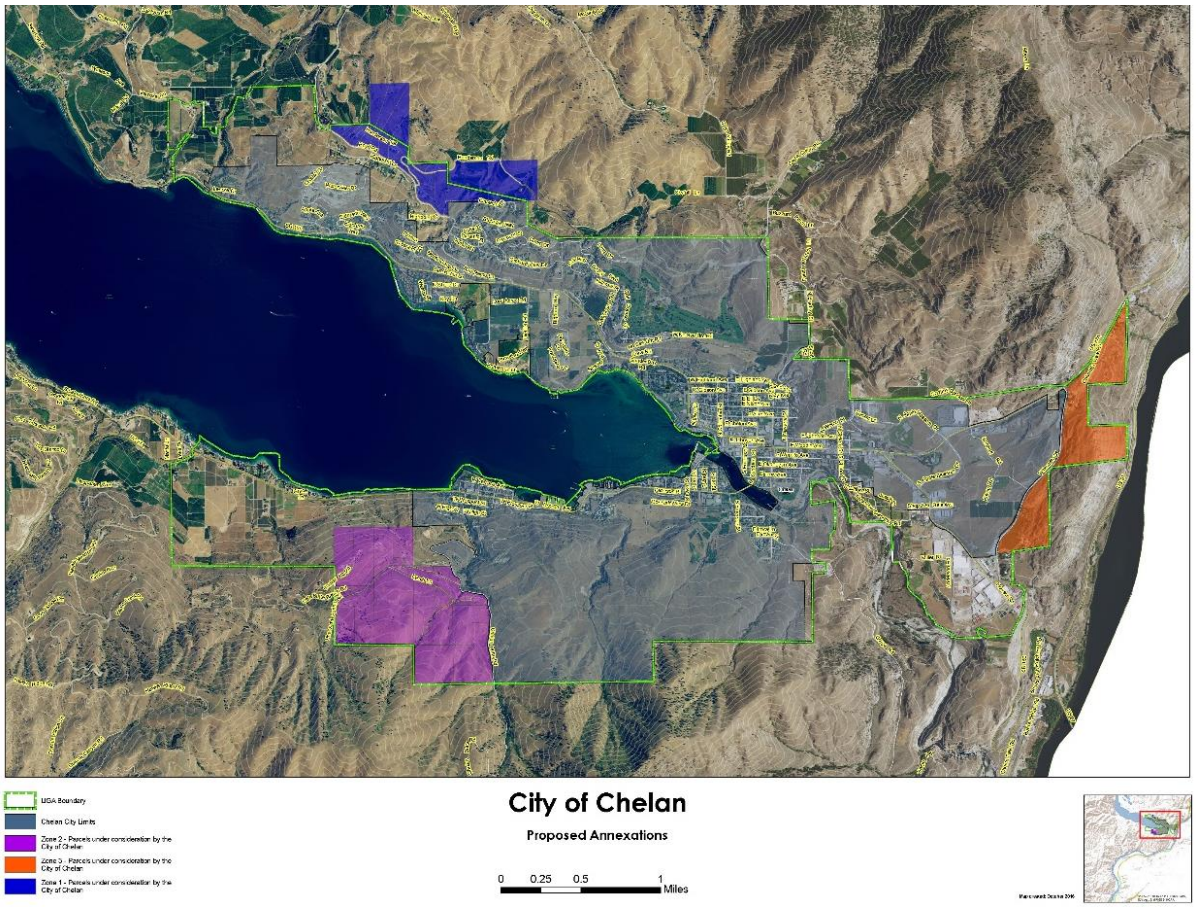
Exhibit 1-2. Chelan Planning Area Map: 2017



Source: City of Chelan, Chelan County Assessor, BERK Consulting 2017

This document considers the full current city limits and UGA with some analysis of the UGA reduction such as with land capacity. The Draft Comprehensive Plan Update addresses the current and potential modified UGA boundaries.

2.0 LAND USE

2.1 Overview

This chapter provides current conditions regarding the use of land in the city limits and urban growth area (UGA), and highlights key issues and topics to guide the update of the Comprehensive Plan Land Use Element.

2.2 Regulatory Context and Planning Framework

Growth Management Act

Washington State's Growth Management Act (GMA) requires each county and city fully planning under the act to include a future land use map and a land use element addressing a range of residential, commercial, industrial, resource, and public uses, as well as critical areas and water quality (RCW 36.70A.070):

The comprehensive plan of a county or city that is required or chooses to plan under RCW 36.70A.040 shall consist of a map or maps, and descriptive text covering objectives, principles, and standards used to develop the comprehensive plan. The plan shall be an internally consistent document and all elements shall be consistent with the future land use map. … Each comprehensive plan shall include a plan, scheme, or design for each of the following:

(1) A land use element designating the proposed general distribution and general location and extent of the uses of land, where appropriate, for agriculture, timber production, housing, commerce, industry, recreation, open spaces, general aviation airports, public utilities, public facilities, and other land uses. The land use element shall include population densities, building intensities, and estimates of future population growth. The land use element shall provide for protection of the quality and quantity of groundwater used for public water supplies. Wherever possible, the land use element should consider utilizing urban planning approaches that promote physical activity. Where applicable, the land use element shall review drainage, flooding, and storm water run-off in the area and nearby jurisdictions and provide guidance for corrective actions to mitigate or cleanse those discharges that pollute waters of the state, including Puget Sound or waters entering Puget Sound.

The following GMA goals are applicable to land use in particular and promote efficient use of land and coordination with infrastructure as well as conservation and environmental protection measures (RCW 36.70A.020):[1]

- **Goal 1:** Urban growth. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.
- **Goal 2:** Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.
- **Goal 9:** Open space and recreation. Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.
- **Goal 10:** Environment. Protect the environment and enhance the state's high quality of life, including air and water quality, and the availability of water.

County-wide Planning Policies

The following Chelan County County-wide Planning Policies are applicable to the Land Use Element and essentially promote focusing growth in existing developed areas and other areas necessary to meet growth allocations provided that infrastructure and services are available. There is also recognition of the impact of local second home demand and economic development needs:

- **POLICY #1:** Policies to implement RCW 36.70A.110 relating to the establishment of urban growth areas.

[1] Per RCW 36.70A.020, "…goals are not listed in order of priority and shall be used exclusively for the purpose of guiding the development of comprehensive plans and development regulations."

- **Sub-policy II:** Designated urban growth areas should include an adequate amount of undeveloped area to adequately accommodate forecasted growth and development for the next 20 years.
- **Sub-policy IV:** The formal designation of urban growth areas should be accomplished as a part of the comprehensive planning process. The size of designated urban growth areas should be based on projected population, existing land use, the adequacy of existing and future utility and transportation systems, the impact of second home demand, viable economic development strategies and sufficient fiscal capacity within the· capital facilities plan to adequately fund the appropriate infrastructure necessitated by growth and development. Consideration should also be given to regularize grossly irregular corporate boundaries during the process of designating urban growth boundaries.

- **POLICY#5:** Policies addressing the need for affordable housing for all economic segments of the population and the adoption of parameters for the distribution of affordable housing.
  - **Sub-policy I.c:** Assess the need for additional units based upon population projections including owned, rented and shelter units and including an assessment of second home ownership.
  - **Sub-policy VII:** Communities should evaluate densities permitted within Urban Growth Areas (UGA) to reduce the overall costs of development.
- **POLICY #6:** Policies for joint County and City planning within urban growth areas and policies providing for innovative land use management techniques that may include use of flexible developments, transfer of development rights, cluster development, density bonus, etc.
  - **Sub-policy III:** Each jurisdiction shall consider the implications · of utilizing innovative land use management techniques in fulfilling the planning goals enumerated in the Growth Management Act including, but not limited to, planned unit development, transfer of development rights, cluster development density bonus, and the purchase of development rights.
- **POLICY #7:** Policies for county-wide economic development and employment.
  - **Sub-policy VI:** Economic development should be one of the considerations in the process of land use planning, transportation planning, infrastructure planning, and the determination of urban growth boundaries.
  - **Sub-policy VII:** Commercial and industrial activities should be encouraged to locate in areas with infrastructure capacity and the potential to provide adequate, affordable housing, and/or transportation linkages to existing housing.

History

Chelan's unique history is reflected in today's existing land use conditions. This section summarizes Chelan's history based on the current Comprehensive Plan and an essay at Historylink.org. (Caldbick, 2012) (City of Chelan, 2011)

About 10,000 years ago, the Lake Chelan area was regularly inhabited by humans. Native Americans, the Chelan Indians, settled along the lakeshore, and were believed to be related to the larger Wenatchi Tribe since they spoke the Wenatchi language, a dialect of the Interior Salishan language.

White explorers from fur trading companies first came to the area in the early 1800s. The City of Chelan began in the late 1880s as a town that supported logging, mining, agriculture, and early tourism.

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After a series of treaty negotiations between the U.S. Congress and the local tribes, the area's original inhabitants were finally moved to the Colville reservation, and the land was officially ratified by U.S. Congress in 1886 and opened to homesteads.

The first settlers were drawn to the area with hope of gaining prosperity through the extraction and exploitation of its abundant natural resources – mining for gold, silver and other minerals, logging forests, and utilizing fresh mountain water for irrigation and transportation.

By the twentieth century, Chelan had experienced economic booms and busts much like other communities in the West. While its timber and mineral resources eventually were exhausted, water has continued to play a vital role in sustaining the economy. The Chelan Dam has provided hydro-electric power, irrigation, and recreation over the centuries. Construction of the Chelan Dam began in 1926 about one-half mile downstream from where Lake Chelan enters the Chelan River. When it was completed in 1928, it was the largest electrical-generating facility in the Northwest. Today it is operated by the Chelan County PUD and remains an important source of power in the city and the county.

Chelan's economy has been dominated by tourism for the past many decades, again due to its geography and natural beauty, which make it ideal for year-round outdoor recreation and relative proximity to large population centers west of the Cascade Range. The first guest accommodations were built as early as 1892, and the famous Campbell Hotel (known today as Campbell's Resort) has been in business since 1901.

Chelan also has a long history of agriculture in the area. Wine grapes and orchards began in the area in the late 1800s. Wine grape cultivation began as early as 1891, although the first commercial wine-production vineyard opened almost a century later in 1998. Most productive land in the Chelan area is devoted to orchards, with several thousand acres planted with apples, cherries, pears, apricots, and peaches.

Historic Properties in Chelan[2]

According to the Washington Department of Archaeology and Historic Preservation (DAHP), the following places are on state and national historic registers:

- St. Andrews Episcopal Church, built in 1899 (National Register, Washington Heritage Register)
- Ruby Theater, built in 1913 (National Register, Washington Heritage Register)
- Lord Richard Hinton House, a Queen Anne Victorian house built in 1902 (National Register, Washington Heritage Register),
- Lake Chelan Hydroelectric Power Plant, built in 1926 (National Register, Washington Heritage Register)

With the extensive use of the land in Chelan by the Chelan Tribe, DAHP has identified through a predictive model that the area may have a high risk of archaeological resources, and surveys are highly advised such as prior to development and construction.

[2] Source: Washington Information System for Architectural and Archaeological Records Data (WISSARD). Accessed January 2017.

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Natural Environment

This section describes the natural environment features in Chelan based largely on the 2011 Comprehensive Plan as well as the recent Shoreline Master Program Update.

Physical Area Description

The dramatic natural setting and physical geography is a defining characteristic of the city. Chelan is situated at the southern end of Lake Chelan as it enters the Chelan River. Lake Chelan is a glacial lake formed gradually over millions of years with the rise of the Cascade Mountains. It is approximately 55 miles long with an average width of 1.5 miles and a maximum depth of 1,500 feet. It is the largest, longest, and deepest lake in Washington State, and the third deepest in the country. Three major tributaries, the Stehekin River, Railroad Creek and Twenty-Five Mile Creek, along with numerous lesser streams feed the lake. The outfall is controlled through a hydroelectric dam and a penstock system to the Columbia River.

The upper portion of the basin is characterized by steep terrain and lies within the North Cascades National Park and the Lake Chelan National Recreation Area complex, in the Stehekin Planning Area, while the area between is in the Wenatchee National Forest, a portion of which is in the Glacier Peak Wilderness Area. The southern end of the lake is surrounded by fertile, gentle hills, making it an ideal location for human settlement and for supporting its historical economies- resource extraction, agriculture, and tourism. Most development is concentrated around the lower end of the lake, where private land dominates. (City of Chelan, 2011)

Topography and Geology

Topographic elevations range from over 9,000 feet above sea level at the crest of the Cascade Mountains to 700 feet on the Columbia River [FERC 2001 in (Laura Berg Consulting , 2004)]. From Twentyfive Mile Creek uplake, the terrain is mountainous and rugged with glacial features such as cirques, truncated spurs, moraines, horns, and U-shaped valleys. In many cases, the steep slopes run directly into Lake Chelan with no flat beaches or shoreline. The terrain of the lower end of the lake is much less severe, mainly arid or semi-arid, and soils consist of alluvial deposits and glacial drift [Beck 1991, FERC 2002 in (Laura Berg Consulting , 2004)].

Many of the soils within the study area become unstable or erosive as slopes increase. An analysis of existing land use patterns indicates that virtually all existing structural and orchard development has occurred on those lands below 2,000 feet in elevation and on less than a 20% slope. These areas serve as one indicator of potential agricultural and community development areas when considered with soils, availability of utilities and existing land use patterns. (City of Chelan, 2011)

The City defines steep slopes in its critical areas ordinance as: “any area in the city or its UGA in which slopes measure thirty percent or greater over a vertical distance of at least ten feet.” The City limits how much of a slope area may be disturbed.

- Slopes 30 – 40% (60% of the site or more): 0.60
- Slopes 40% + (also see landslide hazard area): 0.30

The following map illustrates slopes.

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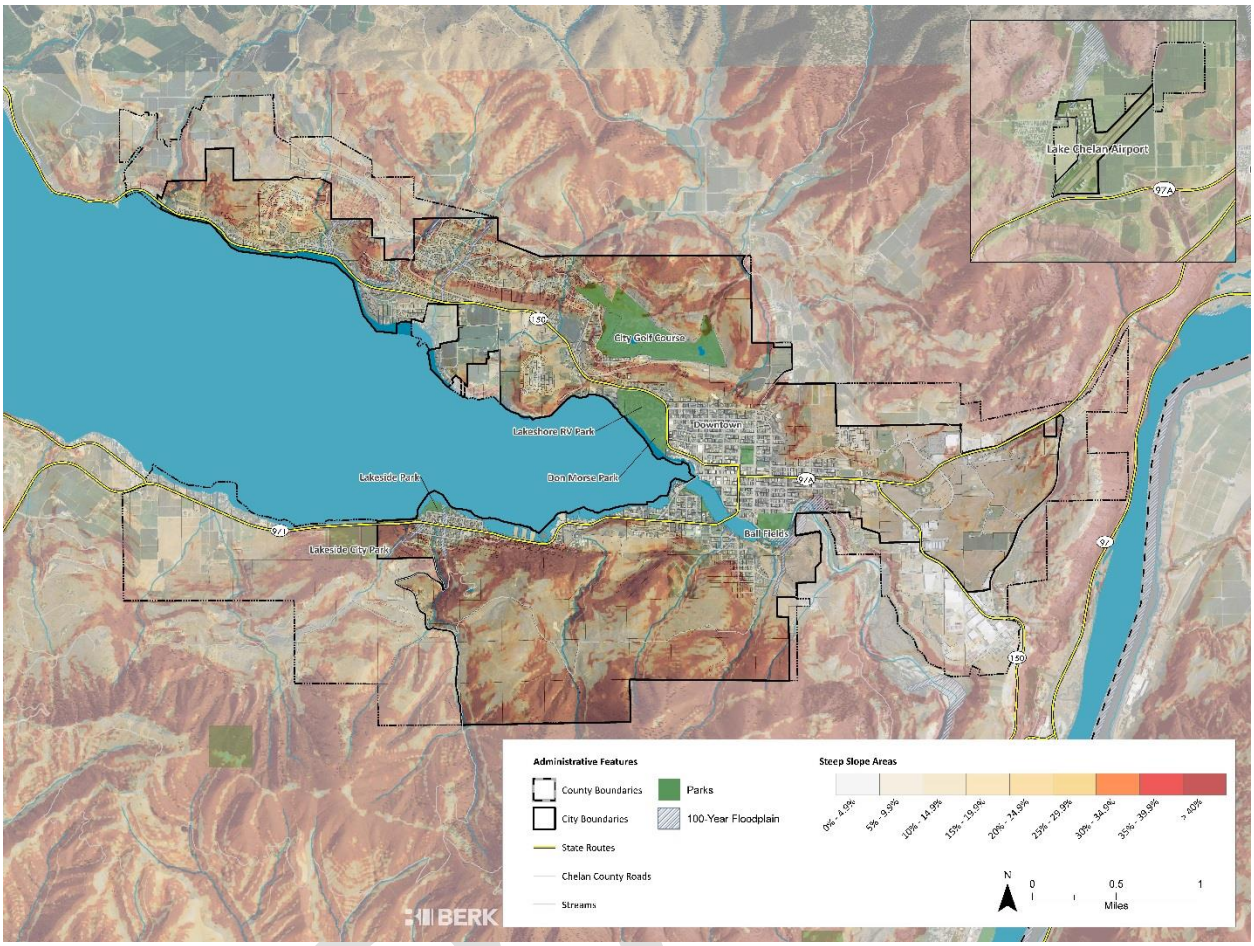
Exhibit 2-1. Steep Slopes in 5 Percent Increments



Source: University of Washington, BERK Consulting 2017

Note: The steep slopes shown were generated by using geographic information system software to convert a digital elevation model (DEM). The DEM was created from satellite imagery of the area and was taken in 10 meter resolution.

Soil Characteristics

Soils are the product of climate, slope, geology, and vegetation with the added dimension of time. The combined working of these factors has resulted in a wide variety of soil conditions in the planning area. Throughout much of the area, the soil is underlain with alluvial deposits and glacial drift. Volcanic pumice and ash from the Glacier Peak region have added substantially to the depth and character of the soil in many areas. The mountainous terrain, with characteristically steep slopes and high elevations, consist largely of rock outcroppings and shallow soils. (City of Chelan, 2011)

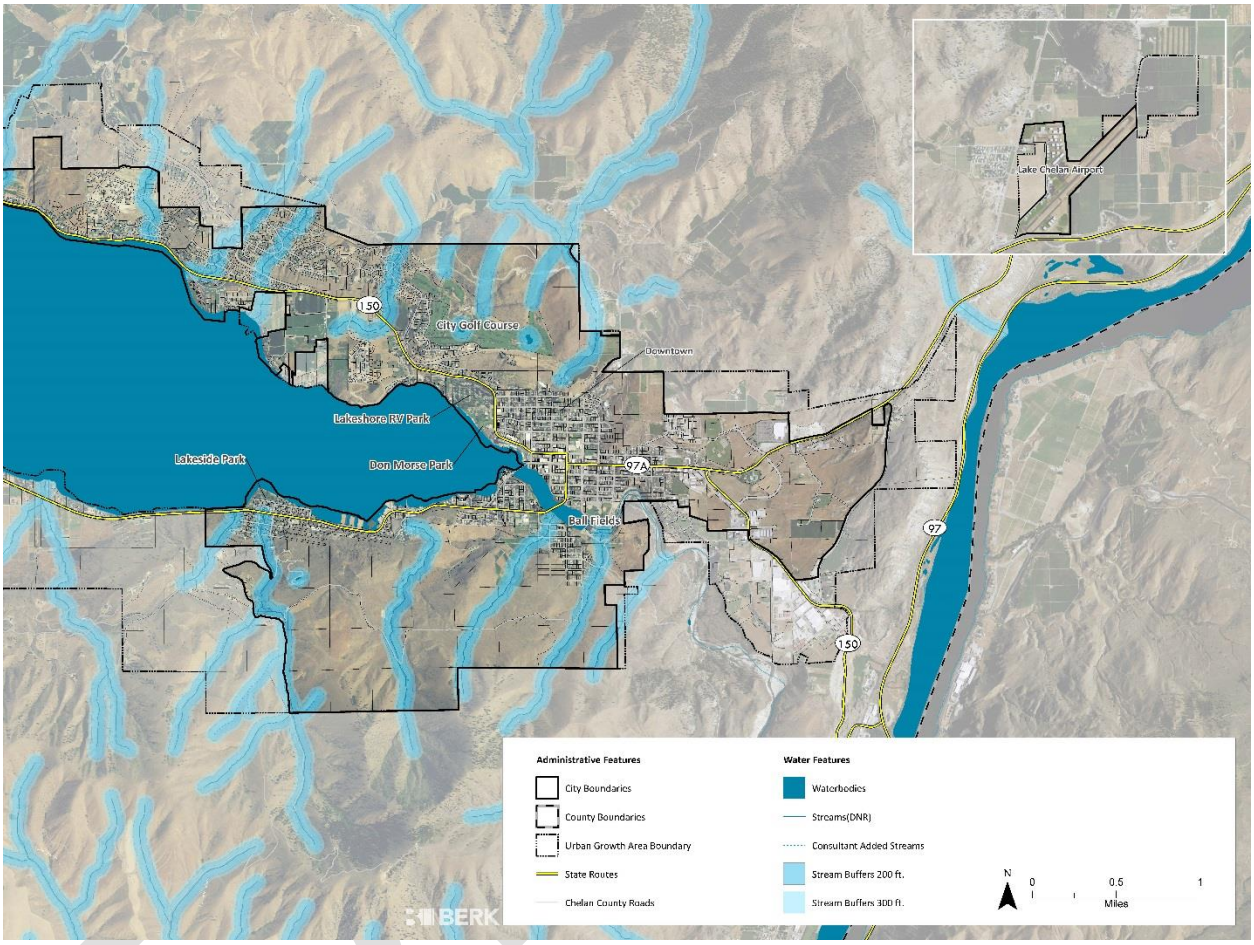
Surface Water

Lake Chelan, Columbia River, and supporting tributaries are important bodies of water within the planning area. Not only do these bodies of water and their tributaries provide the main source of drinking water for the community, they are also important for irrigation, and recreation. The water quality of Lake Chelan is of major concern to many residents in the area. Some of the factors which affect the water quality of Lake Chelan are: recreational activities, septic tank systems, irrigation return flows, storm water runoff, and leachate for old mine tailings. As described in the Lake Chelan Water Quality Plan (XXXX year), the lake has currently been classified as having low biological productivity and high water clarity. Limited supplies of nutrients to the lake, control algae growth and result in the near pristine conditions. The

lowering of the lake water level during the winter months every year helps to reduce algae growth along the lake shorelines as well. (City of Chelan, 2011)

A map illustrating the lake as well as tributaries is presented below. The streams and ravines that are important to protect for water quality and in some cases habitat are addressed as well with light blue buffers representing setbacks in the critical areas regulations.

Exhibit 2-2. Streams and Ravines



Sources: Washington Department of Natural Resources 2014, RH2 2017

Ground Water

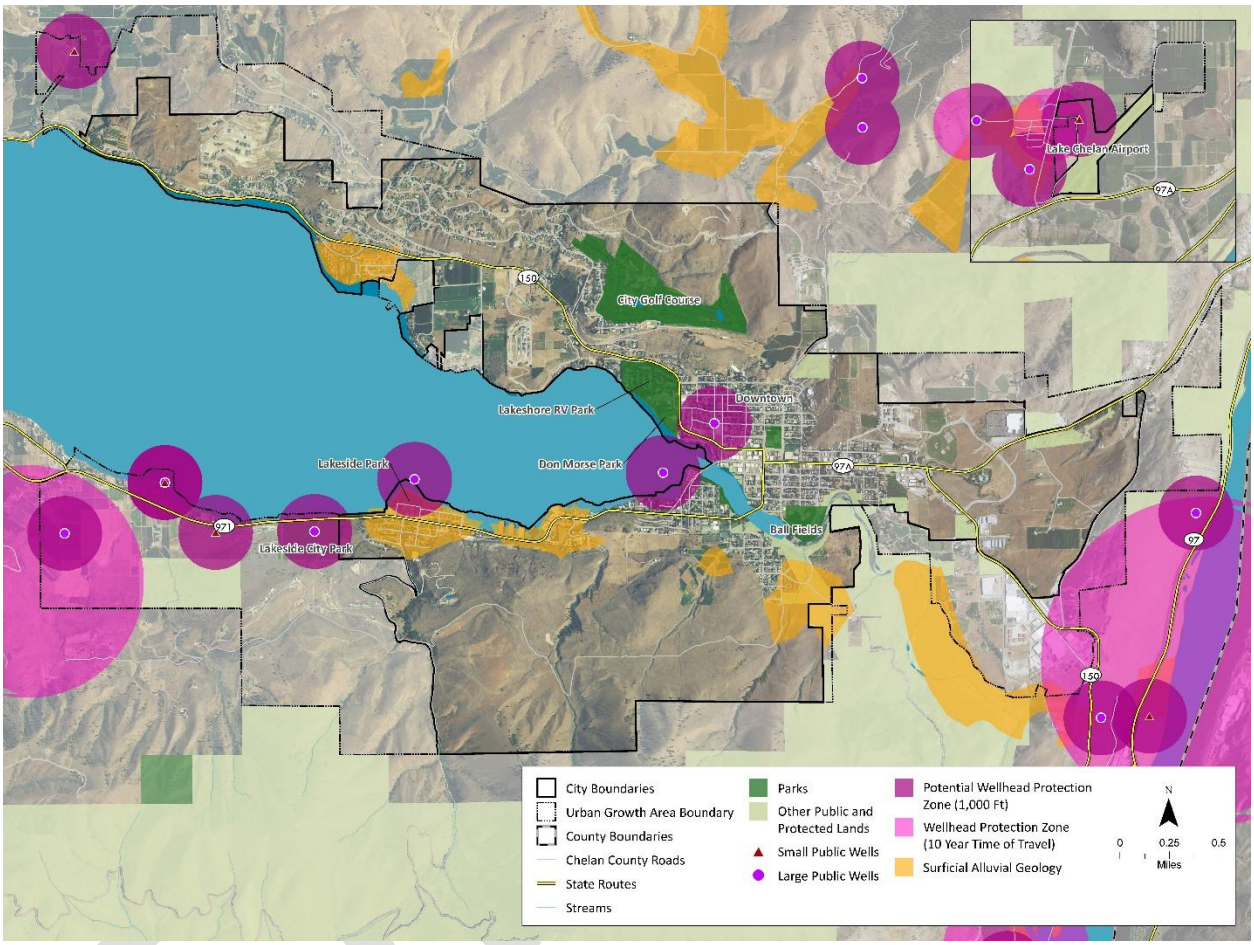
Ground water is replenished from precipitation and surface water filtering through the ground to aquifers. The ground where this filtering process takes place is called an aquifer recharge area. The quality of recharge areas and surface waters need to be protected to ensure the quality of the ground water used in the immediate area, as well as the quality of water for users down gradient from the recharge zone. Ground water, once polluted, is very difficult, if not impossible to clean. (City of Chelan, 2011)

The City regulates critical aquifer recharge areas in its critical areas ordinance.

> *"Critical aquifer recharge areas" are areas where an aquifer which is an essential source of drinking water is vulnerable to contamination that would create a significant hazard to public health. An aquifer is a saturated body of rock, sand, gravel or other geologic material that transmits significant quantities of water to a well or other source of drinking water.*

Aquifer and wellhead mapping for the lower lake vicinity are shown in the map below. Surficial alluvial geology is identified along the southshore, areas west and north of Lord Acres, and lands along the Columbia River. There are wellhead protection areas based on travel time of pollutants to groundwater sources in downtown, east Chelan and the southshore. Some wellhead data appears older and is mapped by the state in the lake bed.

Exhibit 2-3. Critical Aquifer Recharge Areas



Source: Public Wells: Department of Health (2013); Surficial Alluvial Geology: Division of Geology and Earth Resources (DGER), a part of DNR (2010); BERK Consulting 2014

Flora and Fauna

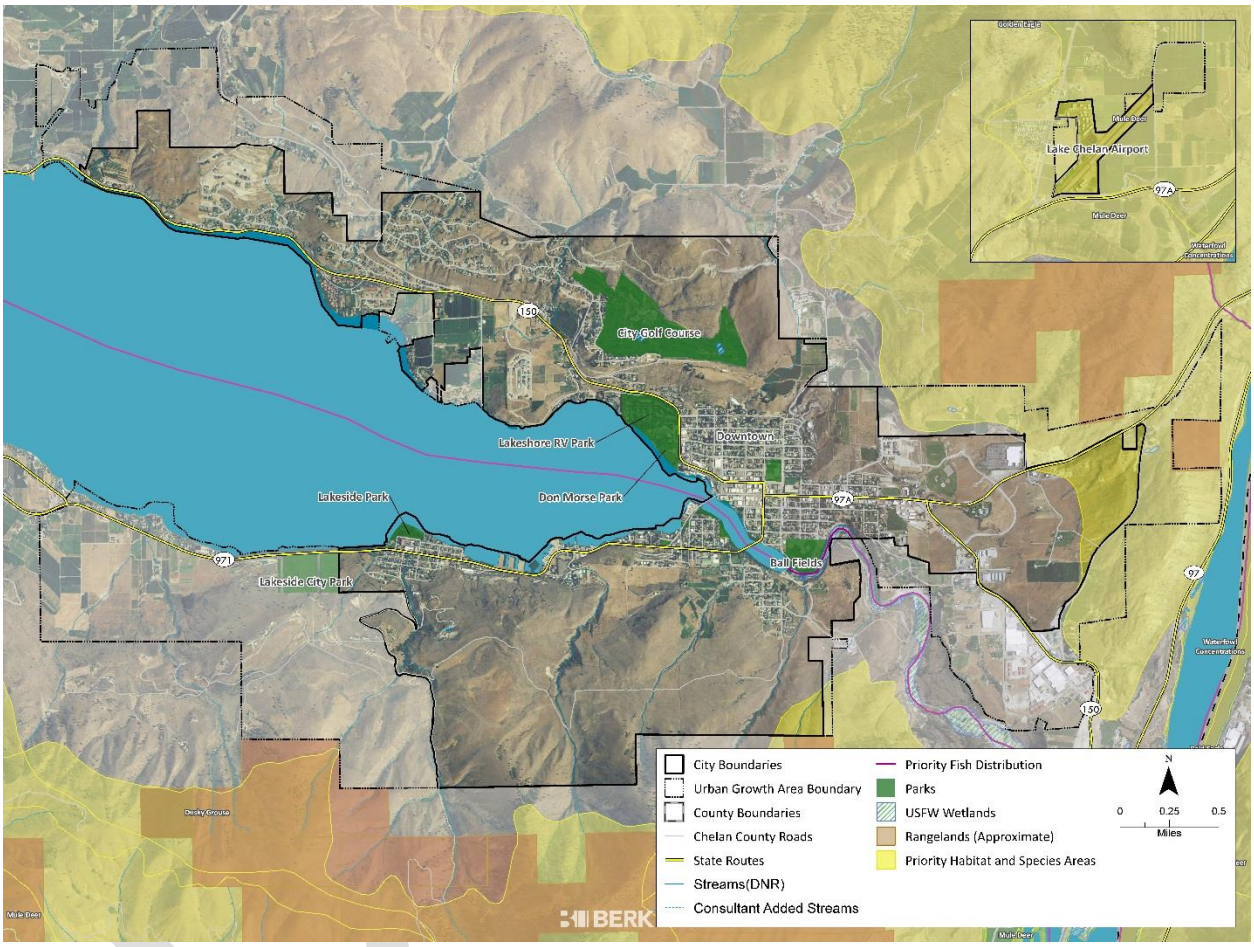
Vegetation in the basin depends to a great extent on the elevation, with most of the land above 1,500 feet being forested. The Soil Conservation Service (SCS) has classified more than three-quarters of the Lake Chelan Basin area as being forested. Lands below the forest level consist of grasses, sagebrush and shrubs. The more level sites have, for the most part, been developed as crop land, with orchards generally occurring where irrigation has been possible and dry land crops such as wheat elsewhere.

Fauna within the study area is found in three specific habitats: the wetlands along the Columbia River and the Lake Chelan shorelines, the canyon/steppe habitat of the steep drainage's and the urban areas of Chelan. The wetland and canyon/steppe habitats support a variety of waterfowl, upland game birds, birds of prey, fur-bearing mammals, reptiles, amphibians and big game animals. Urban wildlife is most common where the essentials of habitat still exist. Undeveloped areas of the city provide habitat for many game birds, raptors, small mammals and rodents. Big game animals occasionally drift into developed areas.

The Chelan Butte Wildlife Refuge is a 12,000-acre game refuge south of the city limits. The property was purchased by the Chelan County PUD #1 in 1967 as a mitigating measure for the construction of the Rocky Reach Hydroelectric Dam. The refuge is primarily inhabited by game birds and occasionally migrating big game animals. The area is presently managed by the Washington State Department of Fish and Wildlife.

A map identifying fish and wildlife habitat is presented below illustrating habitat mapped by the Department of Fish and Wildlife.

Exhibit 2-4. Fish and Wildlife Habitat



Source: Washington Department of Fish and Wildlife (WDFW) (2014) and BERK Consulting 2014

Frequently Flooded Areas

The Federal Emergency Management Agency has defined areas showing the extent of the 100-year flood boundary in order to establish actuarial flood insurance rates and assist communities in efforts to promote sound flood plain management. Development on flood plains retards their ability to absorb water, restricts the flow of water from land areas, and causes hazards downstream. (City of Chelan, 2011)

The presence of the Lake Chelan hydroelectric dam limits the flooding hazard along the main lake valley. The presence of numerous hydroelectric dams along the Columbia River also limits flooding on this system. The possibility of flash flooding is a factor for the many smaller drainages and tributaries at lower elevations in the basin. (City of Chelan, 2011)

The City regulates frequently flooded areas in its critical area regulations, applying standards for building and site development to avoid impacts.

Wetlands

Wetlands are fragile ecosystems which assist in the reduction of erosion, flooding, and ground and surface water pollution. Wetlands also provide an important habitat for wildlife, plants, and fisheries. (City of Chelan, 2011) Federal agencies have identified a number of wetlands (see Exhibit 2-4), but inventory data is older, may not be complete, and may not represent current conditions. The City's critical areas regulations require wetlands evaluation, protection (e.g. buffers), and mitigation if avoidance isn't possible.

Fire Risk

In 2016, a Community Planning Assistance for Wildfire assessment and recommendations were developed (Wildfire Planning International and Wildland Professional Solutions, 2016)

The study noted the recent and ongoing risk of fire in Chelan:

> *The eastern slope of the Cascade mountain range in Washington has recently seen a number of detrimental wildfires impacting numerous communities. In 2015, the City of Chelan was significantly affected by the Chelan Complex fires that destroyed homes and businesses within the City and urban growth boundary, severely disrupting the economy. While the Chelan Complex was the most destructive, the Chelan area has a long history of wildfire and will continue to be prone to wildfire events in the future.*

Mapped risks are illustrated in the figure below based on FireSheds that "tend to correlate to the vegetation and the directions that fires will burn in the absence of wind" and based on the relative amount of built environment (structures, roads) versus wildland fuel. Generally sloped areas to the north and south of developed areas have a moderate to high negative impact on wildfire risk due to the presence of fuel and structures that could be impacted.

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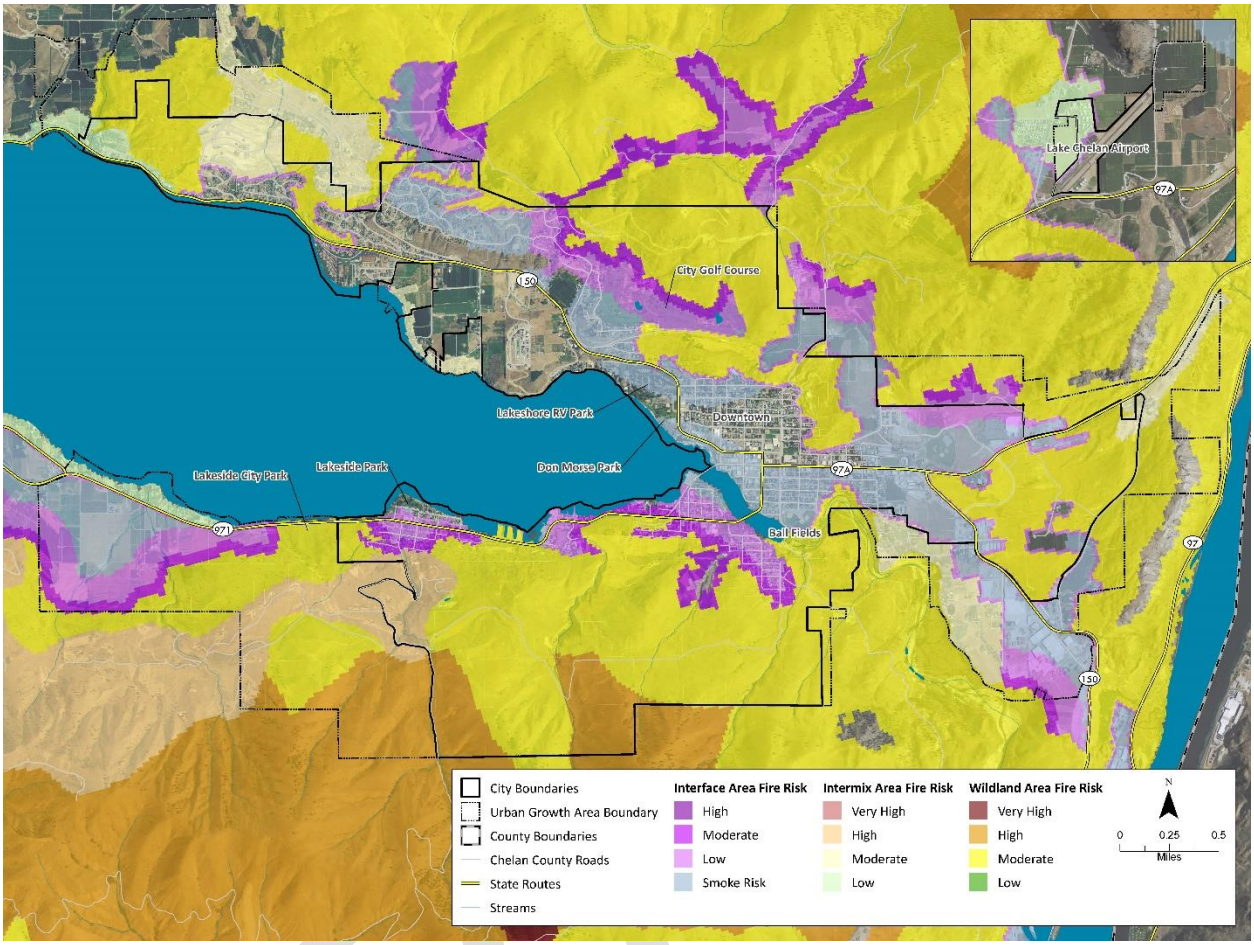
Exhibit 2-5. Wildfire Risk in Chelan



Source: Anchorpoint, National Hazard and Risk Model (No-HARM), 2016; BERK Consulting 2017

Based on the 2016 assessment, nine recommendations were developed for the City of Chelan to consider to promote wildfire risk reduction:

1. *Create a Wildfire Steering Committee*
2. *Create a Community Wildfire Protection Plan*
3. *Adopt a Wildland Urban Interface (WUI) Code*
4. *Revise landscaping requirements to promote wildfire safety*
5. *Adopt regulations to address critical facilities and utilities*
6. *Adopt a Flammable Materials Code in the Warehouse District*
7. *Integrate wildfire areas into other environmental planning objectives*
8. *Encourage educational opportunities in the development process*
9. *Strengthen and enforce nuisance provisions*

These recommendations will largely be addressed through municipal code updates under the guidance of a steering committee and the City Council.

Natural Amenities

The Lake Chelan Valley is abundant with natural amenities that provide for a wide range of scenic and recreational enjoyment. A natural amenity is a place or occurrence that, coupled with certain climatic conditions, topography, geology, weather, or other naturally occurring phenomenon, provide a location where certain recreational activities or other type of human-environment interaction can take place. Many times there needs to be certain man induced development to make the natural amenity accessible and useable by humans. (City of Chelan, 2011)

The most obvious is Lake Chelan, but also included are the smaller lakes and the Columbia River. These bodies of clean water, coupled with the hot, dry summer weather, provide for numerous water sports like boating, water-skiing, sailing, wind surfing, swimming, scuba diving, and sun bathing. There is also excellent trout, bass, and salmon fishing year round. (City of Chelan, 2011)

The mountains that line both sides of the lake range from over 9,000 feet high down to 700 feet elevation at the Columbia River. Coupled with the warmer weather, there is hiking, camping, horseback riding, sight-seeing, mountain biking, hunting, dirt bike riding, and many more opportunities. In the winter, because of the cold weather and deep, dry snow conditions, there are excellent opportunities for all types of snow skiing. Snowmobile trails have been developed and are groomed every year that account for hundreds of miles of great snowmobiling. (City of Chelan, 2011)

The thermals that blow up Chelan Butte have hosted many world and national hang gliding and parasailing events. With development of access to the top of the Butte, parking, launches and other facilities, the Sky Park is now renowned as one of the best hang gliding areas and facilities in the world. (City of Chelan, 2011)

The clear, warm weather from March through October, coupled with sandy loam soil, abundant water and spectacular views, host excellent golf and golf opportunities in the lower valley. The weather conditions, excellent soils, and abundant water also provide ideal orchard growing conditions. (City of Chelan, 2011)

There are many more opportunities for enjoyment and recreational use provided by the natural amenities of our Valley. It is these natural amenities that make the Lake Chelan Valley so popular. (City of Chelan, 2011)

Shorelines of the State

The City adopted it Shoreline Master Program (SMP) in accordance with the Shoreline Management Act (SMA) in the mid-1970s and most recently updated it in 2016. The SMP addresses land uses, recreation, and ecological protection generally within 200 feet of the ordinary high water mark of Lake Chelan and the Chelan River.

The principles of the SMA include promoting water-oriented uses, public access to shorelines, and no-net-loss of shoreline ecological function. The City's environment designations include Aquatic, Shoreline Park/Public, Shoreline Residential-Single Family, Shoreline Residential-Multi Family, and High Intensity. These environment designations direct the land uses and development standards along the shorelines and serve as an overlay to the City's zoning districts.

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Current Land Use Plan and Zoning

The City has adopted a unified Future Land Use and Zoning Map. Most of the combined city and UGA lands are designated for Single Family Residential (R-L), Tourist Accommodation (T-A), Warehouse and Industrial (W-I) and Special Use District (SUD). See Exhibit 2-6 and Exhibit 2-7.

The city limits have a greater share of T-A than the UGA, whereas the UGA has a greater share of SUD than the city limits. There are roughly equal amounts of land planned for W-I and Airport (A) in the city limits and UGA.

The land area of Chelan city limits is about 4,065 acres. Based on parcels in the city limits (excludes rights of way) the area is shown as about 3,710 acres.

Exhibit 2-6. Chelan Unified Future Land Use Designations and Zoning Classifications: Parcel Acres 2016

FLU/Zone	City	UGA	Grand Total
Airport (A)	62	62	123
Highway Service Commercial (C-HS)	41		41
Waterfront Commercial (C-W)	23	0.4	24
Downtown Mixed Residential (DMR)	58		58
Downtown Mixed Use (DMU)	34		34
Downtown Single Family (DSF)	11		11
Public Lands and Facilities (PLF)	310	99	409
Single Family Residential (R-L)	1,244	880	2,124
Multi-Family Residential (R-M)	240	2	242
Special Use District (SUD)	219	480	699
Tourist Accommodation (T-A)	1,042	332	1,374
Tourist Mixed Use (TMU)	6		6
Warehouse and Industrial (W-I)	420	499	920
Grand Total	3,710	2,355	6,065

Note: PLF includes both PLF and Downtown-Public lands.

Source: City of Chelan, BERK Consulting 2017

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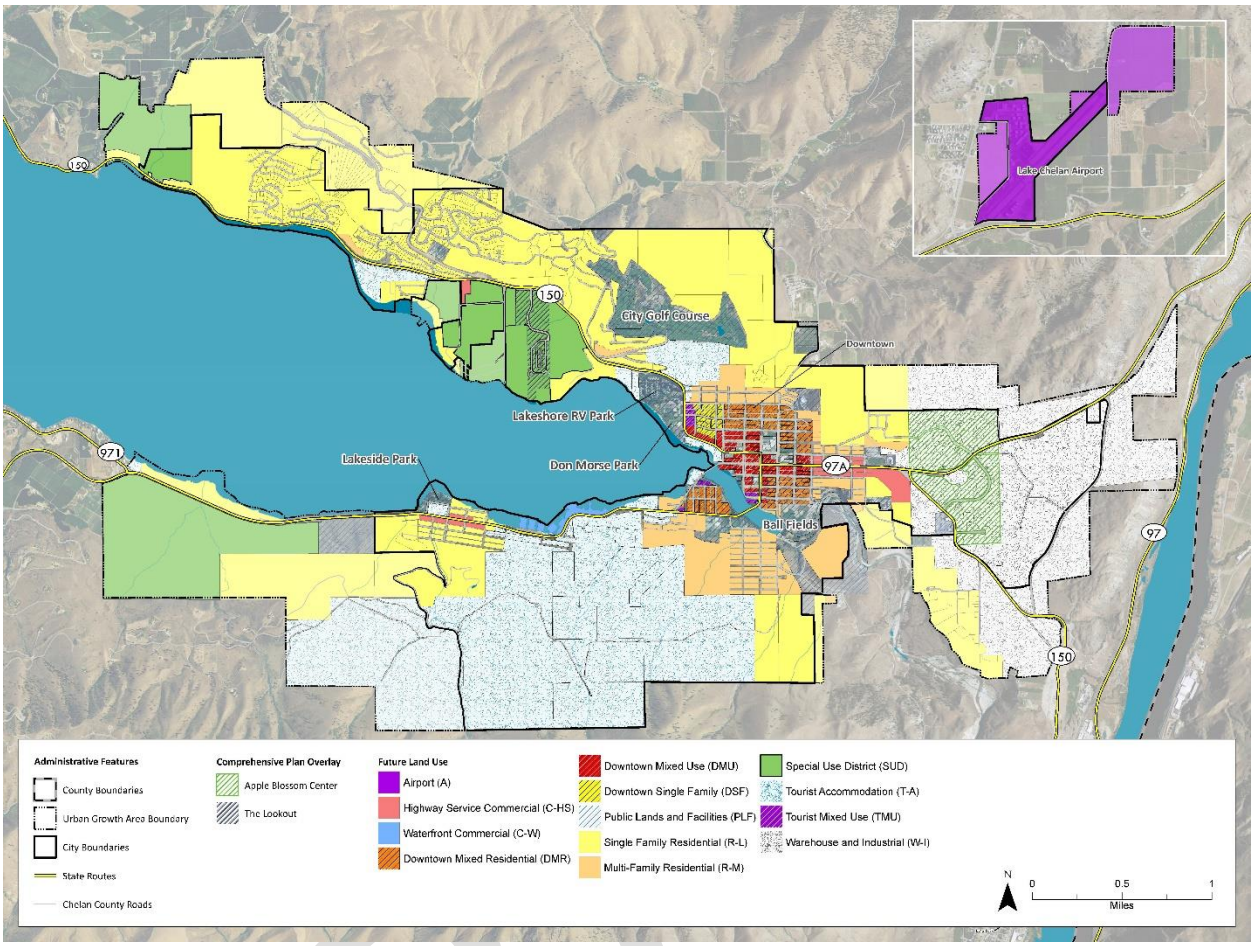
Exhibit 2-7. Chelan Future Land Use and Zoning Map 2016



Source: City of Chelan, BERK Consulting 2017

Existing Land Uses and Densities

Most of the land in the city limits and UGA is in use for detached residential. Much of it is undeveloped or in agriculture or other resource land use. See Exhibit 2-8.

Exhibit 2-8. Current Land Uses per County Assessor Parcel Records

Current Uses: Assessor Compilation	City	UGA	Grand Total	Percent
Agriculture	92.0	326.8	418.8	7%
Other Resource Production	83.3	94.9	178.2	3%
Commercial	204.8	80.3	285.1	5%
Industrial	4.7	10.0	14.7	0.2%
Civic/Institutional	8.9	-	8.9	0.1%
Public	157.6	14.8	172.4	3%
Utilities	5.9	46.6	52.5	1%
Recreation	159.1	-	159.1	3%
Residential, Detached	1,565.6	1,362.1	2,927.6	48%
Residential, Multifamily	15.5	-	15.5	0.3%
Residential, Other	109.1	81.0	190.0	3%
Residential, Vacation and Cabin	81.0	5.0	86.0	1%
Undeveloped	1,221.9	333.8	1,555.7	26%
Unknown	4.2	-	4.2	0.1%
Grand Total	**3,713.6**	**2,355.2**	**6,068.8**	**100%**

Source: Chelan County Assessor, BERK Consulting 2017

A more detailed breakdown of current land uses by zoning district is provided in Appendix A. In all zones, there is a relatively high percentage of residential uses, even in lands proposed for commercial, industrial, or other non-residential purposes.

While the city limits are characterized by single family and undeveloped land, the land use pattern shows a graduation in density from lower densities at city gateways and hillsides to greater densities in downtown and along historic lakeshore areas. There is more density inside the city limits and less in the UGA where there are fewer services and larger tracts of land that have not been subdivided. Inside the city limits there is more density on the northshore than southshore given the lesser services available to the south.

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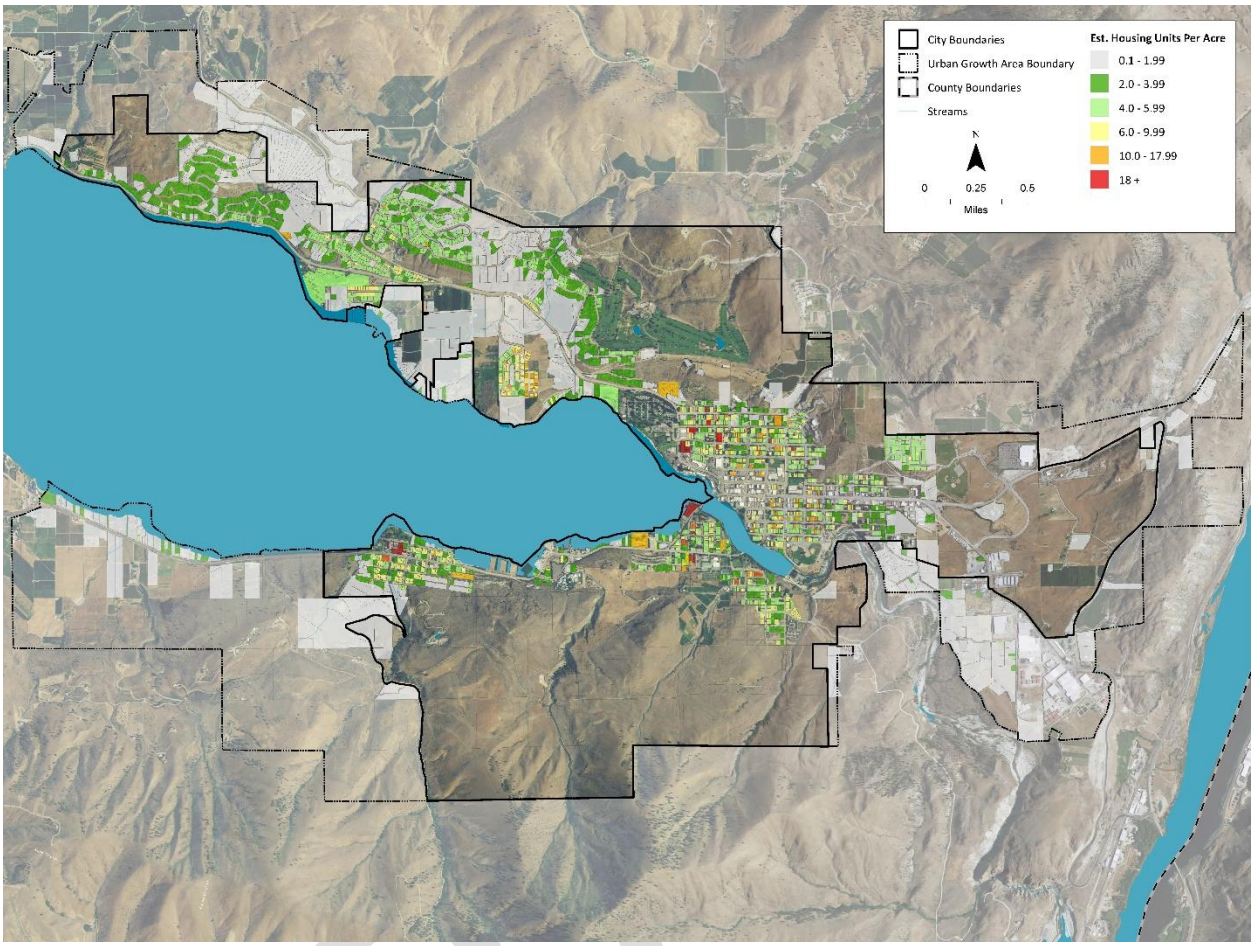
Exhibit 2-9. Observed Densities Map: Fall 2016



Source: Chelan County Assessor, City of Chelan, BERK Consulting 2017

Views

The City of Chelan is defined by its beautiful natural setting and small town charm including a vibrant, historic, and walkable downtown. This connection between the natural and built environments affords opportunities for iconic views of the landscape from public spaces including parks, streets, and open spaces. Impacts to iconic views may occur from a structure or other feature physically blocking the view from a public space or from development occurring in the viewing area such as on the hillsides north and south of the lake. The City has an opportunity through the planning process to consider options for minimizing impacts to public views in the future. Options include design and development standards, focusing development densities in appropriate locations, revising zoning and land use designations, and others.

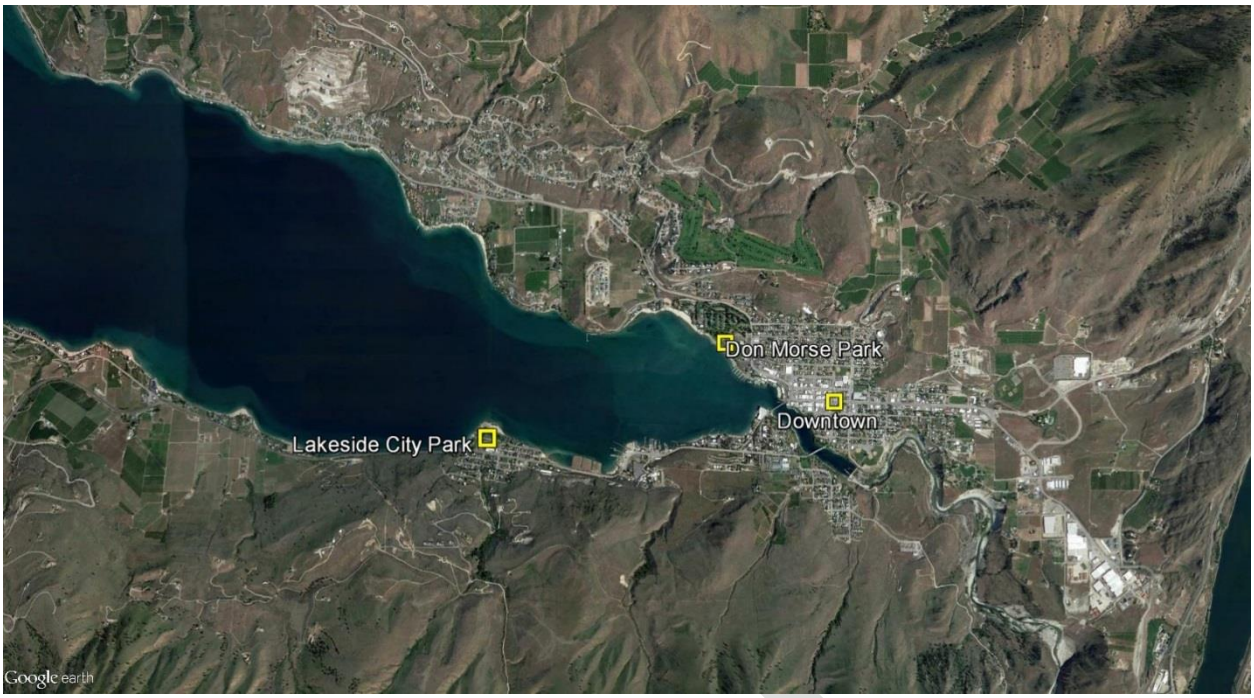
A view analysis, more fully detailed in Appendix B, addresses existing conditions, the potential for future impacts, and opportunities to maintain public views at the following three locations as illustrated in Exhibit 2-10:

A. Views from Downtown towards Lake Chelan

B. Views from Don Morris Park towards the Lake and hillsides

C. Views from Lakeside Park towards the Lake and the north slope

Exhibit 2-10.Viewshed Locations



Source: BERK, 2016; Google Earth, 2016

The view analysis considers visible points from Downtown to Lake Chelan from the intersection of Sanders Street and E Woodin Avenue looking east along E Woodin Avenue towards the lake (See Exhibit 2-11). Views of the hillsides were also considered. The low building heights in Downtown maintain views of the Lake and surrounding hillsides. Large undeveloped areas along the Butte on the south side of the Lake can be seen from this location.

Exhibit 2-11. View from Downtown to Lake Chelan

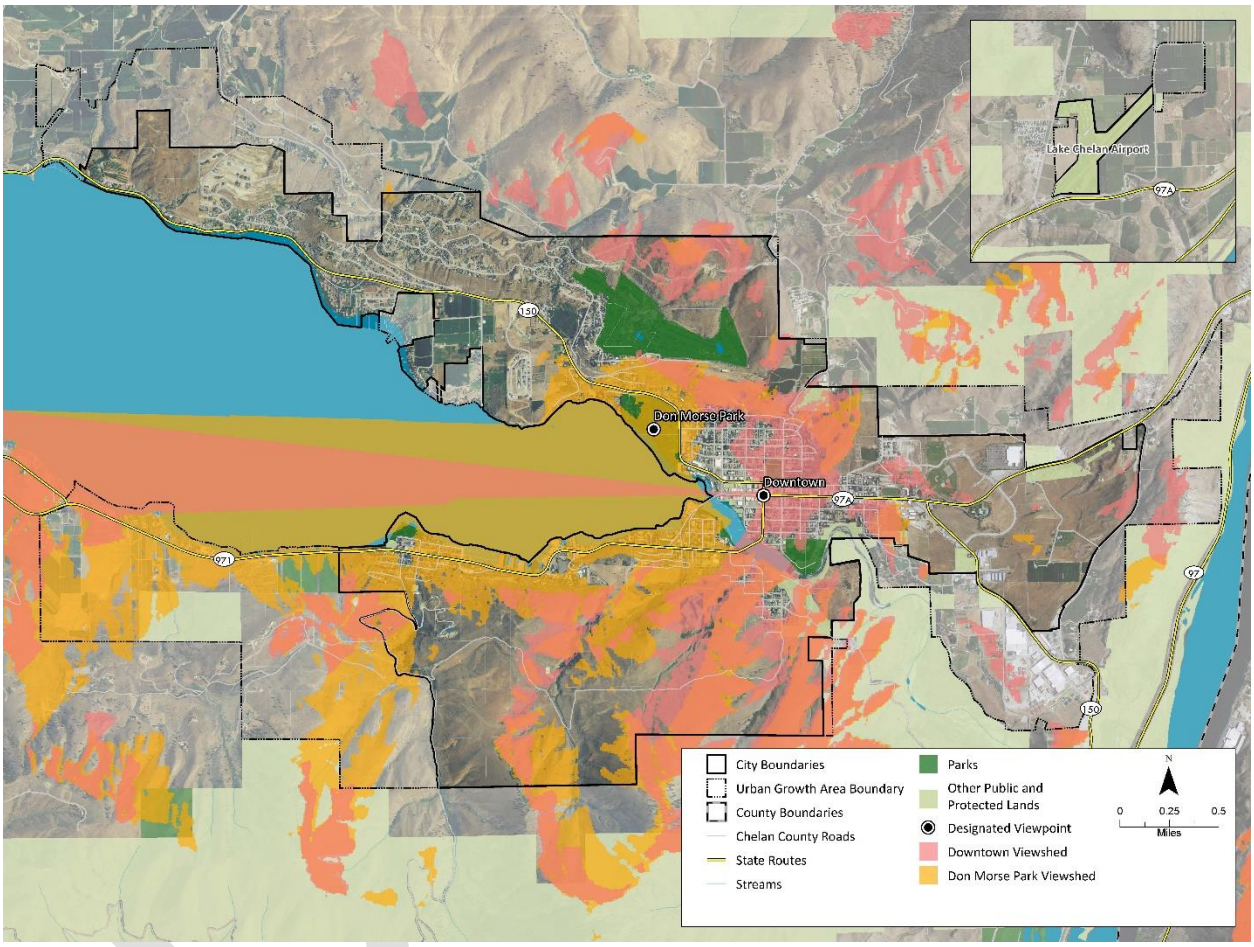
Source: Google Earth, 2016

Views towards the lake and surrounding hillsides were analyzed in Google Earth as shown in Exhibit 2-12. The pink shading identifies areas that are visible from the view location in Downtown and takes into

consideration existing buildings that partially block views. The building height limit of 2-stories along E Woodin Ave in the Downtown core will minimize future view impacts from development.

The Butte is largely undeveloped and abuts public lands to the south. Development on the Butte could impact views, but design standards addressing grading and fill, site design, architecture, and landscape design could minimize view impacts. The north side of the lake is already more developed and less visible from this location.

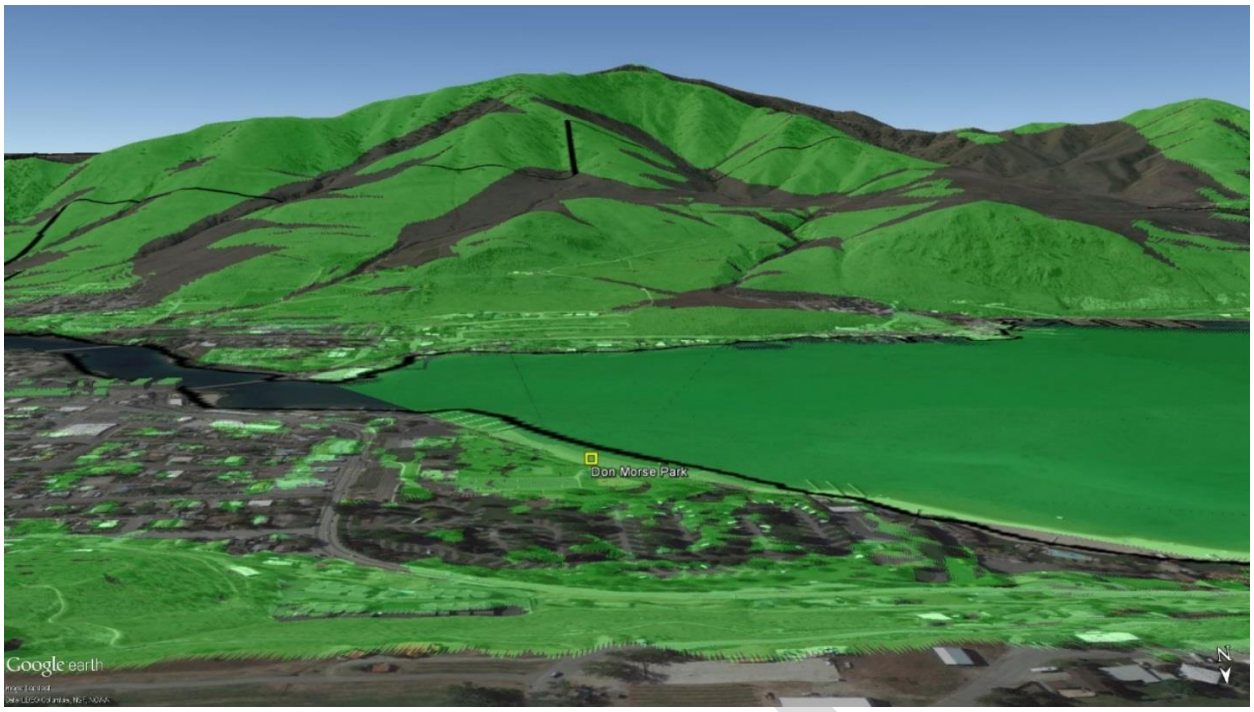
Exhibit 2-12. Viewshed Analysis from Downtown and Don Morse Park towards the Lake



Source: Google Earth, BERK Consulting 2017

Don Morris Park is a large waterfront community park in Downtown that is busy used particularly in the summer. The Park has sweeping views of the lake and surrounding hillsides, but the largely undeveloped Butte is the highly visible on the south side of the lake. Exhibit 2-13 shows the areas visible from Don Morris Park highlighted in green. Further consideration of future development on the Butte is an opportunity to minimize impacts from this location towards the Butte.

Exhibit 2-13. Viewshed Analysis from Don Morris Park towards the Butte



Source: BERK, 2016; Google Earth, 2016

Exhibit 2-11 above shows the areas on the north slope that are visible from Don Morris Park in orange. The areas at higher elevation are not as visible from this location. Some visible areas are already developed, but there are undeveloped areas that could impact views if developed.

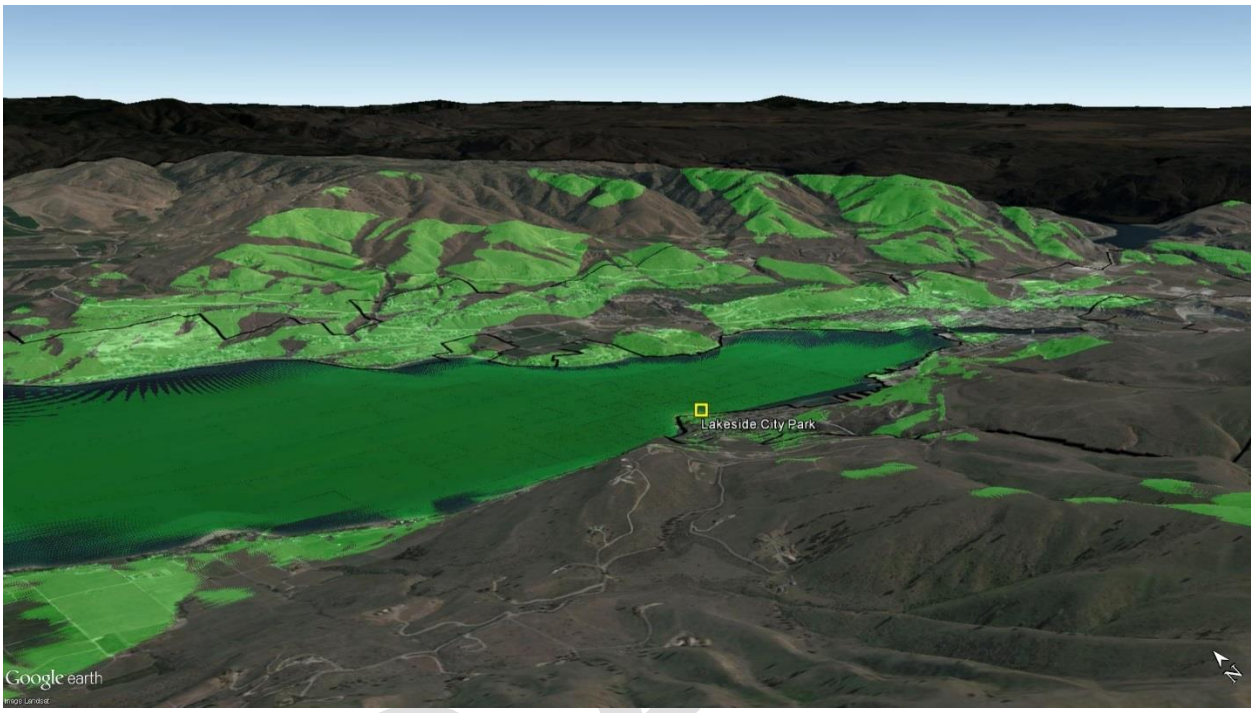
Lakeside Park is on the south shore of the lake and primary views are of the lake, the north slope, and Downtown. Exhibit 2-14 show the view from Lakeside Park towards the lake and north slope. Developed areas along the north slope are clearly visible in the background.

Exhibit 2-14. View from Lakeside Park towards the Lake and North Slope

Source: Google Earth, 2016

Exhibit 2-15 shows the areas that are visible from Lakeside Park towards the lake and north slope. Unlike at Don Morris Park areas higher up on the north slope are visible from this location including several already developed areas. Since the north slope is more developed than the Butte the potential for further view impacts is less, but updated design and development standards could minimize further view impacts.

Exhibit 2-15. Viewshed Analysis from Lakeside Park towards the Lake and North Slope



Source: Google Earth, 2016

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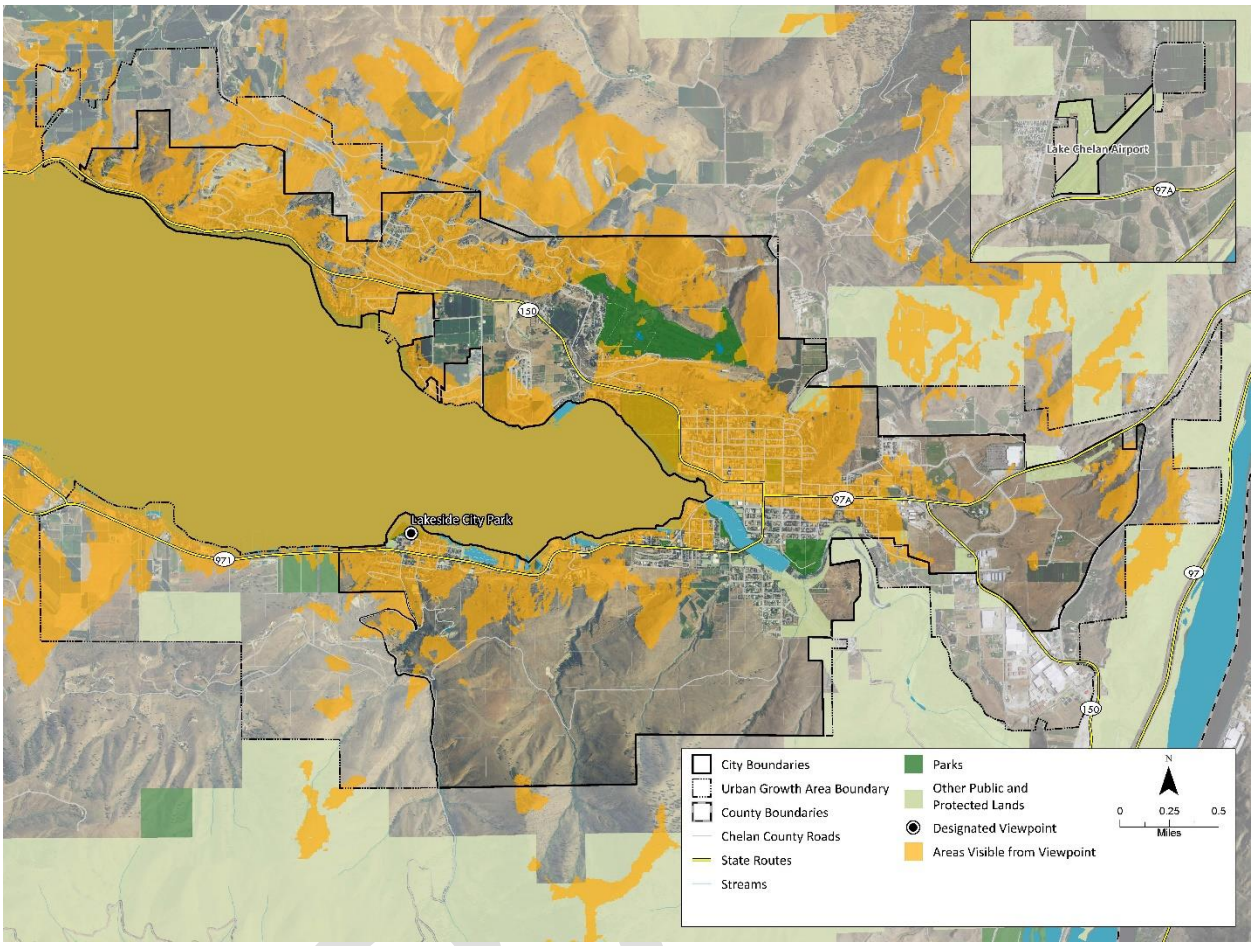
Exhibit 2-16. Viewshed Analysis from Lakeside Park South and North Shores



Source: Google Earth, BERK Consulting 2017

The following are the key recommendations from the viewshed analysis, further detailed in Appendix B:

- Four-story development has the potential to block views from public streets towards the lake and hillsides along the Manson Highway. These properties are designated for 4-story development due to its proximity to the lake and potential for views from tourist accommodation development. More analysis should be completed to determine the difference in view impacts between 4-story and less intense development and to understand the community importance of views from these streets. Ultimately, it is a question of community trade-offs between protecting views and supporting economic development goals.
- Focusing densities and land uses in other appropriate locations to reduce impacts from hillside development are also options that should be considered while meeting the City's requirements to accommodate growth and meet GMA. These efforts should be focused primarily on the Butte since it is less developed and highly visible from public view locations.

Current and Future Population, Housing, and Jobs

The City of Chelan is considering its appropriate boundary for growth in its Comprehensive Plan Update for the years 2017-2037.

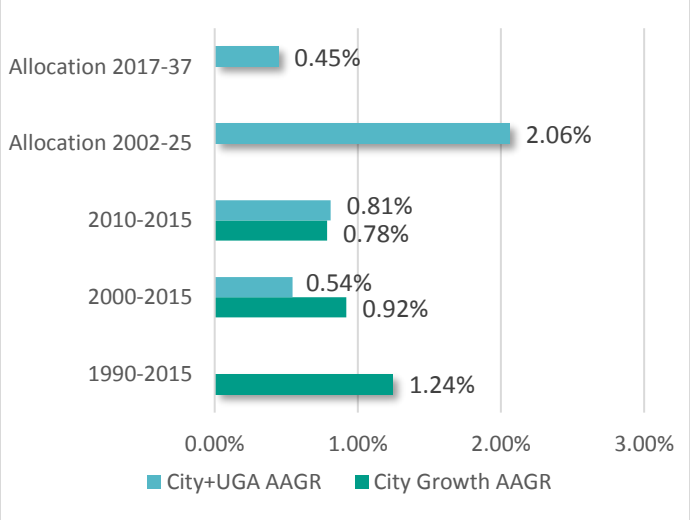
Counties are responsible for allocating population growth and setting urban growth area (UGA) boundaries in consultation with cities (RCW 36.70A.110). UGAs include areas already characterized by

urban development or adjacent to areas characterized by urban development. These UGAs should include "areas and densities sufficient to permit the urban growth that is projected to occur in the county or city for the succeeding twenty-year period." (RCW 36.70a.110 (2)) Designated UGAs must also have services available or planned to support future urban growth in these areas.

Chelan's permanent city population is about 4,045. The Unincorporated UGA is estimated to have another 370 residents, for a total City and UGA population of about 4,415 as of 2015. By 2017, the City and the UGA are anticipated to grow slightly to 4,465 persons. Based on growth allocations developed by Chelan County, Chelan city limits and UGA would add about 415 people for a total of 4,880 people over the 2017 to 2037 period. This is much lower than the projected 2025 growth target allocated to the City by Chelan County, which assumed a future UGA population of 6,705 or a growth rate of about 2.06%.

Chelan's average annual growth rate was 1.24% during 1990-2015 based on city limit population. It was about 0.8% over the 2010-2015 period. During 2017-2037 the rate slows to 0.45% based on County targets. If the City grew at a rate of 1.24% over the 20-year period, the net change in permanent population would equal about 1,254. At a rate of nearly 0.8% the net change in permanent population would equal 5,221 or a net change of 756 persons. Some of the city limit growth is due to annexations, however, recent annexations have not had significant permanent population (a total of 13 persons in 2009 and 2 persons between 2010 and 2015).

Exhibit 2-17. Observed and Planned Growth Rates

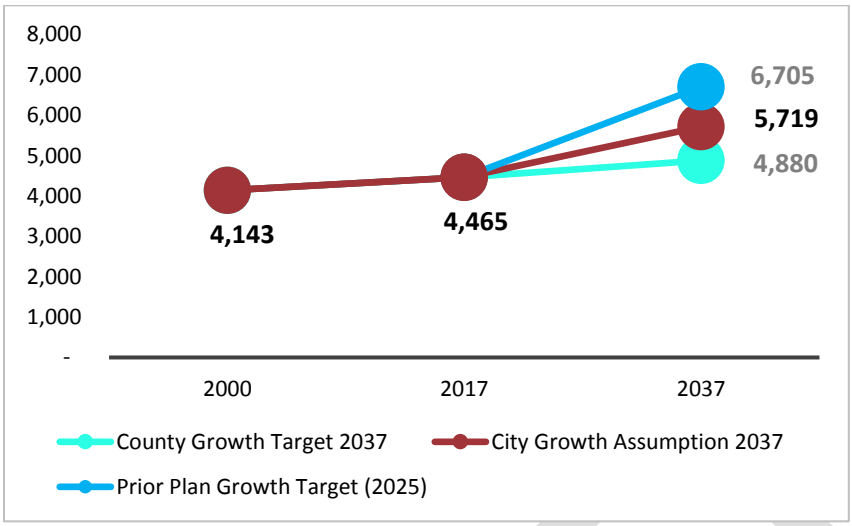


Note: Small area estimates are available for the UGA as of 2000 forward. Allocations are only made for the City+UGA.

Sources: (City of Chelan, 2011) (Office of Financial Management A, 2016) (Office of Financial Management B, 2016), (Chelan County, 2015); BERK Consulting 2017

Using a growth rate of just over 1.24% the Chelan UGA could potentially grow to 5,719 persons. This is considered a moderate assumption between the new 2037 population allocation and the past 2025 allocation which was nearly 2,000 persons higher.

Exhibit 2-18. Projected Permanent Population Growth 2000-2037



Source: (Office of Financial Management B, 2016)

While population is a key driver of the UGA sizing, the City and County must consider other uses: "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." (RCW 36.70a.110 (2))

Since the City's economy is tied to tourism and recreation, the incorporation of employment uses including resort and tourism accommodations is important to the mix of uses in the community. Further, the City has a traditional downtown, a large-format commercial area at the Apple Blossom Center, and an industrial and in the east part of town to help attract family wage jobs.

To help appropriately size the UGA, the City has developed a land capacity methodology (Comprehensive Plan Appendices C and G) that estimates vacant and undeveloped land such as agriculture that could be converted to residential or employment uses. Deductions are taken for unbuildable critical areas, rights of way and public uses, and market factors (not all property owners want to change). The City's land capacity method is summarized in Appendix C and compared with a County methodology.

The land capacity results show that the city limits has capacity for over 2,355 persons in permanent housing in the city limits. See Exhibit 2-19.

Exhibit 2-19. City of Chelan Land Capacity Analysis: City Limits

City	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	779.4	129.8	172.6	963.8
2. 40% Slopes	260.5	6.2	-	272.3
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	518.9	123.7	172.6	691.6
4. Deduct Safety Market Factor (25%)	389.2	92.7	129.4	518.7
5. Deduct Streets/Roads/Public Purposes (25%)	291.9	69.6	97.1	389.0
6. Deduct Land Unavailable (20-50%)	204.3	55.6	48.5	194.5
7. Multiply by Density Assumption for Zone	3	9	3	3
8. Gross Units	613.0	500.8	145.6	583.5
9. Deduct Seasonal Unit Occupancy (32-75%)	416.8	340.6	99.0	145.9
10. Total year Round Population (PPDU 2.35)	980	800	233	343
Total Population Capacity: City Limits	2,355			

Note: Population is rounded from fractional numbers.

Source: BERK = ,2017.

Within the city limits, the Butte area is under review as part of a broader open space strategy with the community and the Trust for Public Land. If development rights were purchased or if clustering or a lower density were applied, the above city land capacity could change, but the change would be not be substantial. If the full area were used for recreation, the resulting reduction in capacity would be a population of about 272 persons, lowering the city capacity to 2,084 instead of 2,355 persons. See Exhibit 2-20.

Exhibit 2-20.City of Chelan Land Capacity Analysis: Chelan Butte

City	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	35.0	-	-	820.7
2. 40% Slopes	35.0	-	-	272.3
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	-	-	-	548.4
4. Deduct Safety Market Factor (25%)	-	-	-	411.3
5. Deduct Streets/Roads/Public Purposes (25%)	-	-	-	308.5
6. Deduct Land Unavailable (20-50%)	-	-	-	154.2
7. Multiply by Density Assumption for Zone	3	9	3	3.00
8. Gross Units	-	-	-	462.7
9. Deduct Seasonal Unit Occupancy (32-75%)	-	-	-	115.7
10. Total year Round Population (PPDU 2.35)	-	-	-	272
Total Population Capacity: Butte	272			
City Capacity Excluding Butte	2,084			

Note: Population is rounded from fractional numbers.

Source: BERK, 2017

The population capacity of the UGA is less than the city limits but still consequential at 1,615 persons as illustrated in Exhibit 2-21.

Exhibit 2-21. City of Chelan Land Capacity Analysis: UGA

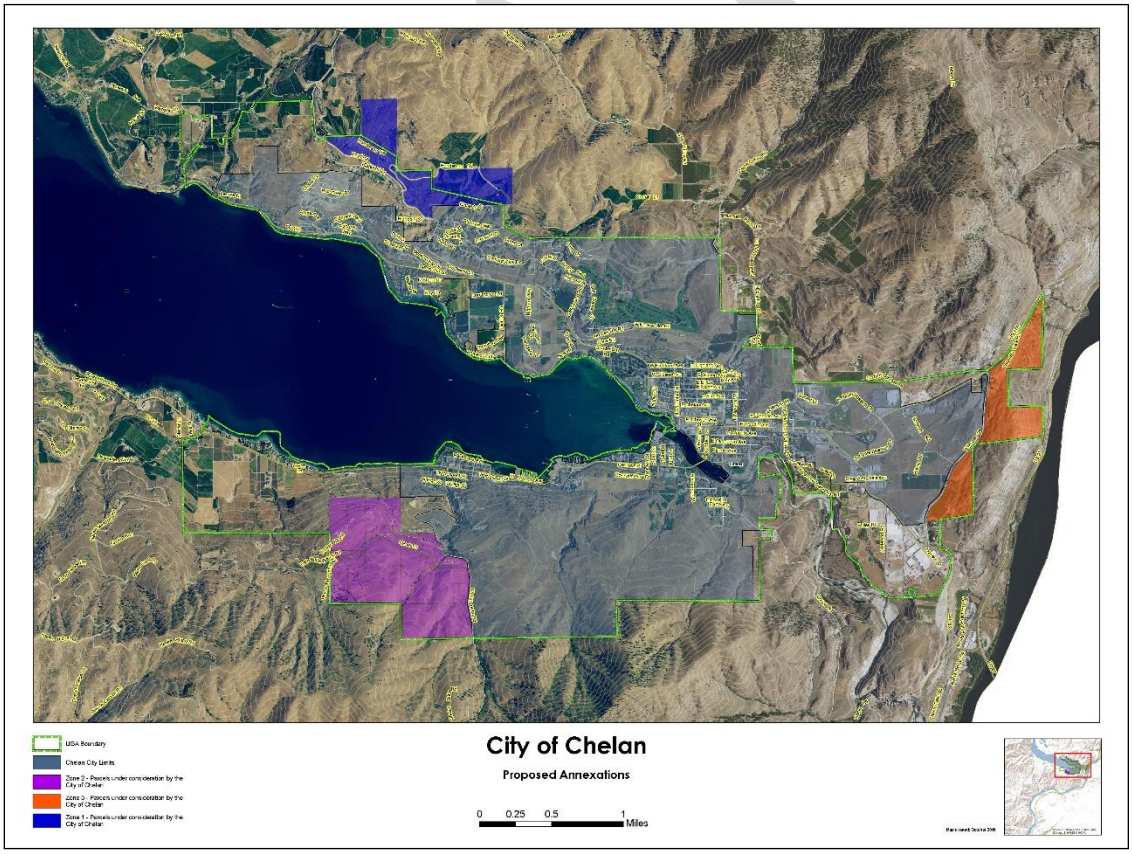
UGA	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	533.41	-	392.42	285.46
2. 40% Slopes	32.66	-	0.84	-
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	500.8	-	391.6	285.5
4. Deduct Safety Market Factor (25%)	375.6	-	293.7	214.1
5. Deduct Streets/Roads/Public Purposes (25%)	281.7	-	220.3	160.6
6. Deduct Land Unavailable (20-50%)	197.2	-	110.1	80.3
7. Multiply by Density Assumption for Zone	3.00	9.00	3.00	3.00
8. Gross Units	591.5	-	330.4	240.9
9. Deduct Seasonal Unit Occupancy (32-75%)	402.2	-	224.7	60.2
10. Total year Round Population (PPDU 2.35)	945	-	528	142
Total Population Capacity: UGA	1,615			

Note: Population is rounded from fractional numbers.

Source: BERK,2017

The City is considering reducing the UGA in three locations, one area on the northshore, one in eastern Chelan and one in the southshore area. These areas are not developed to urban levels largely due to the lack of services. See Exhibit 2-22.

Exhibit 2-22. Potential UGA Reduction Areas



Source: City of Chelan, 2016

If excluding the proposed UGA reduction areas, the loss of capacity would be about 175 persons, and would result in a new UGA population capacity total of 1,439 as identified in Exhibit 2-23.

Exhibit 2-23. City of Chelan Land Capacity Analysis UGA Reduction Areas

UGA Exclusion Area	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	122.08			145.10
2. 40% Slopes	67.23			0.00
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	54.8			145.1
4. Deduct Safety Market Factor (25%)	41.1			108.8
5. Deduct Streets/Roads/Public Purposes (25%)	30.9			81.6
6. Deduct Land Unavailable (20-50%)	21.6	-	-	40.8
7. Multiply by Density Assumption for Zone	3.00			3.00
8. Gross Units	64.8			122.4
9. Deduct Seasonal Unit Occupancy (32-75%)	44.1	-	-	30.6
10. Total year Round Population (PPDU 2.35)	104			72
Total Population Capacity: UGA Exclusion	175			
UGA Capacity Excluding Reduction Areas	1,439			

Note: Population is rounded from fractional numbers.

Source: BERK Consulting 2017

In summary, the city limits and UGA can accommodate a total population of 3,970. If development types were changed on the Butte to be non-residential (e.g. recreation) and if the potential UGA reduction areas were removed, the total population capacity would be about 3,523 persons. This is greater than the 415 person growth target, leaving a surplus of 3,108 persons. See Exhibit 2-24. The additional population growth may occur in planning periods beyond 2037.

Exhibit 2-24. City of Chelan Land Capacity Population Analysis: Summary

City + UGA Capacity Full 2016 Boundaries	3,970
Butte Population	272
UGA Exclusion Population	175
City +UGA with Butte as non-residential and reducing UGA	3,523
Growth Target City+UGA: 2017-2037	415
Surplus (Deficit)	3,108

Note: Population is rounded from fractional numbers.

Source: BERK, 2017

The above analysis subtracted seasonal unit occupancy. The City of Chelan serves a permanent population of between 4,000-5,000 but a seasonal population of 25,000 in peak summer months. After summing the seasonal unit estimates deducted in the land capacity method, there is room for 1,316 seasonal units. If the Butte did not contain seasonal units and the UGA areas were deducted, there would be room for 857 seasonal units. See Exhibit 2-25.

Exhibit 2-25. Seasonal Dwelling Units

Seasonal Dwelling Units	R-L	R-M	SUD	T-A	Total
City	196	160	47	438	841
Butte	-	-	-	347	347
UGA	189	-	106	181	476
UGA Reduction Areas	21	-	-	92	113
City and UGA Total	385	160	152	618	1,316
City and UGA Excluding Bute and UGA Reduction Areas	365	160	152	179	857

Note: Units are rounded from fractional numbers.

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Source: BERK, 2017.

Given the significant capacity of seasonal and permanent housing across zones, the Land Use Element should establish clear policies for both types of dwelling units.

The focus of the land capacity analysis has been on zones that have substantial vacant and underutilized acreage: R-L, R-M, SUD, and T-A consistent with the methodology described in the 2011 Comprehensive Plan and Appendix C.

However, other zones may potentially see change on vacant and redevelopable land.[3] Based on the review of commercial and mixed use zones, the Airport (A) is a particular area where airport industrial uses could locate, and the Commercial-Waterfront (CW) could see redevelopment Some downtown and commercial zones (DMR, DMU, and DSF) could see smaller amounts of conversion. Public Lands and Facilities (PLF) lands may see intensification on land in public ownership.

Exhibit 2-26. Vacant and Redevelopable Land Acres – Other Zones

Type of Land	Location	A	C-HS	C-W	DMR	DMU	DSF	PLF
Vacant	City	3.1	-	0.3	-	-	-	-
	UGA	38.2	-	-	-	-	-	5.2
Redevelopable	City	-	3.6	22.3	6.0	2.9	0.1	2.8
	UGA	-	-	0.4	-	-	-	-
Sum of Land Type	City	3.1	3.6	22.6	6.0	2.9	0.1	2.8
	UGA	38.2	-	0.4	-	-	-	5.2
Grand Total		41.3	3.6	23.0	6.0	2.9	0.1	8.0

Note: Acres are rounded from fractional numbers.

Source: BERK,2017.

Surrounding Land Uses

The Chelan city limits and UGA are surrounded by rural land uses governed by Chelan County. To the south of the city is Rural Residential 20 zoning, allowing 20 acres per residential lot. Rural Public, Rural Residential Resource, and Rural Residential of 1, 2.5, 5, 10 and 20 acres abut city and UGA areas to the north, east, and west.

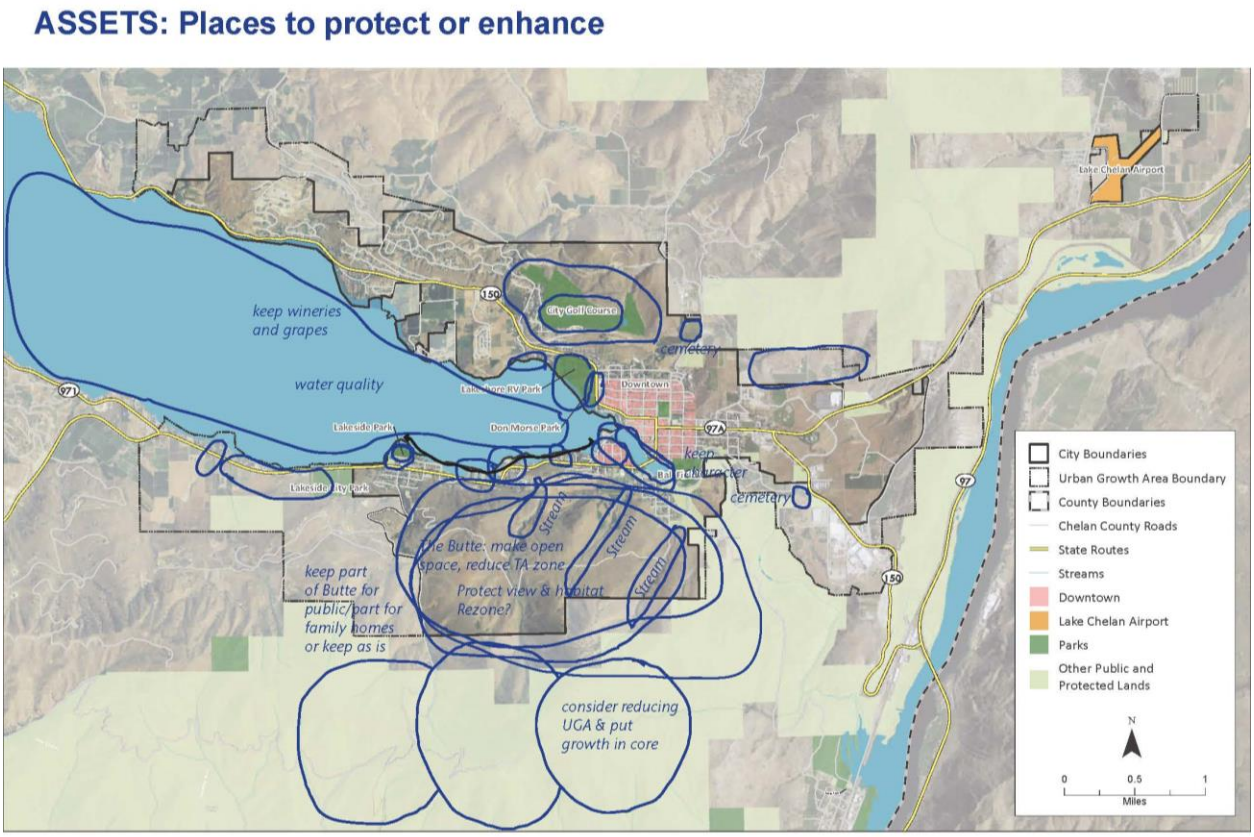
Community Vision

The City invited residents, business and property owners, and visitors to participate in an online survey and interactive vision workshop in November 2016. Overall, 227 people responded to the survey from November 9 to November 30, 2016: 188 people took the full online version of the survey, and 39 took a shortened postcard version. About 50 people attended the workshop on November 16, 2016. See Appendix D for a summary. The full report is available separately.

Some key results of the visioning effort include identifying assets of the community including the lake water quality, Butte, ridges and views, parks, downtown, and wineries/vineyards. These ideas have informed the land use and zoning analysis in the section below.

[3] Redevelopable method identifies land values at two times the building value (land is worth more than the structure on it).

Exhibit 2-27. Community Vision Workshop – Chelan Assets



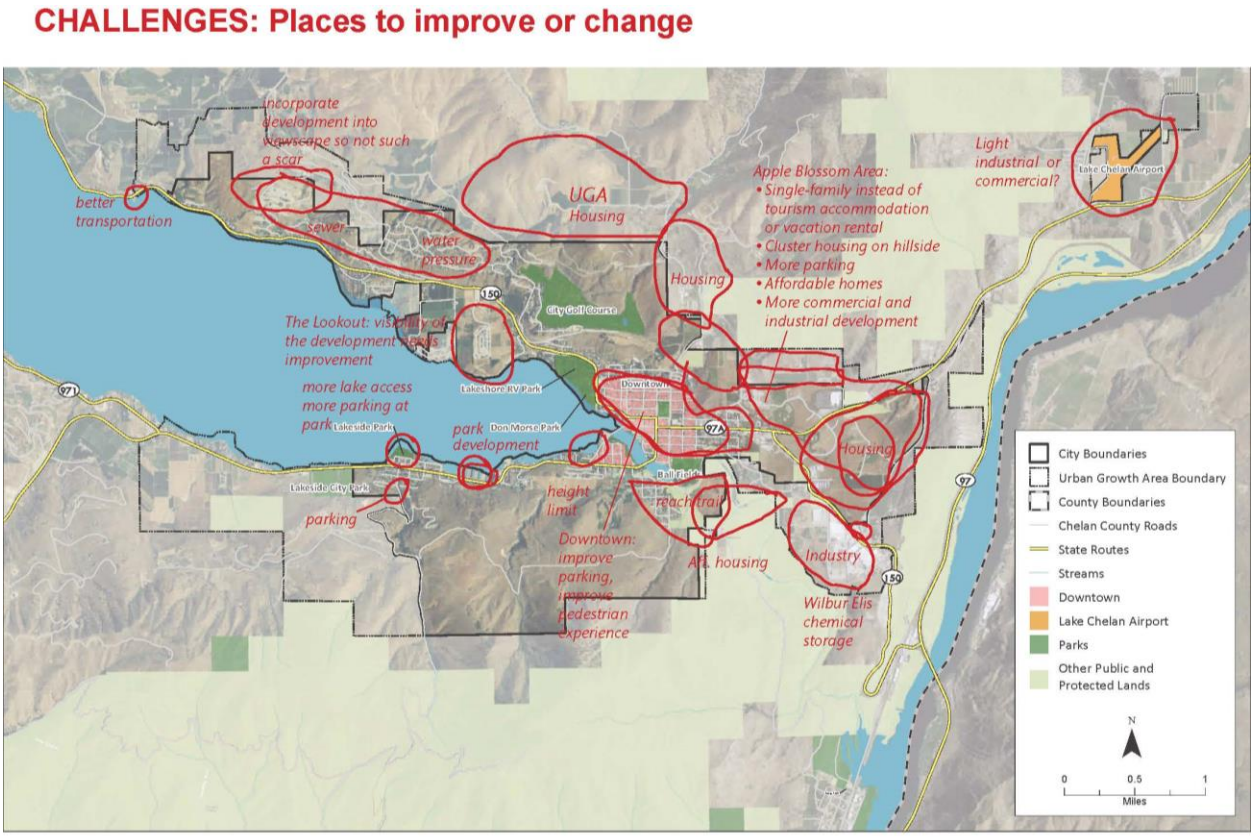
Source: BERK,2017.

The small group discussion about assets matched the online survey results about open space priorities, which included the following priorities and number of respondents:

1. Protecting water quality (113)
2. Protecting iconic views (94)
3. Promoting community health through accessible trails and parks (75)

Some challenges included visibility of development, lake access and parking, promoting infill Downtown, sufficient affordable housing, and year-round businesses.

Exhibit 2-28. Community Vision Workshop – Chelan Challenges



Source: BERK,2017.

The challenges of affordable housing were also reflected in the online survey questions as follows with the following types considered very important and important:

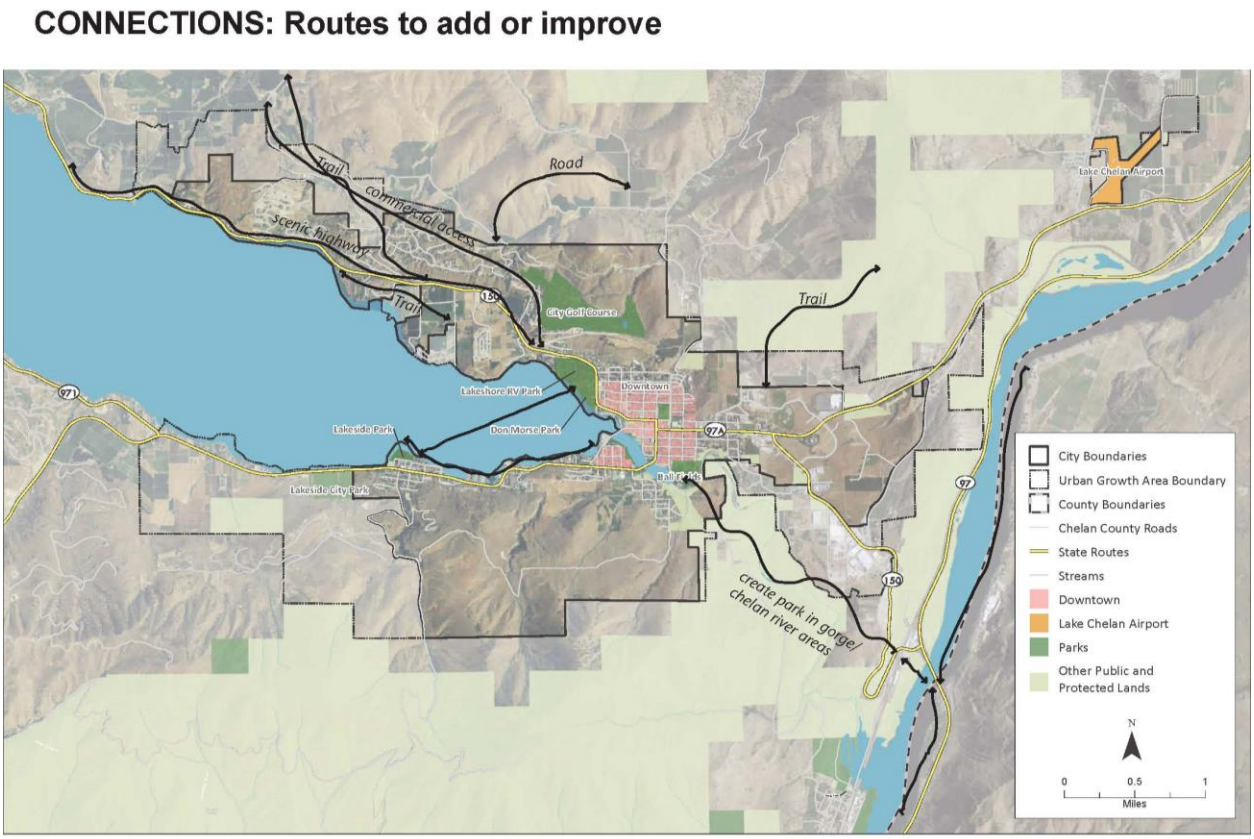
- **Very Important and Important Housing Types**
  - Housing for senior citizens or disabled
  - Single family detached homes – small lots
  - Multifamily-multiplex and townhomes
  - Single family detached homes – moderate to large lots
  - Multifamily-apartment style

A more diverse employment base was also supported in the online survey, with these job sectors being the top types to encourage:

1. Health
2. Manufacturing and light industry
3. Agriculture
4. Education
5. Tourism

Desired connections included more trail connections, improved commercial access, and sidewalk and bike lane connections.

Exhibit 2-29. Community Vision Workshop – Chelan Connections and Routes



Source: BERK,2017.

Survey results were similar with support for protecting neighborhoods, improvement of the pedestrian access and experience, and roadway safety.

Land Use Plan/Zoning Analysis

This Existing Conditions Report has identified several key trends influencing the land use plan including the City's permanent and seasonal population growth, small household sizes and a relatively high percentage of both retirees and children (see Chapter 3.0 Housing), a need for housing variety and affordability for both renters and homeowners (see Chapter 3.0 Housing), and broadening the employment base (see Chapter 4.0 Economic Development). Further, community input during visioning supports a wide range of attached and detached housing types, a range of service and manufacturing jobs, maintaining Lake and park amenities, ensuring transportation connections, and conserving iconic views.

Exhibit 2-30 below identifies the current Future Land Use Designation and Zoning Code intent statements, some trends and issues regarding housing, jobs, and other topics, and preliminary recommendations for conceptual changes.

Exhibit 2-30. Future Land Use and Zoning Classification Intent

Zone Intent (CMC 17.04.040)	Issues and Trends	Recommendations
A. A – Agricultural District. This district classification is intended to be applied in areas which are or will become devoted to agricultural pursuits. The regulations of this district are intended not only to protect the agriculture industry of the city, but also to limit urban development in these areas until the pressures of natural growth will bring about their most beneficial development.	Zone is not mapped any longer.	Remove from code; does not appear on map.
B. R-1 – Single-Family Residential District. This district classification is intended to be applied in areas suitable and desirable for residential use, which are or will become developed by one-family dwellings. The regulations of this district will supply the necessary protection for such development. Uses are limited to residential uses and, under specific conditions, public service uses which are necessary to serve residential areas.	Housing analysis shows a need for affordable home ownership options, e.g. lot sizes that are smaller. Wildland Urban Interface (WUI) illustrates the potential for higher risks of wildfire on steeper undeveloped slopes. Visioning input shows a concern about protecting iconic views and maintaining lake water quality.	Due to concerns over grading, erosion and slopes, and WUI, amend zone purpose and create special development standards in the zone to identify areas where clustering or special building standards will apply to ensure slopes/ WUI/ views are respected. Retitle as R-L in the code to match map.
C. R-M – Multi-Family Residential District. This district classification is intended to be applied in areas suitable and desirable for residential use which are, or will become, developed by one, two, three and multi-family dwellings. Uses are limited to those which are residential in character, including motels under strict regulations and, under specific conditions, public service uses which are necessary to serve residential areas.	Housing analysis and Visioning shows a need for affordable attached housing and senior housing. Warehouse-Industrial property owners are interested in providing workforce housing to seasonal workers in eastern Chelan.	Evaluate compatible housing options along the outer edges of Downtown and South Chelan; consider citywide DMR instead of R-M. Also, consider workforce housing in Apple Blossom and eastern Chelan by amending or replacing W-I.
D. C-L – Low Density Commercial District. This district classification is intended to be applied to provide for mall shopping areas outside the central business district with low structures, off-street parking and attractive appearance to cater to neighborhood convenience needs without being detrimental to adjoining residential properties.		Remove from code; does not appear on map.
E. C-H – High Density Commercial District. This district classification is intended to be applied to provide areas of complete retail facilities necessary for community service and convenience in which high density		Remove from code; does not appear on map.

Zone Intent (CMC 17.04.040)	Issues and Trends	Recommendations
development is encouraged for the convenience of the walking shopper, where off-street parking is provided, but not required as an accessory use to the individual retail structure.		
F. C-HS – Highway Service Commercial District. This district classification is intended to be applied to provide areas outside the central business district for necessary services to the traveling public and heavy commercial uses not oriented to walk-in convenience shopping.		No significant changes proposed.
G. C-W – Waterfront Commercial District. This district classification is intended to be applied to provide areas on lakefront property for heavy waterfront commercial uses, such as boat fueling and servicing, industrial docks, and other uses incidental to commercial water transportation.	Shoreline Master Program (SMP) principles support water dependent uses. The C-W and SMP do not address the full range of water borne transportation such as by seaplanes and boats.	Address commercial transport hub as allowed use in zone and SMP. Limit future residential uses.
H. W-I – Warehousing and Industrial District. This district classification is intended to be applied in areas suitable for industrial use which are or will be developed by industries not detrimental to agriculture or recreation in the Lake Chelan area. The regulations of this district will supply the necessary open level space needed for such development.	See R-M above regarding allowances for workforce housing.	Consider appropriate sizing of industrial areas to maintain opportunities for larger higher-wage industrial uses. Consider whether some uses should be added to the zone to reinforce a wine cluster district (see Chapter 4.0).
I. T-A – Tourist Accommodations District. This district classification is intended to be applied in areas near or adjacent to Lake Chelan which are uniquely suited for motels, hotels, lodges and similar uses in keeping with the importance of the recreation industry to the city. Recognizing the limited amount of land available for such development uses are limited in this district to those which provide tourist residency or are recreational in nature.	The T-A area on the Butte is valued for its views. It is also prone to wildland fires. It lacks access and utilities.	Amend the T-A zone, or develop an overlay for the Butte to require clustering or special building standards to ensure natural landforms, WUI best practices, and iconic views are respected.
J. P-D – Planned Development. The purpose of this zoning district is as set forth in Section 17.52.010 of this code. [The planned development district ("PDD") is a separate zoning classification that is intended to allow new development which is consistent with the comprehensive plan but would not be permitted in other zoning districts due to limitations in the		Address whether uses can be changed or if rezone is needed. Address densities and public benefits.

Zone Intent (CMC 17.04.040)	Issues and Trends	Recommendations
dimensional standards, permitted uses or accessory uses.]		
K. Zone AP – Chelan Municipal Airport District. This zone applies to the property within the boundary of the Chelan Municipal Airport.	City may be extending water to the area. The County has an airport compatible land use plan.	Review the land use allowances on airport zoned lands. Allow private non-airport uses on private property. Consider adding airport compatible land use regulations similar to Chelan County. Retitle "A" per zoning map.
L. SUD – Special Use District. This designation is to allow the transition in an orderly fashion from agriculture uses to mixed uses of commercial planned unit development and residential homes while protecting ongoing agricultural practices. The commercial use that would be allowed must comply with the requisites of the planned unit development section of this title.	Chelan is a wine tourism destination and desires to extend the shoulder season. Expanding allowances for agri-tourism uses can help achieve that aim. Protecting open space and providing for transitional densities can help conserve the agricultural character that supports tourism.	Amend the SUD to increase agri-tourism uses, and allow lower density resort and residential uses, while conserving agricultural views as a part of Chelan gateways and identity as a wine region.
M. P – Public Lands and Facilities. This designation is intended to provide areas for municipal use, related structures and facilities. The designation is also intended to allow for passive and active recreational opportunities. This designation is not intended to allow private commercial amusement enterprises, except traditional nine and eighteen hole golf courses.		No substantive changes are proposed.
N. DT – Downtown Planning Area. This designation applies to property within the downtown planning area, and intends to implement the goals, objectives, and policies of the Chelan downtown master plan.	The Downtown Master Plan provides for several designations: Downtown Mixed-Use (DMU), Tourist Mixed-Use (TMU), Downtown Mixed-Residential (DMR), Downtown Single Family (DSF), and Public.	Some of the zones duplicate other citywide zones and could be consolidated or applied in other areas (e.g. DMR). Further, since there are more design standards associated with attached housing, it would promote a consistent community character to apply them elsewhere. Promote downtown infill. Options for retaining neighborhood character (e.g. height limits, streetscape) could also be considered.

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2.3 Summary of Key Issues and Trends

Chelan's natural amenities, including steep hills and a crystal clear deep lake, have attracted residents and visitors for decades, and also support fish and wildlife. Chelan's soils and climate have also meant a steady agricultural economy. The steep slopes and wild landscapes that interface with residential and employment structures and public facilities and roads, also produce a wildfire risk.

The City of Chelan has provided recreation and tourism opportunities for seasonal residents and traveling public as well as a high quality of life and housing and job opportunities for year-round residents. The amenities afforded to Chelan residents and visitors are valued by the community as illustrated through the Visioning outreach. Comprehensive Plan Land Use Policies and zoning code updates should seek to protect iconic views and critical areas while allowing for development that conserves the landscape and stewards important natural resources.

Managing growth will be important to achieving a balanced approach to conservation and opportunities for housing and jobs. Historically the City has grown at over 1.24% in permanent population, though growth targets for the community have been set at a slower pace between 2017 and 2037 of 0.45%. The County's growth target would mean planning for over 400 residents, in comparison to respecting historic population trends which will mean planning for over 1,200 residents. It is recommended that the City plan for historic trends – 1.24% going forward.

The City's choices regarding UGA reduction areas are more dependent on the balancing of growth and conservation, and are not dependent on urban growth capacity needs. The City will consider whether the areas are able to be effectively served with infrastructure and whether the areas are relatively important to the community's character over the 20-year planning period.

The City has sufficient residential land capacity to meet either its population growth target or growth at historic trends, with or without UGA reduction areas. Permanent population capacity is about 3,970, or 3,782 if UGA lands are removed and the Butte is not developed residentially. The capacity for permanent residential dwellings is 1,690 with the present UGA configuration or 1,610 if UGA land and Butte properties are not developed with permanent residential uses.

Seasonal housing capacity is also quite available. Summing the seasonal unit estimates deducted in the land capacity method, there is room for 1,316 seasonal units. If the Butte did not contain seasonal units and the UGA areas were deducted, there would be room for 857 seasonal units.

As noted in Chapter 3.0 Housing, the city's households have gotten smaller and there is a high percentage of both retirees and children, requiring opportunities for housing variety over the 20-year planning period through the Land Use Plan and City zoning. Additionally, there is also a low vacancy rate for ownership and rental housing, increasing housing costs for permanent residents, and a strong demand for seasonal units. Focusing the growth of seasonal units in a manner that supports the local economy while avoiding impacting the stability and quality of life of permanent residents will be important in terms of the Land Use Element policies and Future Land Use/Zoning. Additionally, creating stable and affordable residential neighborhoods for the next generation of Chelan children to stay in the community are considerations for the Land Use Element Update.

The City also has land capacity for employment uses. Consistent Visioning input and analysis in Chapter 4.0 Economic Development show that attracting health care service, manufacturing, agriculture, and tourism jobs are important to permanent residents, business owners, and visitors alike. The W-I zone use allowances for manufacturing and workforce housing are particularly important to ensure that there is a core employment area and housing to support seasonal workers.

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Without an extensive Comprehensive Plan and code update since the mid-1990s, there are opportunities to amend and align the zoning classifications to meet more recent trends and needs including greater housing variety, and family-wage year round jobs, as well as to conserve critical areas and reduce wildfire risk.

To date, the City has grown in a pattern of lower densities at gateways and hillsides and greater densities at the lakeshore and downtown. Currently, much of the zoned land for residential, commercial, and industrial purposes contains rural or single family dwellings. Based on the Future Land Use Plan and Zoning map, there could be conversion of such rural, undeveloped, and single-family land to other higher intensity uses. To ensure smoother transitions to planned uses, development standards regarding height, density, grading, and landscaping should be reviewed to improve compatibility.

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3.0 HOUSING

3.1 Overview

Data Sources

The bulk of the analysis in this Chapter was developed by Sandra Strieby, consultant, in a Draft Housing Element draft prepared for the City in July 2016. BERK Consulting supplemented this work with additional information in several areas of the demographics, housing inventory, and trends, including affordability, special needs populations, and second homes.

The following data sources are used in this section:

The American Community Survey (ACS) is a nationwide survey designed to provide communities with a more frequent set of data to inform how communities are changing. The ACS replaced the decennial census long-form in 2010 and thereafter by collecting long-form type information throughout the decade rather than only once every 10 years. Questionnaires are mailed to a sampling of addresses to obtain information about households and the people living in them.

The ACS produces demographic, social, housing and economic estimates in the form of one-year and five-year estimates based on population thresholds (three-year estimates have recently been suspended). The strength of the ACS is in estimating population and housing characteristics. It produces estimates for small areas, including census tracts and population subgroups.

Although the ACS produces population, demographic, and housing unit estimates, the Census Bureau's population estimates program produces and disseminates the official estimates of the population for the nation, states, counties, cities and towns, and estimates of housing units for states and counties.

At the time of the preparation of the Draft Housing Element, the best available data was the 2011-2014 ACS; this timeframe is continued with for consistency supplemental information in this chapter.

The Decennial Census provides the official counts of population and housing units for 2000 and 2010 and other decades.

Washington State Office of Financial Management (OFM) provides annual population and housing counts as April 1st for counties and cities across Washington State. Data from OFM as of 2010 has since been corrected and is reflected in this Existing Conditions Report. At the time of the preparation of the draft Housing Element, the year most data was available was 2015. The City's population and dwellings have not changed substantially with 2016 information (70 persons were added between 2015 and 2016 and no dwellings were added per 2016 OFM information). Thus, this chapter retains the 2015 OFM information.

Demographic Profile

The City developed a demographic profile, based primarily on data from the U.S. Census and the OFM, for use in assessing the City's housing needs over time. The profile has been incorporated and updated in this report and includes information about current and projected population, household size and housing tenure, income, and employment.

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Inventory Analysis

Much of the housing inventory information is from the ACS and OFM. Data from the Washington Center for Real Estate Research (WCRER) was also used, as were several local sources of information, which are described below.

Windshield Survey

In the summer of 2008, the City conducted a windshield survey of 11 neighborhoods in and around the downtown core. Although somewhat out of date, information from the survey has been used in the Housing Element update.

The purpose of the survey was to evaluate housing condition and land availability in the City, and to evaluate the potential for using neighborhood planning and other planning tools to address specific housing needs and issues. The neighborhood boundaries were defined using professional judgment, with the possibility of future zone changes and infill development in mind.

The windshield survey evaluated housing condition and the availability of vacant and underused land. The methodology, survey form, neighborhood map, and a summary of findings are incorporated in the City's Community Housing Manual, 2009. Summary outcomes can be found under the heading "Housing Condition."

Chelan Housing Manual

When the City last updated its housing element, in 2009, it also adopted a Community Housing Manual. The manual is intended to serve as the City's housing action plan, offering guidance to policymakers, landowners, developers, development organizations, staff members, and the general public. It explains specific strategies and actions that can be used to implement the City's housing policies and meet its housing goals. The manual is a separate document and has been designed so that materials can be added or removed as new information becomes available, new programs are begun, and action items are completed.

3.2 Regulatory Context and Planning Framework

GMA

Washington State's Growth Management Act (GMA) requires each county and city fully planning under the act to include a housing element in its comprehensive plan. The GMA calls for:

> A housing element ensuring the vitality and character of established residential neighborhoods that: (a) Includes an inventory and analysis of existing and projected housing needs that identifies the number of housing units necessary to manage projected growth; (b) includes a statement of goals, policies, objectives, and mandatory provisions for the preservation, improvement, and development of housing, including single-family residences; (c) identifies sufficient land for housing, including, but not limited to, government-assisted housing, housing for low-income families, manufactured housing, multifamily housing, and group homes and foster care facilities; and (d) makes adequate provisions for existing and projected needs of all economic segments of the community.[4]

[4] RCW 36.70A.070(2). Accessed July 3, 2016.

Housing is the fourth of the GMA's thirteen goals:

> Encourage the availability of affordable housing to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.[5]

County-Wide Planning Policies

In accordance with GMA, Chelan County and the cities within the county have adopted County-Wide Planning Policies. The County-Wide Planning Policies include a series of "Policies addressing the need for affordable housing for all economic segments of the population and the adoption of parameters for the distribution of affordable housing**."**[6] Those policies are informing the Housing Element Update. The policies identify the type of information desired in the inventory and analysis, promotion of housing stock preservation, opportunities for affordable housing, diversity in housing types, effects of regulations on housing costs, evaluating densities that are efficient, and sufficient land capacity for new housing.

2009 Housing Element Vision

The Steering Committee that guided the development of the 2009 Housing Element agreed on the following vision statement, retained in the Housing Element Update.

> *Housing Vision*
>
> *The Housing Element of the City of Chelan Comprehensive Plan is intended to provide a policy framework that will encourage development of a diversity of housing to create a vibrant and healthy selection of housing types in the City, housing options for all income levels, and preservation of thriving neighborhood environments. The Community Housing Steering Committee recognizes a growing shortage of affordable housing (including rentals and owner-occupied dwellings) in the City and its Urban Growth Area (UGA), and a shortage of special needs housing. The Committee recommends that the City of Chelan provide regulatory guidance and incentives to actively encourage the development of:*
>
> *Housing for people earning at or below 110% of the median income level—"working class housing"*
>
> *Special needs housing (senior housing, assisted living facilities, ADA accessible homes)*
>
> *Affordable, well-maintained rentals*

The 2017 Comprehensive Plan Update solicited public feedback through a vision workshop and online survey in November 2016. Comments and opinions from these outreach efforts echoed similar desires for housing for all income levels, attention to special needs, and building a variety of housing styles and densities that would also preserve important views.

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[5] RCW 36.70A.020(4). Accessed July 3, 2016.

[6] Chelan County County-wide Planning Policies Appendix A. See Policy #5. Accessed January 2017.

3.3 Existing Conditions

Demographic Profile

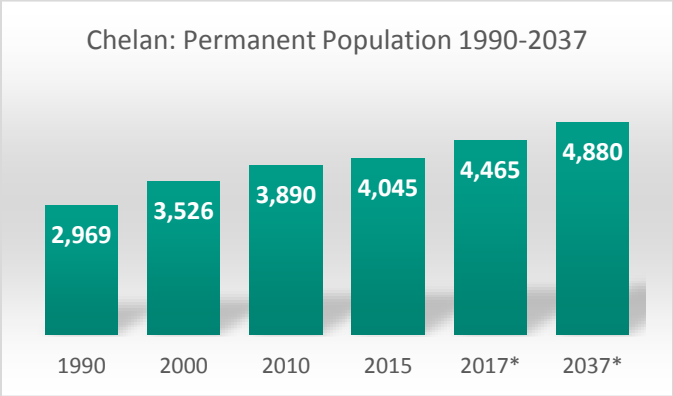
Population

PERMANENT AND SEASONAL POPULATION

Chelan's permanent city population was about 4,045 in 2015. Chelan makes up 5% of the countywide population of 75,030 as of 2015. The Unincorporated UGA is estimated to have another 355 residents in 2015. By 2037, Chelan city limits and UGA would add over 400 people for a total of 4,880 people.

During summer months, the seasonal population can grow to approximately 25,000 including tourists, permanent residents, and part-time residents.[7]

Exhibit 3-1.Chelan Permanent Population, 1990-2037



*Note: City population 1990-2015 *2017 and 2037 = City + unincorporated UGA

Source: OFM 2015, Chelan County Resolution 2015-112, BERK Consulting 2016.

The population of the City of Chelan grew at an average rate of 1.24% between 1990 and 2015. The growth rate more recently has been about 0.80% per year from 2010 to 2015[8]. Chelan County's population grew at an average rate of 0.71% during the same 2010-2015 period.

The OFM projects a growth rate ranging from 0.45% to 1.39% for Chelan County over the next 20 years with a 0.74% growth rate associated with the medium forecast between 2015 and 2035. Given the recent county growth rate, Chelan County's population is likely to continue to grow at a rate of under 1% per year. However, some segments of the population are expected to grow faster than the population as a whole (see Population by Age below).

POPULATION BY AGE

According to 2014 data from the ACS, Chelan's median age is 45.1, greater than the county at 39.2 or the state at 37.4.

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[7] Source: http://www.lakechelan.com/about-the-area/chelan/

[8] Washington. Office of Financial Management. Forecasting and Research Division. *Population Change and Rank for Cities and Towns, April 1, 2010 to April 1, 2015*. http://www.ofm.wa.gov/pop/april1/default.asp. Accessed May 31, 2016.

Exhibit 3-2. Population by Age

	Chelan	County
18 and under	18.1%	17.7%
19 – 64 years	62.0%	66.1%
65 years and older	19.9%	16.2%

Source: ACS Five-Year Estimates 2010-2014. Sandra Strieby, 2016.

According to ACS data, in 2014 nearly 20% of Chelan's population is 65 years and older.[9] This is more than the county and state, at 16.2% and 13.2% respectively. The expected rate of population growth for people age 60 and up in Chelan County is nearly three and a half times the average growth rate, at 2.28% per year. Perhaps more significant in terms of planning for housing type and location is the projected growth rate among people age 70 and up—4.97%, more than seven times the rate for the population as a whole. By age 70, homeowners may be thinking of downsizing and seeking housing features such as single-story dwellings, level lots, and easy access to shopping, walking trails, and health-care facilities. OFM estimates for the Lake Chelan School District over the past 15 years show population growth of 2.8% per year among people age 60 and above, with rates of 3.2-5.0% over the past five years.

Chelan's share of children under 18 years is 18.1%, similar to the county (17.7%), but higher than the state (16.6%). The projected rate of growth in the number of people aged 20-34 in Chelan County is lower than the average, a reverse of the trend noted in the last update of the Housing Element in 2009.

The 35-49-year-old age group is now projected to grow somewhat faster than the population as a whole, at an average rate of 0.98% per year. Because many young people have delayed home buying due to economic conditions, that group may include first-time home buyers and represent a pent-up demand for housing. The projected increases in older and younger residents have important planning ramifications to be addressed in the Housing Element Update.

ETHNICITY AND RACE

As of 2014, the City of Chelan is about 98% white, but has a large Hispanic or Latino population at 27%. This is similar to Chelan County as a whole (90% white, 27% Hispanic/Latino).[10]

Households

HOUSEHOLD SIZE

According to OFM 2015 data, the City's average household size is 2.38 in 2015.[11] This is lower than Chelan County at 2.67 and the statewide average of 2.55. According to 2014 ACS data, the City's average household size was 2.35. This is lower than Chelan County at 2.67 and the statewide average of 2.55. This

[9] Source: Demographic and Housing Estimates ACS 2010-2014.

[10] Source: Race and Age Information is from the ACS 2010-2014.

[11] Source: Washington State Office of Financial Management, Small Area Estimate Program (SAEP). Calculated using "Estimates of Household Population for Census 2010 Urban Growth Areas" and "Estimates of Occupied Housing Units for Census 2010 Urban Growth Areas." 2015.

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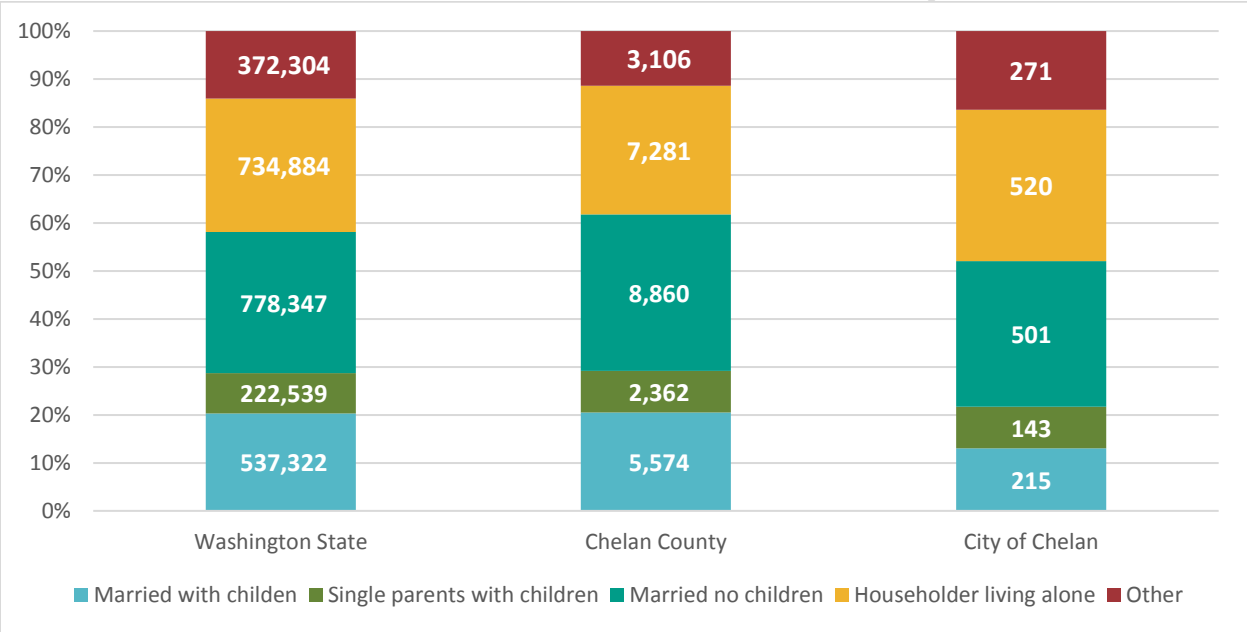
is likely due to the greater share of persons above retirement age and single-person households described above.[12]

HOUSEHOLD COMPOSITION

The City of Chelan has more householders living alone than the county or state and fewer households with children. See Exhibit 3-3.

Exhibit 3-3. Household Composition



Source: ACS Five-Year Estimates, 2010-2014; BERK Consulting, 2016.

Special Needs Population

DISABILITIES

Exhibit 3-5 and Exhibit 3-5 compare Chelan and Chelan County populations living with a disability. Approximately 9.4% of the total population of Chelan has a disability. This is slightly lower than the county at 11.7%.

Exhibit 3-4. Chelan and Chelan County Population Living with a Disability: 2013

	Chelan	Chelan County
Total Civilian non-institutionalized population	3,895	73,111
With Disability	407	8,410
Percent of Total	10.4%	11.5%

Source: ACS 5-Year Estimates 2010-2014; BERK Consulting, 2017.

[12] Source: ACS 5-Year Estimates 2010-2014.

Exhibit 3-5. Chelan's Estimated Population Living with a Disability 2013

	Chelan			Chelan County
	Total	With a disability	% with a disability	% with a disability
Total Civilian non-institutionalized population	3,895	407	10.4%	11.5%
Population 5 to 17 years	716	22	3.1%	4.8%
With a hearing difficulty		0	0.0%	0.1%
With a vision difficulty		0	0.0%	0.6%
With a cognitive difficulty		22	3.1%	3.2%
With an ambulatory difficulty		0	0.0%	0.5%
With a self-care difficulty		0	0.0%	1.0%
Population 18 to 64 years	2,270	219	9.6%	9.4%
With a hearing difficulty		14	0.6%	2.2%
With a vision difficulty		0	0.0%	1.4%
With a cognitive difficulty		179	7.9%	4.3%
With an ambulatory difficulty		41	1.8%	3.9%
With a self-care difficulty		24	1.1%	1.4%
With an independent living difficulty		84	3.7%	3.7%
Population 65 years and over	750	166	22.1%	31.7%
With a hearing difficulty		73	9.7%	16.3%
With a vision difficulty		26	3.5%	7.3%
With a cognitive difficulty		11	1.5%	8.7%
With an ambulatory difficulty		104	13.9%	19.3%
With a self-care difficulty		40	5.3%	8.0%
With an independent living difficulty		54	7.2%	13.0%

Source: ACS 5-Year Estimates 2010-2014; BERK Consulting, 2017.

- About 40% of the senior population in Chelan aged 65 and older has a disability. Again this is slightly lower than the county overall, where 63.7% of the senior population has a disability.
- The most prevalent disabilities among the total population in Chelan include ambulatory difficulty (difficulty walking around) at 21%.

SENIORS

Chelan has a significant senior population age 60 and older (see Exhibit 3-2). The percentage of seniors in Chelan's overall population is about 20%. In the future, the senior population is expected to grow as baby boomers retire. The City of Chelan is attractive to retirees, and the data suggest that the City's older population will continue to grow at a rate considerably higher than the overall population growth rate in the City, just as it is expected to do in the County. This segment of the population may need housing features and design that fit their needs.

SINGLE PARENT POPULATION

According to Exhibit 3-3, 143 households, or 9%, were single parents with children. This is similar to Chelan County (9%) and Washington State (8%).

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GROUP QUARTERS

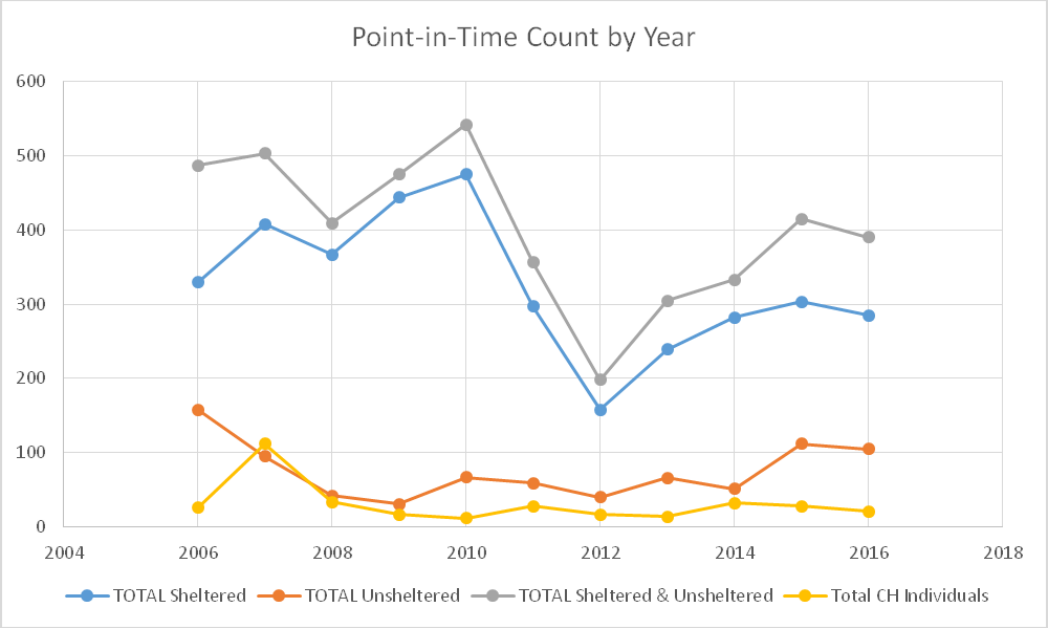
According to ACS 5-Year Estimates 2010-2014, 72 persons were living in group quarters in the city. This will likely increase as assisted living and other care facilities increase in the community.

HOMELESS POPULATION

Estimating the total homeless population is difficult, and not much information is available at the City level. Point in Time (PIT) counts are collected at the county level; see Exhibit 3-6. Chelan County works cooperatively with Douglas County to address and reduce homelessness in both counties.

Both sheltered and unsheltered homeless individuals and families are considered in need of permanent housing. The following graph shows trends in the annual PIT count of homeless individuals both sheltered and unsheltered in Chelan and Douglas counties combined.

Exhibit 3-6. Point-in-Time Count by Year (Chelan and Douglas County)

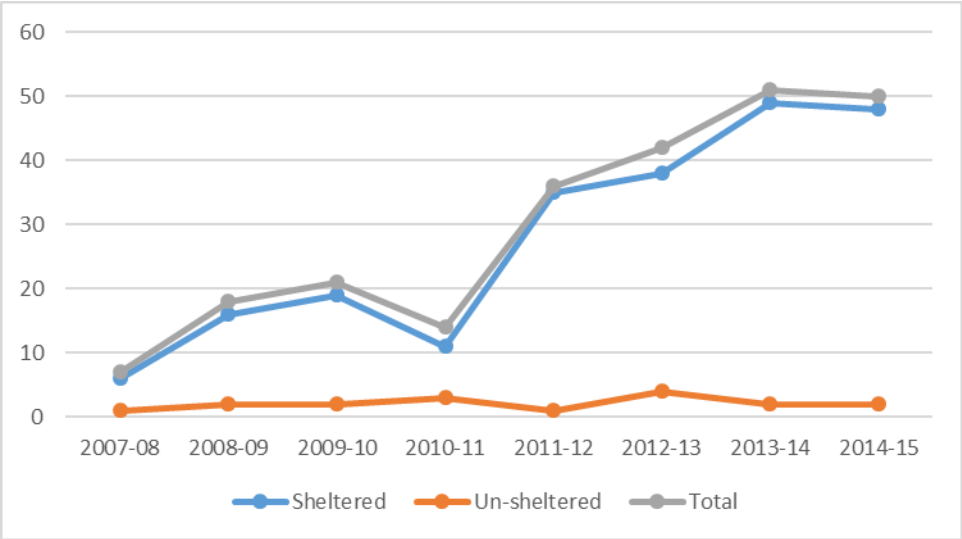


Source: 2015 Action Plan Update: Ten-Year Plan To Reduce Homelessness in Chelan and Douglas Counties, 2015; BERK Consulting, 2017.

- The total number of homeless individuals and families (sheltered and unsheltered) in Chelan and Douglas counties in 2016 was 390. This is a small decrease from the total in 2015, and is also a halfway point between the highest recorded annual count in 2010 at 542, and the lowest annual count recorded in 2012 at 198.

The Washington State Office of the Superintendent (OSPI) collects annual data on the number homeless students both sheltered and unsheltered. Exhibit 3-7 below shows the annual homeless student count for the Lake Chelan School District.

Exhibit 3-7. Lake Chelan School District Homeless Student Count



Source: OSPI Homeless Students in Washington State by School District 2007-2015; BERK Consulting, 2017.

- The number of homeless students (sheltered and unsheltered) has increased over past years from 2007 to 2015. In 2015, there was a total of 50 homeless students.
- The large majority of homeless students were sheltered (shelters, doubled-up, hotels/motels).
- The number of unsheltered homeless students has remained constant over the years.

MIGRANT WORKER HOUSING

It is a goal of the Housing Element update to consider workforce housing, of which migrant worker housing is part of. While the City of Chelan does not provide migrant worker housing, the City works with other housing agencies and resources to address this population. According to the 2009 Chelan Community Housing Manual, the City partners with other governmental agencies and nonprofit organizations. At the county level, Chelan County in partnership with Washington State Department of Commerce Housing Division administers farm worker housing. It operates a camp that provides seasonal housing for migrant agriculture workers and their families. The camp is located along State Highway 2 next to the Wenatchee River County Park just outside of Monitor, about 40 miles south of Chelan. It provides 380 beds in total during cherry season and 200 beds for pear and apple season.[13]

Other resources include the USDA Rural Development program which supports rural rental housing and farm labor housing through loan and grant programs. The Washington State Farmworker Housing Trust is a nonprofit organization that addresses workers' housing needs.

[13] Chelan County website. "Chelan County Farm Worker Housing" Accessed January 2017.

Housing Inventory Analysis

Housing Units and Type

OFM estimates current housing units for all Washington jurisdictions over time. In 2015, the OFM estimated that there were 2,871 housing units in the Chelan UGA,[14] of which 1,823, or 63%, were occupied.[15] The UGA used for the analysis does not include the 2014 and 2015 changes to the UGA, which added four housing units,[16] bringing the estimated 2015 total to 2,875. Within the City of Chelan, the OFM estimated there were 2,617 housing units in 2015[17] See Exhibit 3-8.

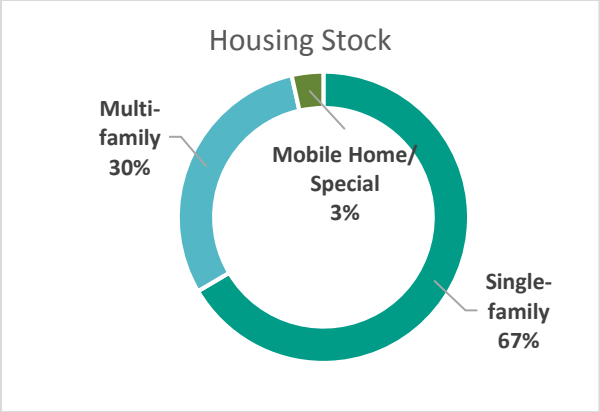
Exhibit 3-8. Housing Units by Type

Single-family	Multi-family	Mobile home/special	TOTAL
1,741	784	92	2,617

Source: OFM 2015; Sandra Strieby, 2016.

About two-thirds of Chelan's housing stock is single-family. See Exhibit 3-9.

Exhibit 3-9. Percentage of Housing Stock by Type



Source: OFM 2015; BERK Consulting, 2017.

Housing Tenure

The City's homes are increasingly owner-occupied based on 2014 information from the ACS, though that information has about a 9% margin of error. Even accounting for the margin of error the share would be ticking up recently. See Exhibit 3-10.

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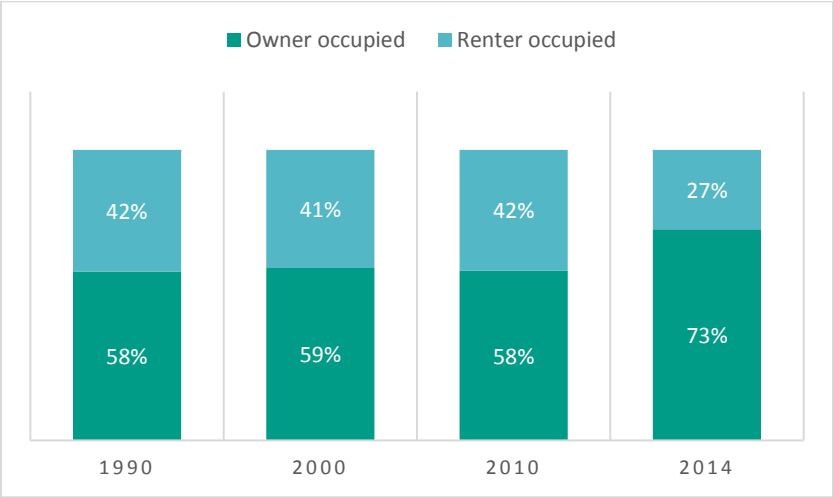
[14] OFM, Small Area Estimate Program. Estimates of Total Housing Units for Census 2010 Urban Growth Areas. Accessed June 18, 2016.

[15] OFM, Small Area Estimate Program. Estimates of Occupied Housing Units for Census 2010 Urban Growth Areas. Accessed June 18, 2016.

[16] City of Chelan Planning and Building Department. "Proposed Urban Growth Boundary Removal Options" map, provided to consultant July 28, 2014; Staff report: 2015 Urban Growth Area Modification Request, dated August 19, 2015. [pending confirmation]

[17] OFM, Forecasting & Research Division. *2015 population trends*. September 2015. "Table 8: Housing Units by Structure Type for Cities, Towns, and Counties April 1, 2010 and April 1, 2015". Accessed June 18, 2016.

Exhibit 3-10. Chelan Renter and Owner Occupancy1990 -2014



Source: 1980-2000 data: City of Chelan Comprehensive Land Use Plan, Amended September 2011. 2010 data: United States Census Bureau. American FactFinder. General Housing Characteristics: 2010: 2010 Census Summary File 1. 2014 data: United States Census Bureau. American FactFinder. Selected Housing Characteristics, ACS 5-Year Estimates 2010-2014; Sandra Strieby, 2016; BERK Consulting 2016.

Vacancy Rates

Vacancy rates (the proportion of vacant to occupied housing units) are an excellent measure of the relationship between housing supply and demand. While opinions vary, three to seven percent is usually considered an adequate vacancy rate to provide residents with some choice in housing. A rate lower than three percent indicates a tight housing market.

Exhibit 3-11 shows rental vacancy rates for the City of Chelan derived from the 1990, 2000, and 2010 censuses.

Exhibit 3-11. Changes in Rental Vacancy Rates

	1990[18]	2000[19]	2010[20]
City of Chelan	11.5%	5.8%	17.3%

Source: U.S. Census 1990, 2000, 2010; Sandra Strieby, 2016.

The vacancy rates reported show considerable fluctuation over a period of 25 years. While the 2010 data suggest a substantial over-supply of rental housing, they probably reflect conditions that no longer exist and, indeed, may never have existed.[21] In the United States as a whole, rental vacancy rates peaked

[18] United States. Bureau of the Census. 1990 Census of Population and Housing. Chelan City, Washington. Summary Tape File 1. Accessed September 17, 2008.

[19] United States. Bureau of the Census. 2000 Census of Population and Housing. Chelan City, Washington. Summary Tape File 1. Accessed September 17, 2008.

[20] U.S. Census Bureau. General housing characteristics: 2010. 2010 census summary file 1. Accessed June 18, 2016.

[21] The Census data report a margin of error for the 2010 vacancy rate data of 15.6%±.

around 2009 and have dropped steadily since.[22] It is unlikely that the 2010 data accurately represent rental housing availability in Chelan. The Washington Center for Real Estate Research (WCRER) reports an apartment vacancy rate in Chelan County of 2.0% as of Spring, 2016.[23] Local real estate agents report a very tight rental market in which vacancies are filled quickly.[24]

The vacancy rate for owner-occupied dwellings has continued to drop, as shown in the table below.

Exhibit 3-12.Changes in Owner-Occupied Housing Vacancy Rates

	1990	2000	2010
City of Chelan	6.0%	5.0%	3.5%

Source: City of Chelan Comprehensive Land Use Plan. Amended September 2011. United States Census Bureau. General Housing Characteristics: 2000. Census 2000 Summary File 1 (SF1) 100-Percent Data. Accessed June 25, 2016. United States Census Bureau. General Housing Characteristics: 2010. 2010 Census Summary File 1. Accessed June 25, 2016; Sandra Strieby, 2016.

The U.S. Census Bureau's American FactFinder lists estimated homeowner vacancy rates in Chelan of 3.5-4.3% from 2010-2012, but by 2013 the rate has dropped to 0%.[25] A June, 2016 review of Chelan Multiple Listings shows few houses for sale that would be considered affordable for residents earning 110% of median income or less.

Housing Condition: Age and Year Built

The condition of a community's housing stock affects both the quality of life of residents and the potential for new development in established neighborhoods. An assessment of housing condition can provide information about:

- The ability of the existing housing stock to provide adequate housing. How much of the population is living in housing that is in sub-standard condition? Are there areas in which residents may need assistance with housing repairs?
- The desirability of existing neighborhoods for new construction (including infill, accessory dwelling units, and other density-enhancing housing). Are there areas in which housing condition may discourage new investment—neighborhoods in which people are unlikely to want to live because of the condition of houses and lots?
- The likelihood that existing housing stock will be replaced—perhaps with higher-density housing, or perhaps with seasonal housing that does not meet the needs of full-time residents. Older housing units in sub-standard condition are more likely to be demolished and replaced with new structures.

[22] U.S. Census Bureau. Housing vacancies and homeownership [Housing vacancy survey]. Annual and Quarterly Charts of Rental and Homeowner Vacancy Rates and Homeownership Rates. Figure 1: Annual rental and homeowner vacancy rates for the United States: 1968 to present. Accessed June 18, 2016.

[23] Washington Center for Real Estate Research. *Washington Apartment Market*. Spring 2016. Accessed July 3, 2016.

[24] Personal communications, Joe Collins, June 18, 2016; Myrt Griffith, June 21, 2016.

[25] United States Census Bureau. American FactFinder. Selected Housing Characteristics. 2010, 2011, 2012, 2013, 2014. Accessed June 25, 2016.

- Trends in housing construction. What neighborhoods are developing most quickly? Where are single-family and multi-family housing being built? Where is there a preponderance of housing units that are likely to be used seasonally rather than by full-time residents?

This report includes information about two measures of housing condition: age and physical condition.

The Census Bureau tracks the age of structures. The age of housing units can demonstrate trends. As the table below shows, the number of housing units in the City of Chelan has been growing relatively steadily for several decades. However, because of the high proportion of seasonal residences being built, the number of new housing units does not necessarily indicate that there will be adequate or affordable housing for the City's residents.

Exhibit 3-13. Age of Housing Units in the City of Chelan

When built	Number of housing units
1939 or earlier	290
1940-1949	216
1950-1959	274
1960-1069	242
1970-1979	336
1980-1989	385
1990-1999	337
2000-2009	346

Source: ACS 5-Year Estimates 2010-2014; Sandra Strieby, 2016.

In addition, the 2008 windshield survey provided information about the physical condition of single-family houses in selected neighborhoods in and near the City of Chelan's downtown. The table below shows the numbers of standard and sub-standard housing units in each of the eleven neighborhoods as of 2008. More detailed information, including a map, can be found in the City's Community Housing Manual.

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Exhibit 3-14. Condition of Single-Family Housing Units

Neighborhood	% Standard	% Substandard
1—Carroll/Ogden	88.9	11.1
2—South Chelan	72.6	27.4
3—East of Sanders	63.9	36.1
4—West Chelan	66.7	33.3
5—Hospital District	57.4	42.6
6—Highlands	69.4	30.6
7—Harvey Tracts	54.4	45.6
8—Riverview	60.0	40.0
9—Lakeside	71.0	30.0
10—Highway Corridor	54.2	45.8
11—Original Town	49.4	50.6

Source: 2008 windshield survey; Sandra Strieby, 2016.

Subsidized Housing

Subsidized housing refers to housing managed by public agencies that received Federal, State, and local funding sources, incentives, and subsidies. For qualified low-income households, there are currently 73 rental units in the City of Chelan with some type of rent assistance or low-income qualification. Sixteen houses have been built for and sold to lower-income families. Most of the low-income housing units have waiting lists. For those in need of senior or assisted living, there are 74 units ranging in price from $420 to $4,845 per month.

The following paragraphs provide a more detailed inventory of the current special needs housing options in Chelan.

- **Casa Guadalupe** is located in South Chelan, and run by the Diocese of Yakima. There are 31 rental apartments for people and families who earn 80% or less of the median income level.
- **Housing Authority of Chelan County and the City of Wenatchee** manage the following housing complexes:
  - Chelan Bluff: Year-round agricultural housing located at 1135 S. Bradley Street. Built by the Housing Authority in 2007; owned and managed by the Housing Authority. Twenty-two units; rent (as of summer, 2016): $647/2 bedroom, $710/3 bedroom. All tenants receive rental assistance. Five families on wait list (down from 34 in 2008).
  - Chelan Gardens: Senior housing; located at 210 W. Gibson. Built in 1980 and purchased by the Housing Authority in 2003. Sixteen units; rent (as of summer, 2016): $640/1 bedroom. Tenants receive rental assistance. Forty-four individuals on wait list (up from nine in 2008).

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- Gibson Gardens: Multi-family housing located at 309 E. Gibson. Built in 1976 and purchased by the Housing Authority in 2003. Twenty units; rent (as of summer, 2016): $659/1 bedroom, $723/2 bedroom, $786/3 bedroom. Tenants receive rental assistance. One hundred forty-three families on wait list (up from 82 in 2008).
- Lake Chelan Community Apartments: Senior/Disabled Housing located at 410 E Gibson and owned by the Housing Authority. Twenty-eight units; rent (as of summer, 2016): $526/1 bedroom. Most tenants receive rental assistance. Five individuals on wait list (as compared to three vacancies and no wait list in 2008).
- Riverview Homes: Located at the corner of Iowa and Bradley. Built in 2004 by the Housing Authority and the Columbia Valley Housing Association. Sold to qualified first-time, low-income buyers. Sixteen single-family houses. Original selling price range: $128,000-$134,000. Houses can only be resold to qualified low-income buyers.
- Heritage Heights: Heritage Heights is an assisted living facility operated by a private non-profit and located next door to the hospital. It typically has a short waiting list for its 30 units, and the current price range for those units is $3,795 to $4,845 per month. Heritage Heights accepts Medicaid.

Housing Stock at Different Price Levels

COST OF RENTAL UNITS

Median rent paid in Chelan, as listed in the U.S. Census Bureau's American FactFinder, was $665 in 2014. It is worth noting that the margin for error in the inter-censal estimates is high; and that rent amounts reported may include subsidies. A number of sources provide additional information about rental costs (and availability) in Chelan:

- The WCRER lists the average apartment rent in Chelan County in Spring, 2016 as $1,078—the highest in Washington State outside King and Snohomish counties.[26]
- On July 3, 2016, Craigslist lists seven rentals in Chelan, Chelan Falls, and Manson, with monthly rents ranging from $700 to $2,500.
- On the same date:
  - Trulia lists a single rental, priced at $1,695 per month
  - The *Lake Chelan Mirror* classified ads list no rentals in the Chelan area
    - Homes.com lists no rentals in the Chelan area

MONTHLY OWNER COSTS

Median values of owner-occupied housing units in Chelan, as listed in the U.S. Census Bureau's American FactFinder, are shown below. It is worth noting that the margin for error in the inter-censal estimates is high.

[26] Washington Center for Real Estate Research. *Washington Apartment Market*. Spring, 2016. http://realestate.washington.edu/wp-content/uploads/2016/04/spring-2016.pdf. Accessed July 3, 2016.

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Exhibit 3-15. Median value of owner-occupied housing units in Chelan

2010	2011	2012	2013	2014
$332,000	$354,800	$361,000	$327,200	$289,500

Source: United States Census Bureau. American FactFinder. Selected Housing Characteristics. 2010, 2011, 2012, 2013, 2014. Accessed June 25, 2016; Sandra Strieby, 2016.

A number of sources provide additional information about the cost of buying a house in Chelan:

- Zillow reports that as of May, 2016, the median price of a house in Chelan was $264,700.[27]
- Trulia lists a median sale price for a house in Chelan as $271,000 for the month ending June 22, 2016.[28]
- The WCRER gives the following median house prices in Chelan County: 1st quarter of 2016, $249,400[29]; 3rd quarter of 2015, $280,900.[30]

Housing Affordability

HOUSEHOLD INCOME

The median household income in the city is $36,901 as of 2014. This is lower than county and state median household incomes. This is likely a reflection of the greater share of single person households or residual effects of the Great Recession given the 5-year estimates over 2010-2014 (see Household Composition above showing that the City has a relatively higher proportion of householders living alone)s. Family incomes are still lower than the state, but comparable to the county family incomes.[31] See Economic Development for 2015 income information and comparisons showing that the median household income has risen significantly (to $49,905) while family income is fairly stable (at $60,577).

[27] Zillow. Chelan home prices & values. Zillow Home Value Index. Accessed June 25, 2016.

[28] Trulia. Chelan Real Estate Market Overview. Accessed June 25, 2016.

[29] Washington Center for Real Estate Research. Housing market snapshot: State of Washington and counties: First quarter 2016. Accessed June 25, 2016.

[30] Washington Center for Real Estate Research. Housing market snapshot: State of Washington and counties: Third quarter 2015. Accessed June 25, 2016.

[31] According to the ACS 2015 Subject Definitions, household income includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not. Because many households consist of only one person, average household income is usually less than average family income. See Subject Definitions link, available here: https://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html.

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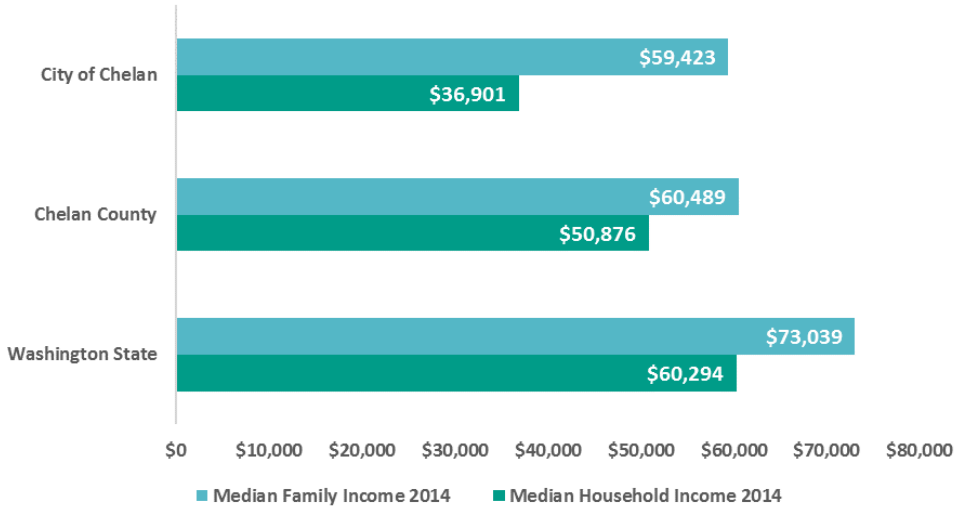
Exhibit 3-16. Household and Family Incomes



Source: ACS 5-Year Estimates 2010-2014; BERK Consulting 2016.

HOUSEHOLDS BY PERCENT OF MEDIAN INCOME

GMA rules encourages cities to use income ranges consistent with local county-wide planning policies, or to use HUD definitions (24 C.F.R. 91.5) if there are no local definitions. Chelan County's county-wide planning policies do not include specific income ranges. The income ranges established by the HUD are as follows[32]:

- Extremely low income: at or below 30% of median income
- Low income: between 30% and 50% of median income
- Moderate income: between 50% and 80% of median income
- Middle income: between 80% and 95% percent of median income

All of the ranges are intended to be based on HUD median income and adjusted for household size.[33] For the purpose of the Housing Element Update—to plan for affordable housing, rather than to establish housing payment limits—the City of Chelan will use median income from the U.S. Census Bureau's ACS, and the income levels will not be adjusted for household size. Also, because the City's housing vision includes encouraging the development of housing for people earning up to 110% of median income, "middle income" will be defined as between 80% and 110% of median income.

The ACS reports a median household income in the City of Chelan of $36,901 in 2014.[34] Chelan's UGA includes housing located outside of the City limits, in areas where incomes may be slightly higher than

[32] Growth Management Act — Procedural Criteria for Adopting Comprehensive Plans and Development Regulations: Housing Element. Chapter 365-196-410 WAC. Accessed May 21, 2016.

[33] 24 CFR 91.5 - Definitions.

[34] US Census Bureau. American FactFinder. Selected Economic Characteristics: ACS 5-Year Estimates 2010-2014. Accessed May 21, 2016.

those reported within the city.[35] Because the difference is small and there are no readily available income data for the UGA as a whole, $36,901 will be used for analyses in this report. Table 3, below, shows, economic groupings based on that figure.

Exhibit 3-17. Economic Groupings by Percentage of City of Chelan's Median Income

Economic Grouping	Income
Extremely low income (< = 30% AMI)	No more than $11,070
Low income (30% and 50% of AMI)	No more than $18,451
Moderate income (between 50% and 80% of AMI)	No more than $29,521
Middle income (80% and 95% percent of AMI)	No more than $40,591

Source: ACS 5-Year Estimates 2010-2014; Sandra Strieby, 2016.

A common practice is to use County median income. Chelan County's 2014 median income was $50,876.[36] Exhibit 3-18 below presents the estimated number of households in each income category for Chelan County and the City of Chelan related to the county income.

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[35] Census data for the Chelan Census County Division (CCD), which includes Holden, Lucerne, and Chelan Falls estimate a 2014 median household income of $38,317. US Census Bureau, American FactFinder. Accessed June 15, 2016.

[36] ACS 5-Year Estimates 2010-2014.

Exhibit 3-18. Household Income 2014

	Chelan		Chelan County
Income Range	**Households**	**Percent**	**Percent**
Less than $10,000	168	10.2%	7.9%
$10,000 to $14,999	109	6.6%	4.9%
$15,000 to $19,999	106	6.4%	4.9%
$20,000 to $24,999	129	7.8%	5.6%
$25,000 to $29,999	73	4.4%	4.6%
$30,000 to $34,999	148	9.0%	4.9%
$35,000 to $39,999	147	8.9%	5.9%
$40,000 to $44,999	31	1.9%	5.4%
$45,000 to $49,999	25	1.5%	4.7%
$50,000 to $59,999	188	11.4%	10.6%
$60,000 to $74,999	151	9.2%	9.9%
$75,000 to $99,999	201	12.2%	12.0%
$100,000 to $124,999	91	5.5%	7.6%
$125,000 to $149,999	23	1.4%	4.5%
$150,000 to $199,999	7	0.4%	3.5%
$200,000 or more	53	3.2%	3.0%
Total Households	**1,650**	**100%**	**100%**
Median Income	**$36,901**		**$50,876**

Source: 2010-2014 ACS 5-Year Estimates; BERK Consulting, 2017.

- Chelan's median household income is lower than Chelan County's median household income. The city's median income is about 72.5% of the County's median income.
- Chelan has a greater percentage of households with incomes between $0 to $40,000 annually than the County as a whole. Chelan County has a higher percentage of its population in the lower middle income category ($40,000 to $50,000) than Chelan.

Exhibit 3-19 below shows household income ranges as reported in the 2014 ACS and the percent of the county's median income represented by each range. The income ranges reported by the US Census do

not correlate exactly with the economic groupings used by HUD, but the data below give a rough idea of the number of households in each of the economic groupings above.

Exhibit 3-19. Household Estimates by Percentage Median Income, 2014 Dollars.

	Income Ranges		Rounded (1,000s) Income Ranges		Estimated Households			
% of county AMI	Low	High	Low	High	Chelan		Chelan County	
Under 30%	$0	$15,263	$0	$15,000	277	16.8%	3,467	12.8%
30-50%	$15,263	$25,438	$15,000	$25,000	235	14.2%	2,878	10.6%
50-80%	$25,438	$40,701	$25,000	$41,000	374	22.7%	4,479	16.5%
80-100%	$40,701	$50,876	$41,000	$51,000	69	4.2%	2,739	10.1%
100-120%	$50,876	$61,051	$51,000	$61,000	179	10.8%	2,769	10.2%
120% +	$61,051		$61,000		516	31.3%	10,851	39.9%
Total					1,650	100%	27,183	100%

Source: Figure based on 2010-2014 ACS 5-Year Estimates; BERK Consulting, 2017. Figures may not add to total due to rounding.

- **Under 30% AMI (HUD Extremely Low)**. Chelan has a higher percentage of the population earning less than 30% of the AMI at 16.8% versus 12.8% for Chelan County.
- **Between 30-50% AMI (HUD Low).** Chelan also has a higher proportion of households earning 30-50% of the County AMI than Chelan County at 14.2% versus 10.6%.
- **Between 50-80% AMI (HUD Moderate).** Chelan's proportion of moderate income households at 50-80% of the Chelan County AMI is likewise higher than the County proportion at 22.7% versus 16.5%.
- **Between 80-100% AMI (Middle Income).** At 80-100%, Chelan is much lower than Chelan County (4.2% of households in Chelan compared to 10.1% in the County.
- **Above 100% AMI** Households at and above 100% AMI are similar for Chelan and the County.

Affordability Based on Income Level

OWNER AFFORDABILITY

The table below is based on Chelan's estimated median household income given in the demographic profile: $36,901. Insurance is assumed to cost $500 per year. Tax rates are based on current rates for residential properties in the City of Chelan.[37] Mortgage calculations are based on a 30-year mortgage with a fixed rate of 3.85%, using an online simple mortgage calculator available at www.mortgage-calc.com. A 20% down payment is assumed.

[37] Personal communication, Chelan County Assessor's Office

Exhibit 3-20. Mortgage Affordability Based on Income Level

City of Chelan Median Income: $36,901

Earnings as a percentage of median income	Household Income (HI)	Affordable Annual Cost (30% of HI)	Tax and Insurance	Affordable Mortgage Payment[38]	Affordable Property Value	Down Payment
50%	$18,451	$5,535	$1,396	$345	$91,875	$18,375
80%	$29,521	$8,856	$1,987	$572	$152,500	$30,875
110%	$40,591	$12,177	$2,578	$800	$213,125	$42,625

Source: Chelan County Assessor's Office, www.mortgage-calc.com; Sandra Strieby, 2016.

- According to the calculations above, a household earning 50% of median income (the upper limit of the "low-income" bracket) could afford a house priced at $91,875. A household earning 80% of median income (the upper limit of the "moderate-income" bracket) could afford a house priced at $152,500, and a household earning 110% of median income (about in the middle of the "middle-income" bracket) could afford a house priced at $213,125. In all cases, those figures assume that the buyer can afford the 20% down payment.
- A comparison between the amount residents can afford to pay and the cost of houses in Chelan (as reported in Housing Stock at Different Price Levels) reveals a very significant gap. A household income of nearly $50,577—137% of median income—would be required to afford a house costing $268,000—an estimate of the median price in June, 2016.[39] Although low interest rates currently make home-buying more affordable than it was when the Housing Element was last updated, buying a house remains out of reach for many residents of Chelan.

RENTER AFFORDABILITY

The same approach can be used to assess rental housing affordability. The table below uses the same assumptions about household income and affordable annual housing cost as did the mortgage affordability table. Utility costs are estimated.

[38] Affordable annual cost minus tax and insurance

[39] Based on a rough average of median selling prices reported by Zillow and Trulia.

Exhibit 3-21. Rental Affordability Based on Income Level

City of Chelan Median Income: $36,901

	Household Income (HI)	Affordable Annual Cost (30% of HI)	Utilities	Affordable Monthly Rent[40]
50% of City AMI	$18,451	$5,535	$1,200	$361
80% of City AMI	$29,521	$8,856	$1,800	$588
110% of City AMI	$40,591	$12,177	$2,400	$815

Source: Chelan County Assessor's Office, www.mortgage-calc.com; Sandra Strieby, 2016.

- As reported in Housing Stock at Different Price Levels, the median rent in Chelan County in Spring, 2016 was $1,078[41]—a cost that would be affordable for a household earning $51,120, or 139% of the median household income. Assuming rents are similar in the City of Chelan, rental housing is now about as affordable as for-purchase housing. And, as noted in Vacancy Rates, rental housing is in short supply, regardless of cost.

Using the County's average median income and breaking out renter occupied housing units according to income levels, households that rent housing in Chelan tend to have lower incomes. Exhibit 3-22 compares the number of renter households by housing need category to the number of units being rented at rents affordable to each category. Exhibit 3-22 compares renters (people) with housing rents (unit costs) and does not speak to the housing burden of any particular household or group. Very-low income households may be renting at prices much more than they can afford, and median- and upper- income households may be paying a smaller proportion of their monthly income on rent.

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[40] Affordable annual cost minus utilities.

[41] Washington Center for Real Estate Research. *Washington Apartment Market*. Spring, 2016. http://realestate.washington.edu/wp-content/uploads/2016/04/spring-2016.pdf. Accessed July 3, 2016.

Exhibit 3-22. Chelan Renter-Occupied Income and Current Rents 2014

Ratio to Chelan County AMI	Income Ranges		Monthly Housing Budget*		Estimated Renter HHs		Estimated	Gap
$50,876	Low	High	Low	High	Count	Percent	Units	
Under 30%	$0	$15,263	$0	$382	85	19%	114	29
30 - 50%	$15,263	$25,438	$382	$636	129	29%	87	(42)
50 - 80%	$25,438	$40,701	$636	$1,018	46	10%	100	54
80 - 100%	$40,701	$50,876	$1,018	$1,272	34	8%	53	19
100 - 120%	$50,876	$61,051	$1,272	$1,526	64	14%	39	(25)
120% or Over	$61,051		$1,526		99	22%	27	(72)
Total					457	101%	419**	(38)

*Estimated monthly housing budget based on 30% of monthly gross income. Total estimated Renter households is rounded.

** This table does not include units identified as "no cash rents", of which there were 32; thus there is an apartment for each household.

Source: Figures based on ACS 2010-204 5-Year Estimates; BERK Consulting, 2017. Figures may not add due to rounding.

- There is a gap of affordable housing units for the rental households that earn between 30-50% of the County median income.
- There are about 163 renter households that make more 100% of the County median income or more who rent. There is a gap of rental units that are affordable for these income groups, which may mean these households rent units that are much cheaper for them, putting added pressure on households making less than 50% of the County median income.

Housing Affordability Index

The Housing Affordability Index (HAI) was established by the National Association of Realtors (NAR) to gauge the financial ability of consumers to buy a house. When the index is 100 there is a balance between the family's ability to pay and the cost. Higher numbers indicate that housing is more affordable; lower numbers indicate that it is less affordable.

Each quarter, the Washington Center for Real Estate Research calculates the HAI for households earning the median income and for first-time buyers in each county in the State. For households earning the median income, a reading of 100 means the household can qualify for a mortgage on a typical median-priced existing single-family home. For first-time buyers, assumed to be earning 70% of median income, a reading of 100 means the household can carry the mortgage on a house that costs 85% of the median

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price. The table below shows the most recent figures for Chelan County, along with figures from 2005 and 2008.[42],[43]

Exhibit 3-23. Housing Affordability—Chelan County

	2nd quarter 2005	1st quarter 2008	4th quarter 2015[44]
Households earning median income	143.8	92.8	153.1
First-time buyers	83.0	53.8	86.2

Source: Washington State University. College of Business. Washington Center for Real Estate Research 2008, 2016; Sandra Strieby, 2016.

- The indices show that housing in Chelan County is now more affordable than it was 10 years ago. The dramatic decline in affordability of a few years ago has reversed, making Chelan County much more affordable for both households earning the median income and first-time buyers.
- It is worth noting that income levels in the City of Chelan tend to be lower than those in the County as a whole, and housing costs tend to be higher. Therefore, housing is likely to be less affordable in the City than is indicated by the index numbers for all of Chelan County. However, the picture is much brighter than it was when the Housing Element was last updated in 2009. Because the HAI for first-time buyers is still well below 100, younger adults may still have a difficult time buying houses.

Housing Cost Burden

Another important measure is housing cost burden among households, particularly those of moderate-, low-, and very-low incomes, who spend more than 30% of their income on housing. HUD has created a data set for the purposes of creating a Comprehensive Housing Affordability Strategy that looks at this relationship.

Exhibit 3-24 provides data on the number and percentage of households earning less than 80% AMI and spending more than 30% of their income on housing. As of 2013 about 24% of homeowners and renters were paying more than 30% of their incomes towards housing costs and earning less than 80% of the county median income.

[42] Washington State University. College of Business. Washington Center for Real Estate Research. *Housing Affordability Index: State of Washington and Counties: Time Trend*. Accessed October 9, 2008.

[43] Washington State University. College of Business. Washington Center for Real Estate Research. *Housing Affordability Index: First-Time Buyers: State of Washington and Counties: Time Trend*. Accessed October 9, 2008.

[44] University of Washington. Runstad Center for Real Estate Studies. Washington Center for Real Estate Research. *Washington State's Housing Market: Fourth Quarter 2015*. Accessed June 15, 2016.

Exhibit 3-24. Percentage of Households with Housing Cost Burden

	Percent of Total Spending >30% of Income on Housing
Renters and Owners (80% of AMI or less)	25%
Renters Only (80% of AMI or less)	13%
Owners Only (80% of AMI or less)	28%

Source: 2009-2013 ACS, CHAS; BERK Consulting, 2016.

Second Homes, Seasonal Housing Units, and Short-term Rentals

Short-term rentals, second homes, and seasonal housing can have both positive and negative impacts to the local economy and local housing supply. Negative impacts include potential loss of long-term rental housing and impacts on the availability and cost of workforce housing. On the positive side, short-term rentals and seasonal housing contribute to the local economy by creating jobs and work in the tourism industry.

These types of housing units are defined as follows:

- **Second homes** are houses that are the secondary residences of people who do not reside in Chelan. Second houses may be used for a few weeks of the year by the owners and vacant the rest of the year or they may be used as a short-term rental. For purposes here, housing that is used primarily by the owner and appears vacant the rest of the year is classified as a second house.
- **Short-Term Rental:** A dwelling unit or other building or any portion thereof that is available or advertised, or listed by an agent, for use, rent, or occupancy for a period of time that is less than 30 consecutive days. Short-Term Rentals (STRs) does not include guest quarters, bed and breakfast facilities, hotels, or other types of lodging.
- **Seasonal Housing:** These include units for recreational, periodic, or occasional use.

The current Chelan Comprehensive Plan identified seasonal housing as an issue that affects availability and affordability of housing in the city:

> *"…the percentage of housing units in the City that are devoted to seasonal use has increased rapidly over the past decades [1980-2007]. Because such a large percentage of the housing stock in the City and its UGA is reserved for seasonal use, fewer units are available to house full-time residents. The demand for both seasonal and year-round housing has driven up both housing and land costs, so that there is a smaller stock of affordable housing and little incentive to develop more."*

A table in the 2009 element has been extended with current information below, illustrating the points in the quoted text:

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Exhibit 3-25. Chelan Percentage of Seasonal Housing Units, 1980-2014

	1980	1990	2000	2007	2010	2014
City of Chelan	5.2%	12.6%	19.3%		28%	32%
Entire UGA				31.4%		

Source: Chelan Comprehensive Plan Update 2011: Chelan Comprehensive Plan 1992, U.S. Census 2000, 2010. ACS 5-Year Estimates 2010-2014; Sandra Strieby, 2016; BERK Consulting, 2017.

The percentage of seasonal housing units is relatively high. The 2010 Census reports 2,516 housing units in the City, of which 914 were vacant—694 (28% of total housing units) of those for seasonal use.[45]

In 2016 the OFM estimates there were 242 housing units in Chelan's unincorporated UGA, of which 154 (64%) were occupied, in 2015.[46] Of the 36% of units in the unincorporated UGA that were vacant, the percentage reserved for seasonal use is not known. Within the city limits, 75% of the vacant housing units were for seasonal use. Assuming that 75%-90% of the vacant housing units in the unincorporated UGA are for seasonal use gives a range of 27%-32% of total housing units in the unincorporated UGA reserved for seasonal use. The analysis in this report assumes that 30% of housing units in the UGA as a whole will be for seasonal use throughout the planning period—that is, they will not be available to house Chelan's year-round residents.

According to ACS data, as of 2014, the Census counted 2,426 housing units. Of these 1,650 or 68% were occupied. The County's occupied housing rate is 76% reflecting a greater number of year-round residents, particularly in the Wenatchee and Cashmere areas.[47]

3.4 Summary of Key Issues and Trends

The inventory and analysis suggest a number of trends that will affect the City of Chelan's ability to provide adequate housing to all segments of its population:

- **The number of seasonal housing units is growing.** As noted above, the 2010 Census reports that 28% of total housing units are for seasonal use. This number has been growing by about 8% every 10 years.
- **There is a growing disparity between income and housing.** As of 2013, 25% of homeowners and renters were considered cost-burdened, spending more than 30% of their income on housing.
- **There is an ongoing shortage of rental housing.** The Washington Center for Real Estate Research (WCRER) reports an apartment vacancy rate in Chelan County of 2.0% as of Spring, 2016. Local real estate agents report a very tight rental market in which vacancies are filled quickly.
- **Chelan's senior population will become a greater proportion of the population** over the 20-year life of the Comprehensive Plan. Seniors tend to have a greater likelihood of disability. Senior citizens

[45] U.S. Census Bureau. American FactFinder. Chelan City Profile of General Population and Housing Characteristics: 2010. 2010 Demographic Profile Data. Accessed July 4, 2016.

[46] Washington Office of Financial Management, Small Area Estimate Program. Estimates of Total Population for the Unincorporated Portion of Urban Growth Areas. http://www.ofm.wa.gov/pop/smallarea/default.asp. Accessed June 15, 2016.

[47] ACS 5-Year Estimates 2010-2014

may need alternative forms of housing, such as smaller units with less maintenance responsibilities or assisted living units, and supportive services, such as day health, meals on wheels, etc.

- **There is a lack of housing variety**, where two-thirds of the housing stock are single family units. Public outreach through an online survey and public workshop in November 2016 found that there is strong community support for building a variety of housing types.

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4.0 ECONOMIC DEVELOPMENT

4.1 Overview

This section provides an overview of the current economic conditions and identifies important economic issues facing the City of Chelan. These issues help guide the development of the Economic Development Element of the Comprehensive Plan. The section is divided into the following topics:

- Regulatory Context and Planning Framework
- Existing Conditions
- Demographics
- Local Economy
- Implications of Existing Conditions and Trends
- Financial Tools for Economic Development
- Key Issues for the Economic Development Element

4.2 Regulatory Context and Planning Framework

State and countywide policies that the City's Economic Development Element should reflect are summarized below.

Washington State Growth Management Act

The Growth Management Act (GMA) includes the following goal:

> *Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, promote the retention and expansion of existing businesses and recruitment of new businesses, recognize regional differences impacting economic development opportunities, and encourage growth in areas experiencing insufficient economic growth, all within the capacities of the state's natural resources, public services, and public facilities. (RCW 36.70A.020(5))*

The economic development element is a required section of a Comprehensive Plan and is to contain information on the local economy as well as goals and policies:

> *Each comprehensive plan shall include a plan, scheme, or design for each of the following: (7) An economic development element establishing local goals, policies, objectives, and provisions for economic growth and vitality and a high quality of life. The element shall include: (a) A summary of the local economy such as population, employment, payroll, sectors, businesses, sales, and other information as appropriate; (b) a summary of the strengths and weaknesses of the local economy defined as the commercial and industrial sectors and supporting factors such as land use, transportation, utilities, education, work-force, housing, and natural/cultural resources; and (c) an identification of policies, programs, and projects to foster economic growth and development and to address future needs. (RCW 36.70A.070 (7))*

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Chelan County Countywide Planning Policies

Policy #7. Policies for county-wide economic development and employment.

I. The Economic Development element of the Comprehensive Plans should be based upon a needs assessment which evaluates the following factors within the community:
   A. An inventory of available land suitable for development of commercial and industrial use.
   B. The availability of infrastructure including transportation (air, rail, roads) and utilities.
   C. The availability to housing to support economic growth.
   D. An analysis which evaluates the commercial and industrial sectors which are not adequately represented in the community based upon the state average and factoring in community desires.

II. Encourage coordination and cooperation at the local and regional level to ensure consistency on economic growth considerations.

III. Consideration should be given to diversification of the economic base to provide opportunities for economic growth in all communities on a county-wide basis to ensure a healthy stable economic base.

IV. Communities are encouraged to provide information on the community strengths, marketable factors (i.e. waterfront, quality of life considerations) availability of housing, infrastructure, contact people, etc. which can be used by the Economic Development Council to attract and/or expand commercial and industrial activities.

V. Communities should consider establishing a local standing committee or task force to work on economic development. The committee should be responsible for preparing and maintain the community's database, developing local goals and policies for economic development and act as the contact group to work with the Economic Development Council.

VI. Economic development should be one of the considerations in the process of land use, planning, transportation planning, infrastructure planning, and the determination of urban growth boundaries.

VII. Commercial and industrial activities should be encouraged to locate in areas with infrastructure capacity and the potential to provide adequate, affordable housing, and/or transportation linkages to existing housing.

VIII. Encourage the retention and growth of existing industries and businesses by promoting the establishment of commercial/ industrial, research and education activities which support these industries and businesses.

IX. Local government should develop criteria under which they would consider participating in infrastructure improvements needed to support economic development.

4.3 Existing Conditions

Population and Households

As of 2015, Chelan's permanent city population is about 4,045. The Unincorporated UGA is estimated to have another 355 residents.

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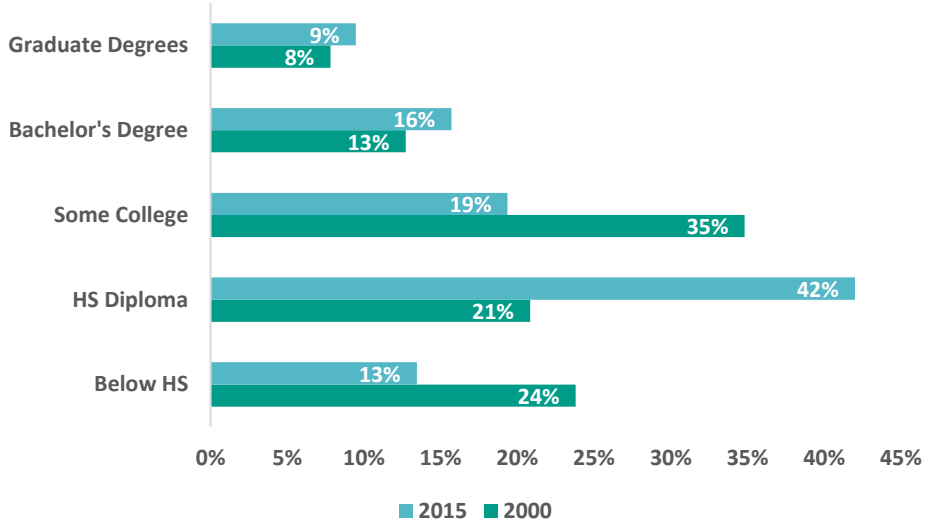
The City of Chelan's population has grown 15% from 3,526 in 2000 to 4,045 in 2015.[48] Over the longer term the City's growth rate has been as high as 1.245% from 1990-2015 and as low as 0.785% in the last five years (2010-2015). By 2037, Chelan city limits and UGA would add over 400 people for a total of 4,880 people; that estimate is a growth allocation adopted by the County following city consultations and represents a growth rate of 0.45%. See Chapter 3 for more information on current permanent and seasonal population.

According to the 2011-2015 American Community Survey (ACS) five-year estimates, there are 1,687 households in the City of Chelan which is a 15% percent increase from the 2000 U.S. Census estimate of 1,471 households. [49]

Educational Attainment

Exhibit 4-1 shows the breakdown of educational attainment by the City's population that is 25 years and older. Educational attainment and household income (covered below) provide an understanding of the types of jobs that people living in Chelan have now or types of jobs that may suit residents.

Exhibit 4-1. Educational Attainment for Population 25 and Over in the City of Chelan



Notes: Some college includes an Associate's Degree as well.

Source: US Census, 2000; U.S. Census American Community Survey Five-year Estimates 2011-2015.

- The share of residents with a high school diploma only has increased significantly from 19% of the population in 2000 to 35% of the population in 2015.

[48] Washington State Office of Financial Management (OFM). 2016. April 1, 2016 Population of Cities, Towns and Counties. Available: http://ofm.wa.gov/pop/april1/default.asp.

[49] Whereas housing work is based on 2015 OFM and 2014 ACS given the information available at the time, Economic Development uses 2015 OFM and 2015 ACS. Results are similar except for median household income.

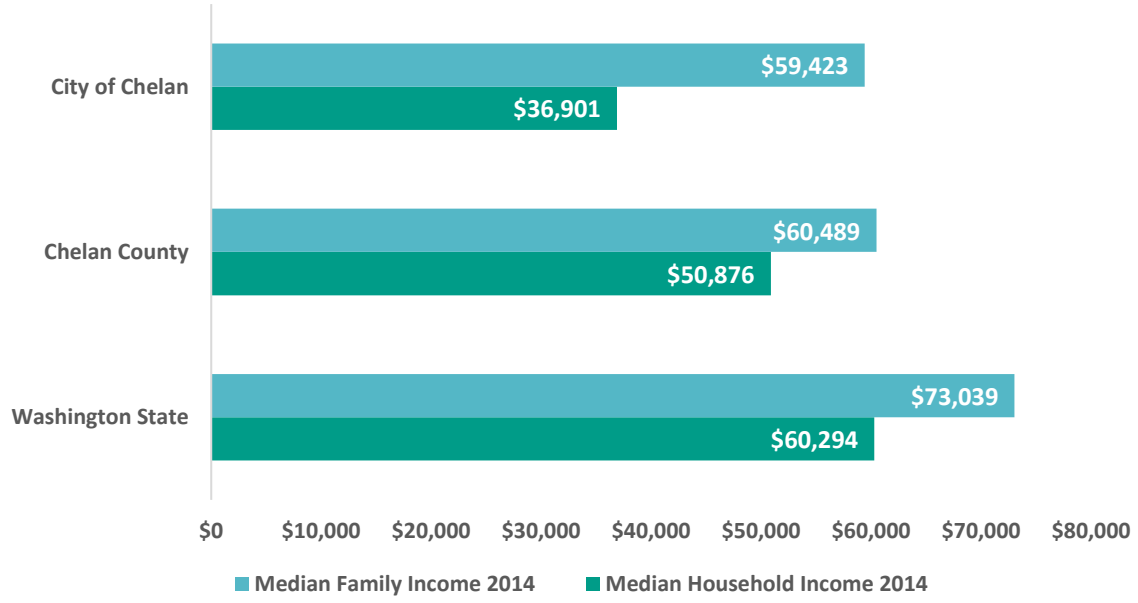
- The share of residents with graduate degrees and bachelor's degree has increased from 2000 to 2015.

Household and Family Income

The median household income in the City of Chelan in 2015 equaled $49,905, which is lower than the median household income for Chelan County at $51,837. The median family income for the city in 2015 was $60,577 similar to the county's $61,464 (U.S. Census American Community Survey Five-year Estimates 2011-2015).

Exhibit 4-2 shows the household and family median income for 2014. The 2014 median household income for the city was $36,901, far lower than the above 2015 estimate. The median family income for the city is slightly lower than the county and lower than the state; it is fairly stable between 2014 and 2015 estimates. Chelan's 2014 median household income may be due to the presence of single person households or residual effects of the Great Recession given the 5-year estimates includes the period 2010-2014 (see Household Composition in Chapter 3 showing that the City has a relatively higher proportion of householders living alone).[50]

Exhibit 4-2. Household and Family Median Incomes



Source: U.S. Census, American Community Survey 5-Year Estimates, 2010-14.

Exhibit 4-3 shows that the average household size for the City of Chelan is lower than for Chelan County (see Household Composition in Chapter 3 showing that the city has a relatively higher proportion of householders living alone). While the owner-occupied average household size is higher in Chelan County

[50] According to the ACS 2015 Subject Definitions, household income includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not. Because many households consist of only one person, average household income is usually less than average family income. See Subject Definitions link, available here: https://www.census.gov/programs-surveys/acs/technical-documentation/code-lists.html.

than the City of Chelan, the renter-occupied average household size is reversed. Exhibit 4-4 shows that the average family size has increased for both the city and the county from 2000 to 2015; however, the increase in larger in the county than the city.

Exhibit 4-3. Average Household Size

	City of Chelan	Chelan County
Total	2.33	2.7
Owner Occupied	1.95	2.54
Renter Occupied	3.16	3

Source: U.S. Census, American Community Survey 5-Year Estimates, 2010-15.

Exhibit 4-4. Average Family Size

	2000	2015
City of Chelan	2.93	3.1
Chelan County	3.14	3.32

Source: U.S. Census, 2000; U.S. Census, American Community Survey 5-Year Estimates, 2010-15.

Employment

Exhibit 4-5 shows the 2016 employment breakdown by sector relying on a base of 2010 US Census information and forecasts from ESRI. In the City of Chelan, almost half or 45.2% of employment is in the service sector, which is very similar to Chelan County. Services, retail, and agriculture/ mining make up the top three sectors of employment in the City of Chelan and Chelan County. More than 50% of employment is in services (45.2%) and retail (13.6%), and an additional 12.1% of employment is in agriculture and mining in the City of Chelan. In general, the employment breakdown in the City of Chelan is similar to that in Chelan County.

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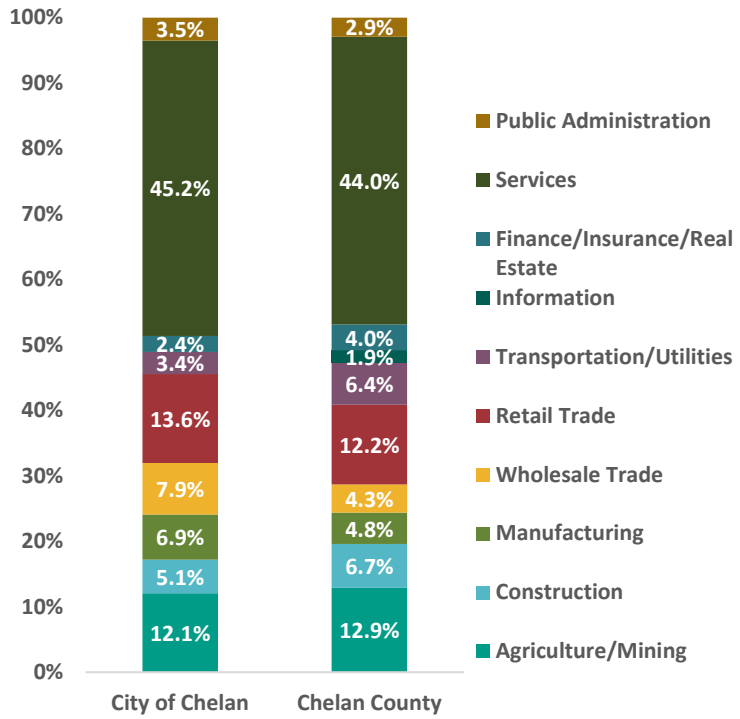
Exhibit 4-5. Employment, 2016



Source: U.S. Census Bureau, Census 2010 Summary File 1. Esri forecasts for 2016 and 2021 Esri converted Census 2000 data into 2010 geography.

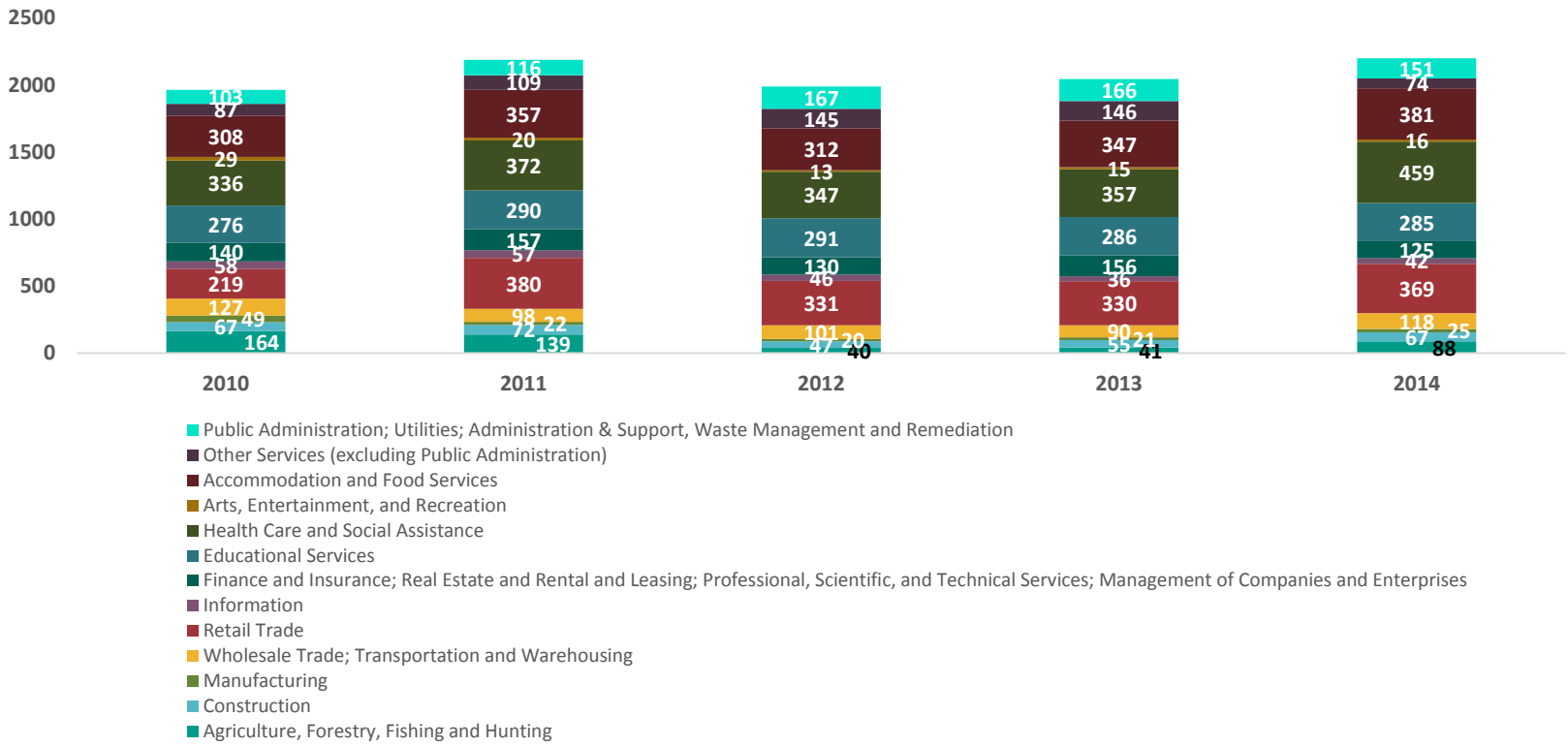
- The unemployment rate for the City of Chelan population 16 years and over was 12.6%[51]. This is higher than the Chelan County unemployment rate of 7.5%[52].

Exhibit 4-6 show employment over time by NACIS Industry sector.

[51] U.S. Census American Community Survey 2011-2015 Five-year Estimates.

[52] Ibid.

Exhibit 4-6. Employment over Time, 2010-2014



Source: U.S. Census Bureau, OnTheMap Application, 2010-14.

- Public administration; utilities; administration & support, waste management and remediation increased from 103 jobs in 2010 to 151 jobs in 2014. A 47% change.
- Accommodation and food services has increased from 308 jobs in 2010 to 381 jobs in 2014. A 24% change.
- Health Care and Social Assistance has increased from 336 jobs in 2010 to 459 jobs in 2014. A 37% change.
- Retail Trade jobs increased from 219 jobs in 2010 to 369 jobs in 2014. A 68% change.
- Manufacturing jobs decreased from 49 jobs in 2010 to 25 jobs in 2014. A -49% change.
- Agriculture, Forestry, Fishing and Hunting jobs decreased from 164 jobs in 2010 to 88 jobs in 2014. A -46% change.

Downtown

The Chelan Downtown Planning area is south of Gibson street, north of Sayles and Webster Street, west of Robinson Street, and Woodin Avenue and Manson Highway. The historic core that is northeast of Riverwalk Park is surrounded by the Lake and the downtown perimeter. These are then surrounded by residential neighborhoods. Within the historic core, there are restaurants, theatres, banks, grocery stores as well as the Chelan County Fire Department, and the Lake Chelan Chamber of Commerce.

Chelan Downtown Master Plan Market Analysis

In December 2009, Property Counselors prepared the Chelan Downtown Master Plan Market Analysis in support of the Downtown Master Plan. The Market Analysis had the following key takeaways:

- The visitor industry is the major sector in the local Chelan economy. Visitor activity is heavily concentrated in the summer months. It doesn't capture nearly as much activity in the winter, spring, and fall as communities like Leavenworth. Retail sales increased in 2007 with the opening of a Walmart in the community.
- The City of Chelan serves a trade area that extends the length of the lake to the west and north into Okanogan County. Population in the trade area is projected to grow from 13,000 in 2000 to 19,000 in 2025.
- The City is a net attractor of resident spending from beyond its own boundaries, with the $81 million in sales by trade area residents exceeding the $60 million City resident spending.
- The Chelan housing market services both a year-round population and a second home or visitor community. There aren't many apartment complexes in Chelan. Many of the rental units are in condominium complexes. The shortage of year-round affordable housing for workers in resort communities can be at least partly addressed with additional apartment development. With expansion of the visitor season, there will be additional demand for year-round affordable housing.

Chelan Downtown Master Plan

In October 2010, the City adopted the Chelan Downtown Master Plan prepared by MAKERS on behalf of the community. The strategy promotes "…protecting and enhancing Chelan's existing strengths, connecting assets such as parks, trails and amenities for greater impact, addressing key issues such as parking and traffic movement that constrain economic opportunities and reinforcing Chelan's identity as a recreational destination and a great place to live."

To accomplish the Downtown Master Plan Concept, the following actions were recommended:

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- Enhance the Woodin Avenue Core
- Route the through traffic around the core to ease congestion
- Protect the local neighborhoods
- Complete the network of parks, trails and walks
- Undertake projects to attract visitors during spring – fall "shoulder season"

The economic development strategy indicates that the most important opportunities to address are:

- Enhancing and unifying current attractions in order to strengthen Downtown's appeal to visitors.
- Supporting these attractions with sufficient infrastructure to make them accessible and convenient.
- Growing the downtown residential population to provide year-round support for businesses, sustainably accommodate growth and housing needs, and strengthen local neighborhoods.
- Adding "shoulder season" (off-peak) visitor activities to strengthen the visitor based and retailed business sectors.

Permit Data

Exhibit 4-7. through Exhibit 4-9 show the City of Chelan permits issued from 2007 to 2015 for commercial, single family, and multifamily permits, as well as the valuation of the building. Permits decreased after 2008, likely due to the Great Recession.

Exhibit 4-7. City of Chelan Permit Data for Commercial, 2007-2016

Year	*Commercial*			
	All Units	New	Valuation	Value/ All Unit
2007	7	7	$6,656,408	$950,915
2008	29	5	$10,860,105	$374,486
2009	6	6	$774,057	$129,009
2010	2	2	$1,335,968	$667,984
2011	4	2	$427,835	$106,959
2012	0	0	$0	$0
2013	2	2	$223,653	$111,826
2014	5	5	$2,748,269	$549,654
2015	1	1	$5,000	$5,000
11/14/2016	5	5	$4,717,000	$943,400

Source: City of Chelan, 2016.

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Exhibit 4-8. City of Chelan Permit Data for Single Family, 2007-2016

Year	*Single Family*			
	All Units	New	Valuation	Value/ All Unit
2007	21	21	$5,980,756	$284,798
2008	16	16	$4,511,899	$281,994
2009	10	10	$1,837,661	$183,766
2010	11	11	$3,244,578	$294,962
2011	12	12	$3,768,071	$314,006
2012	8	8	$2,042,640	$255,330
2013	37	37	$9,248,892	$249,970
2014	33	33	$9,764,532	$295,895
2015	48	48	$11,497,280	$239,527
11/14/2016	65	65	$15,006,000	$230,862

Source: City of Chelan, 2016.

Exhibit 4-9. City of Chelan Permit Data for Multifamily, 2007-2016

Year	*Multifamily*			
	All Units	New	Valuation	Value/ All Unit
2007	54	3	$11,108,187	$205,707
2008	4	1	$461,270	$115,318
2009	2	1	$390,991	$195,495
2010	0	0	$0	$0
2011	0	0	$0	$0
2012	4	1	$426,292	$106,573
2013	0	0	$0	$0
2014	0	0	$0	$0
2015	0	0	$0	$0
11/14/2016	4	8	$1,640,000	$410,000

Source: City of Chelan, 2016.

Exhibit 4-10 shows the total building permits issued and the total valuation from 2007 to 2016. Total building permits issued decreased sharply in 2008 and started increasing again in 2013.

Exhibit 4-10. City of Chelan Permit Data for Total, 2007-2016

Year	Total Bldg. Permits Issued	Total Valuation	Value/ Building Permit
2007	207	$34,299,365	$165,697
2008	86	$18,300,122	$212,792
2009	63	$6,690,822	$106,204
2010	56	$5,505,497	$98,312
2011	90	$6,907,818	$76,754
2012	71	$4,783,626	$67,375
2013	100	$11,386,557	$113,866
2014	106	$14,633,966	$138,056
2015	191	$15,305,080	$80,131
11/14/2016	140	$23,454,500	$167,532

Source: City of Chelan, 2016.

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Highway Commercial Areas

About 41 acres are designated and zoned Highway Service Commercial (C-HS), which is "intended to be applied to provide areas outside the central business district for necessary services to the traveling public and heavy commercial uses not oriented to walk-in convenience shopping" according to the City's zoning code. Two thirds of the C-HS land is occupied by commercial and service uses, and one-third by single family residential uses.

US Route 97 Alternate goes through the City of Chelan and along the Lake Chelan waterfront. A Walmart Supercenter opened on the intersection of U.S. Route 97 and North Apple Blossom Drive in 2007.

Using Chelan County Assessor data addressing parcels within 100 feet of U.S. Route 97 Alternative, businesses were designated into the categories listed in Exhibit 4-11. Though the corridor supports many businesses, there are a number of residential acres along it. Retail and other services make up the most numerous commercial acres fronting the highway.

Exhibit 4-11. Land Uses Fronting Highway 97 (Acres)

Categories	City	UGA
Residential	294	299
Retail and other Services	41	36
Educational Services	24	0
Government Services	17	6
Undeveloped Land	14	57
Lodging	5	0
Industrial	5	6
Utilities	1	0
Agriculture	0	36

Source: Chelan County Assessor, 2016.

Tourism and Lake Chelan Brand

Total direct travel spending in the county was a whole was $156.1M in 1991 and increased to $343.2M in 2009, which is a significant percentage change of 121%[53]. Lake Chelan and City recreation offerings together with wineries have helped attract tourism to the county.

PBJS, an advertising agency with an office in Seattle, held 30-minute telephone interviews with 19 Puget Sound transits and Lake Chelan local residents to better understand Lake Chelan brand perceptions in May 2013. Some key takeaways include:

- Most people believe that in the summer Chelan does a good job because businesses are busy and lodging is filled.
- An increase in the shoulder season would be good for local residents. It was suggested to target the following groups:

[53] Dean Runyan Associates. Department of Commerce: Washington State County Travel Impacts 1991-2009. Available: http://www.deanrunyan.com/index.php?fuseaction=Main.TravelstatsDetail&page=Washington

- The over 30+ single or family crowd.
- Middle-aged adults and retirees who are looking for places to visit.

- Suggestions for the key shoulder season activities include:
  - Wine activities
  - Downhill and cross-country skiing
  - Tubing and snow mobiles
  - Hiking and mountain biking
  - Fishing
- The study also included interesting people to meet and suggested focusing on the beauty of Lake Chelan and the year-long spectacular weather.
- In discussing concerns, people suggested that the area is lacking in some key amenities that would attract more sophisticated tourists, people were afraid to drive over the pass in the winter.
- Local community discussed their sense of belonging and suggested that Lake Chelan be considered, "a home away from home," where one can unplug, relax, and have a good time.
- Tourists state that Chelan feels like, "a happy place where you can have fun as a single [person] or a family", "feels very affordable as a get-away", "tourists seems to get both the party and relaxing side of Lake Chelan."
- Local residents stay in Lake Chelan for, "the lifestyle, weather, atmosphere, their family and/or business."
- Local residents wish that Chelan had these options: more cultural activities, recycling, better and more affordable shopping, more dining options, and access to a better pool of employees.
- Local residents hope that these economic development strategies will bring in more tourists during the shoulder season, build more sophisticated tourist settings, more activities focused on wine and food, additional festivals.

Agri-tourism

Designated as an official American Viticulture Area (AVA) in 2009, the Lake Chelan Wine Valley offers wine tasting at over 20 wineries near Lake Chelan. The Lake Chelan AVA is encompassed within the larger Columbia Valley AVA, but Lake Chelan has a larger elevation and more temperate climate than more southern AVAs within the Columbia Valley[54]. Much of the wine-tasting is focused in lower Lake Chelan including the City of Chelan and Manson.

A 2012 study prepared for the Washington State Wine Commission estimated that the wine industry supports 1,374 jobs in the County with wages of approximately $35 million, producing a total economic

[54] Washington State Wine. Chelan. Available: https://www.washingtonwine.org/wine/facts-and-stats/regions-and-avas/lake-chelan. Accessed on January 23, 2017.

impact of about 221.4 million. The study also indicated that Washington wine generates $9.5 million in state and local taxes and $9 million in federal taxes in Chelan County. (Stonebridge, April 2012)[55]

The Lake Chelan region also hosts multiple festivals each year that include:

- Lake Chelan Crush Festival – hosted by the Lake Chelan Wine Alliance
- Red Wine and Chocolate in the Lake Chelan Wine Valley - hosted by the Lake Chelan Wine Alliance
- Lake Chelan Winterfest – hosted by the Lake Chelan Chamber of Commerce

Citywide about 440 acres remain in agricultural use. Much of it lies at the gateways to the city on the north and south shores as well as in Lord Acres and eastern Chelan. Products typically include orchards and vineyards. While agriculture is likely to diminish in the city and would be developed for housing or industry, some of the City's zoning promotes agriculture such as the Special Use District (SUD). The City is considering reinforcing agri-tourism uses in the SUD.

Industrial Development

The City and its UGA has 920 acres of Warehouse-Industrial zoned land. Most of it is characterized today by residential, agriculture, or undeveloped uses. Only about 5% has been developed for businesses.

Based on Assessor data showing current land uses, approximately 9.5 acres of industrial land lies within the City boundaries and approximately 13.5 acres of industrial land within the UGA boundaries, bringing the total up to approximately 13.5 acres. More land that is in agriculture or vacant is planned for Industrial purposes.

The following Assessor codes considered Industrial were studied in more detail: Contract Construction Services; Fabricated Metal Products; Marine Craft Transportation; Motor Vehicle Transportation; Petroleum Refining/ Related Industry Total; Printing and Publishing; Repair Services; Stone, Clay, and Glass Products.

Within the City, 4.9 acres belongs is characterized by Repair Services, which appears to be owned by a number of individual owners. Marine Craft Transportation totals about 2.6 acres. Within the UGA, Chelan Concrete Inc., classified as Stone, Clay & Glass Products, has the largest acreage with 5.75 acres. Motor Vehicle Transportation has an acreage of 3.4 acres.

The City could consider ways to leverage its agricultural production and tourism economy by potentially establishing a wine cluster. Characterizations of a wine cluster include:

- a "group of interconnected wineries, grape growers, suppliers, service providers, and wine-related institutions"[56] or

[55] Stonebridge. April 2012. *The Economic Impact of Washington State Wine and Grapes,* http://www.wawgg.org/files/documents/2012_Economic_Impact_WA_Wine-Grapes.pdf. Prepared for: Washington State Wine Commission.

[56] Harvard Business School. Faculty and Research. Abstract: The California Wine Cluster by Michael E. Porter and Gregory C Bond. Available: http://www.hbs.edu/faculty/Pages/item.aspx?num=24449. Accessed February 2, 2017.

- "wineries, vineyards, local suppliers and services, and a subset of the hospitality sector that is oriented toward wine tourism (hotels, restaurants, specialized retail, and the arts)".[57]

This would advance the idea of a year-round economy and diverse jobs to support permanent residents and attract new ones with wages that assist with housing affordability.

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[57] Walla Walla Valley Wine Cluster. 2007. Walla Walla Valley Wine Cluster. Economic Development Project. Available: http://www.wwcc.edu/CMS/index.php?id=1759.

Taxable Retail Sales

As seen in Exhibit 4-12, the City of Chelan is capturing more than the expected amount of retail sales based upon the population within its boundaries in general merchandise stores and food services & drinking places, but less than the expected amount of retail sales based upon the population within its boundaries in all other categories.

The comparison cities in Exhibit 4-12 were chosen for the following reasons:

- Forks and Colville are similar to Chelan in terms of population size and distance from larger cities.
- Forks, Leavenworth, Woodinville, and Gig Harbor are tourist destinations. Woodinville is in the Puget Sound AVA, and also promotes agri-tourism similar to Chelan.
- Leavenworth and Wenatchee are other cities in Chelan County.

Exhibit 4-12. Retail Pull Factor for the City of Chelan and other Cities in Washington

Category	Chelan	Forks	Colville	Leavenworth	Wenatchee	Woodinville	Gig Harbor
Motor Vehicle & Parts Dealers	0.48	0.07	2.77	0.08	0.94	1.61	0.91
Furniture & Home Furnishings Stores	0.45	0.00	5.20	0.30	3.22	2.41	1.87
Electronics & Appliance Stores	0.55	0.00	2.42	0.67	0.33	2.06	0.97
Bldg Materials, Garden Equip. & Supply Stores	0.80	5.07	2.00	4.72	2.04	5.86	2.54
Food & Beverage Stores	0.47	1.11	2.79	4.54	1.52	3.29	1.80
Health & Personal Care Stores	0.54	4.75	1.44	0.99	2.09	2.01	2.58
Clothing & Clothing Accessories Stores	0.53	0.05	0.37	1.93	0.96	0.47	1.45
Sporting Goods, Hobby, Book & Music Stores	0.70	0.00	2.47	2.83	1.58	3.50	2.08
General Merchandise Stores	7.32	0.04	6.93	0.12	1.89	1.44	5.97
Miscellaneous Store Retailers	0.82	0.14	0.83	3.38	1.03	2.89	4.99
Nonstore Retailers	0.00	0.25	1.56	1.01	0.95	0.30	0.21
Food Services & Drinking Places	2.78	1.28	2.28	5.96	1.79	1.97	3.27

> 1.1	Jurisdiction is capturing more than the expected amount of retail sales based upon the population within its boundaries.
0.9-1.1	Jurisdiction is capturing near the expected amount of retail sales based upon the population within its boundaries.
< 0.9	Jurisdiction is capturing less than the expected amount of retail sales based upon the population within its boundaries.

Source: ESRI, 2016.

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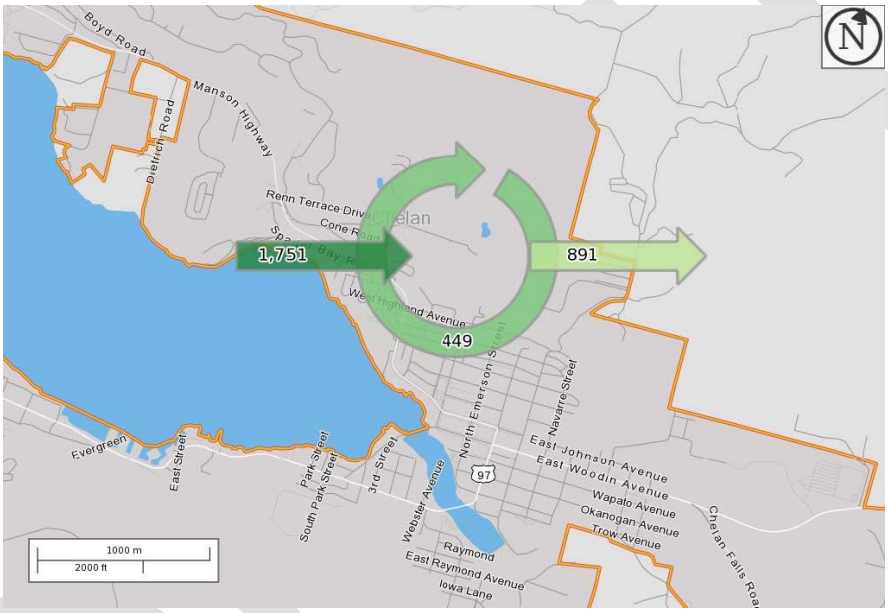
Exhibit 4-12 shows that only two categories are capturing more than the expected amount of retail sales based upon the population within its boundaries. The Chelan Walmart indicates why the General Merchandising Stores retail pull factor is so high, and that may also mean that it is capturing sales within Food & Beverage Stores, Electronics & Appliance Stores, Clothing & Clothing Accessories Stores. Thus, there may not be opportunity for additional retail sales in every category. See implications below for more discussion.

Travel to Work

Exhibit 4-13 shows the number of inflow/outflow for all jobs in the City of Chelan in 2014. 449 people live and work in the City of Chelan. 1,751 people from outside the City of Chelan work come to work in the City of Chelan, and 891 people that live in the City of Chelan work outside the City of Chelan.

Exhibit 4-13. Inflow/Outflow Counts of all Jobs for Selection Area, 2014



Source: U.S. Census, OnTheMap, 2016.

4.4 Summary of Key Issues and Trends

Overall, the existing conditions show that:

- The population has grown 17% in the last 15 years, and is expected to continue growing slowly through 2037.
- The share of residents with a high school diploma has increased significantly from 2000 to 2015. The number of people with Bachelor's Degrees and Graduate Degrees has also increased significantly in that time period.
- A larger number of people commute into the City to work than leave the City to work in another location.
- Median family and household income is lower in the City of Chelan in comparison to the state and slightly lower than the county.
- The majority (58.8%) of City of Chelan jobs are in the service and retail sectors. Studies done of the City of Chelan show that the visitor sector is the major sector in the local Chelan economy. Most

visitors from the Puget Sound Region enjoy visiting Lake Chelan to enjoy different tourist activities, and local residents want to increase the number of visitors during the shoulder season.

- The retail pull factor analysis shows that the City of Chelan is capturing more than the expected retail sales in general merchandising sales and food services & drinking places, but not in other categories (see implications below).
- Through the Chelan Vision Outreach efforts done in January, residents responded to an online survey and postcard survey responding to the questions, "how should Chelan grow?" One of the important issues brought up here was a need for additional types of housing including affordable housing and housing for senior citizens and people with disabilities. Additionally, a desire for more transportation and transit options. At the same time, residents want to maintain iconic views and the small town feel. Residents asked for jobs in the following sectors: health, manufacturing and light industry, agriculture, education, and tourism.
- 449 people live and work in the City of Chelan. 1,751 people commute from outside the City to work in the City, and 891 people from the City commute to jobs in other locations.

Implications of Existing Conditions and Trends

- An increase in tourist activities and options would increase business revenues in the service sector. For example, visitors to the region have suggested an increase in the sophistication of certain tourist activities such as more winery-related tourism to bring in more visitors. As the Lake Chelan Wine Valley continues to mature, this is an opportunity to further develop the tourist attractions to bring more people to the City of Chelan during the shoulder season. The City of Chelan could also focus on wine festivals in the shoulder season, prioritizing this timeframe over developing anything new in the summer.
- It is also worth evaluating the categories that are capturing less than the expected amount of retail sales to see if there are opportunities for economic development. As discussed earlier, all of the categories are not opportunities for an increase in retail sales, but it is worth doing more market analysis to determine the potential of increasing the retail pull factor in these categories: Health & Personal Care; Sporting Goods, Hobby, Book & Music Stores.
- For a diverse range of housing and transportation options, more housing variety is needed. This may have some impact on the need to maintain iconic views and the small town feel that residents desire; therefore, engaging the community through the Land Use Element update is particularly important. Increasing the diverse range of housing options could also allow more people that work in the City of Chelan to live in the city instead of commuting from outside the city. Increasing the number of year around jobs may potentially support current households and their ability to attain desired housing and services, and attract more residents to the City of Chelan.

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5.0 UTILITIES

5.1 Overview

The section provides information on the current state of utility services available in Chelan and the surrounding areas and will support the development of the updated Utilities Element as part of the Comprehensive Plan Update.

5.2 Regulatory Context and Planning Framework

The GMA requires all Comprehensive Plans to include a Utilities Element that provides goals and policies to guide provision of electrical, natural gas, and telecommunications services in the City. Utilities elements are required to provide an inventory of utility facilities, as well as a discussion of capacity at proposed locations.

5.3 Existing Conditions

Energy and telecommunication services are utilities that are generally available in the City and the City's Urban Growth Area (UGA) boundary.

Energy

Chelan County Public Utility District (P.U.D.)

The Chelan County P.U.D. provides energy to Chelan County as a whole including the City of Chelan and UGA. The Chelan County P.U.D. is administered by a five-member commission and is divided into three service districts: Chelan-Manson area, Wenatchee area, and Leavenworth area. The P.U.D. owns and operates three hydroelectric projects in the County. P.U.D. operates 25,000 power poles that support 1,950 miles of lines of electricity to P.U.D. customers. P.U.D. serves more than 48,000 retail electric customers.

The Chelan County P.U.D. operates the Lake Chelan Hydroelectric Project or the Lake Chelan Dam in the City limits[58]. The Lake Chelan Dam supplies hydropower using 2 generators with a nameplate capacity of 59 megawatts. The Lake Chelan Dam, containing 8 spillaway gates, was originally constructed in 1927. Its project license expires in 2056. The Chelan County P.U.D. is responsible for measuring lake levels at the Lake Chelan Dam.[59]

There are multiple forums connected to the Lake Chelan License Implementation that include the Chelan River Fishery Forum, Lake Chelan Fishery Forum, Lake Chelan Policy Committee, Lake Chelan Recreational Forum, Lake Chelan Cultural Forum, and the Lake Chelan Wildlife Forum.

[58] Chelan County P.U.D. Lake Chelan Dam. Available: https://www.chelanpud.org/hydropower/lake-chelan-dam. Accessed: February 2, 2017.

[59] Chelan County P.U.D. Lake Chelan Lake Levels. Available: https://www.chelanpud.org/parks-and-recreation/lake-chelan-lake-levels. Accessed: February 2, 2017.

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Within the 50-year license signed for the Lake Chelan Dam, there is discussion of a Micro Park Feasibility Study as well as maintenance and expansion of trail systems within the City of Chelan[60].

As of 2015, the Chelan County PUD serves 49,702 customers in Chelan County, with total energy sales at 5,762,000 MWh including retail and resale[61]. Electricity is transmitted in Chelan County by 254 miles of 115kV transmission lines to 9 switching stations[62]. Electricity is distributed to 36 substations in the County. There is a substation and no switching stations located within the City of Chelan's Urban Growth Area[63].

The demand for electricity in Chelan County is increasing, and Chelan County P.U.D. is planning on increasing system capacity by 1.8% or 7MW annually over the next twenty years[64]. This percentage of growth covers "organic" type electric growth[65]. Additional growth that includes development, commercial and industrial will exceed this forecast[66]. In 2017, the Chelan P.U.D. is planning to site 28 new MVA substations in the area with one site being within the City of Chelan[67].

Natural Gas

At this time, natural gas is not available in the City of Chelan.

Telecommunications

Based on the Washington Utilities and Transportation Commission (WUTC) service map, land line communication services are provided by Frontier Communications Northwest. Based on WUTC service maps, there are multiple broadband and wireless telephone service providers in Chelan County.

The Chelan County P.U.D, provides fiber optics in the Chelan area[68]. There are currently 8 high-speed Internet service providers that use the Chelan P.U.D. fiber optic networks[69] The Chelan County P.U.D. is planning on extending service to 85 to 90 percent of Chelan County within the next 11 years[70].

The Chelan County P.U.D. Strategic Plan 2015-2019 indicates the P.U.D plans to restart the fiber expansion using public power benefit for expansion capital costs. The goal, if a public power benefit can be sustained,

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[60] United States of America 117 FERC 62,129 Federal Energy Regulatory Commission. Order on Offer of Settlement and Issuing New License. November 2006.

[61] Personal Communication with Chelan County Public Utility District, 2017.

[62] Ibid.

[63] Ibid.

[64] Ibid.

[65] Ibid.

[66] Ibid.

[67] Ibid.

[68] Ibid.

[69] Ibid.

[70] Ibid.

is to move from 69 percent to 85-90 percent of current county residences having fiber accessibility within 11 years, $3.7 million for 2015 and 2016, with a total estimated program costing $25 million over 11 years.

5.4 Summary of Key Issues and Trends

Coordinated Growth

Energy and telecommunications are provided by a public utility district and state regulated utilities. To ensure that services are provided concurrent with growth, the City coordinates with utilities and provides growth estimates. The City also administers development regulations and permitting services pertaining utility projects.

Telecommunication companies continues to evolve and innovate with new technologies. As they continue to expand their service areas, we may see more service providers available in Chelan County.

Sustainability and Conservation

Related to utility services, sustainability can be achieved by development that is compact in areas with existing utility infrastructure, but also through energy conservation and water recycling.

The Washington State Energy Independence Act requires electric utilities to pursue conservation. Electric utilities are required to offer their customers a voluntary option to buy green power, which the Chelan P.U.D. offers (RCW 19.29A.090.)

In response to this Act, the Chelan County P.U.D. commissioners approved a new two-year conservation target that is about twenty percent less than the previous target set in 2013 due to the success of previous program, lower market prices, and customer use of more energy-efficient products[71].

[71] Chelan County Public Utilities District, https://www.chelanpud.org/environment/operating-responsibly/energy-independence-act.

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6.0 CAPITAL FACILITIES

Local governments planning under the Growth Management Act (GMA) must include a Capital Facilities Plan Element in the Comprehensive Plan. Capital facilities are services and facilities with a long and useful life that support current residents and businesses as well as tourists, and that are needed to serve future development or meet another community need such as economic development. Per WAC 365-196-415, at a minimum, those capital facilities to be included are water systems, sewer systems, stormwater systems, schools, parks and recreation facilities, police facilities and fire facilities.

The City of Chelan is responsible for capital facility planning for parks and recreation, roads, airport, water, sewer, stormwater, and municipal buildings and facilities. Other capital facilities such as schools, fire and emergency services, and police services are provided by other special district service providers.

Exhibit 6-1 summarizes the facilities and services addressed in the Capital Facility Plan Appendix including the service, provider, and applicable plans that further guide these agencies.

Exhibit 6-1. Infrastructure and Services Addressed in the Capital Facility Plan

Facility Type	Providers	Description	Applicable Plans
Parks & Recreation	• City Parks & Recreation Department • Chelan County Public Utilities District • Manson Parks & Recreation District • Washington State	Provides park and recreation facilities and other amenities with capital facilities.	City of Chelan Parks, Recreation & Open Space (PROS) Plan, 2016
Streets	City Streets Department	Provides and maintains paved streets, alleys, traffic signals, and cleans and maintains storm drainage ditches.	See Transportation Element
Refuse	City Solid Waste & Recycling Department	Provides facilities for services for garbage and recycling collection.	Chelan County Solid Waste Management Plan
Wastewater and Sewer	• City Wastewater Department • Lake Chelan Sewer District (LCSD)	Treats wastewater and maintains water quality.	General Sewer Plan, 2008
Water	• City Water Division • Bear Mountain Water District (BMWD)	Provides potable water to the City.	Water System Plan, 2017, pending

Facility Type	Providers	Description	Applicable Plans
Municipal Buildings	City of Chelan	Includes city-owned buildings and property management related to city owned capital.	City of Chelan Budget, 2016
Airport	City of Chelan and the Port of Chelan County	A general use airport owned by the City and Port of Chelan County.	Airport Layout Plan, 2009, pending update
Law Enforcement	Chelan County Sheriff's Office	Contracts with the County to provide law enforcement to the City.	Chelan County Sheriff Annual Report, 2015
Fire	• County Fire Protection District 7 • Chelan County Fire Protection District 5	Contracts with fire protection districts to provide fire services to the City.	Chelan County Fire District #5 Community Task Force Report, 2012 Chelan Fire and Rescue Long Range Plan, 2014-2018
School	Lake Chelan School District	Provides facilities for instruction for the City of Chelan.	Lake Chelan School District Capital Projects Summary

A complete analysis of capital facilities, revenues, and proposed capital projects are included in the Capital Facilities Appendix under separate cover.

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7.0 TRANSPORTATION

7.1 Overview

The current Transportation Element was adopted in April 2011. Since that time, traffic growth has been minimal: comparison of traffic volumes from 2008/2009 with recent data indicate that traffic volumes have remained relatively flat and have decreased in some locations. There has not been significant commercial or residential growth in the Chelan area since the last plan update. The 2011 plan noted that Lake Chelan and the many amenities offered by the community attract thousands of visitors to the area through the summer months, and the existing circulation system was ill-equipped to handle the volume of pedestrian and bicycle traffic sharing the roadways with recreational vehicles, automobiles, and trucks. Since that analysis, the City has made significant improvements in the downtown area to address some of these needs.

While the City of Chelan had experienced significant growth prior to 2011, over the past several years the growth has slowed and it is predicted that growth will continue at a less intense level in the immediate future.

7.2 Regulatory Context and Planning Framework

Growth Management Act Requirement

Washington State's 1990 Growth Management Act (GMA) requires that transportation planning be directly tied to the City's land use decisions and fiscal planning. Transportation plans in the state of Washington are required to be consistent with local, regional and statewide plans, policies and guidelines. The GMA requires, at a minimum, that a transportation plan must contain:

- Land use assumptions to estimate travel, including impacts to state-owned facilities;
- An inventory of air, water, and land transportation facilities and services, including transit alignments, to define existing capital facilities and travel levels as a basis for future planning;
- Level of service (LOS) standards for all arterials, transit routes, and state-owned facilities as a gauge for evaluating system performance. These standards should be regionally coordinated;
- Specific actions and requirements for bringing into compliance locally owned transportation facilities or services that are below an established level-of-service standard;
- Forecasts of traffic for at least ten years based on the adopted land use plan to provide information on the location, timing, and capacity needs of future growth;
- Identification of system expansion needs and transportation system management needs to meet current and future demands;
- An analysis of funding capability to judge needs against probable funding resources;
- A multiyear transportation financing plan;
- If probable funding falls short of meeting identified needs, a discussion of how additional funding will be raised or how land use assumptions will be reassessed to ensure that level of service standards will be met;

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- Intergovernmental coordination efforts, including an assessment of the impacts of the transportation plan and land use assumptions on the transportation systems of adjacent jurisdictions; and
- Demand-management strategies

The City of Chelan is a member of the North Central Regional Transportation Planning Organization (NCRTPO) an intergovernmental board that develops the regional transportation plan and policies. The 20-Year Regional Transportation Plan (RTP) 2017 Update identifies regional priorities, complementing the local planning that makes the roadway network function within each jurisdiction. The actual projects are implemented by the individual jurisdictions. The Chelan Transportation Plan must be consistent with the Statewide Multi-modal Transportation Plan, the Regional Transportation Plan and local jurisdiction plans.

Land Use and Transportation

The State Growth Management Act requires that land use assumptions be used to estimate future travel. The location and density of housing, shopping and employment centers all impact the transportation system, and future traffic volumes will reflect the interactions between land uses. Data provided by the City of Chelan, Chelan County, Office of Financial Management (OFM), Washington State Employment Security Department, Census Bureau, and Bureaus of Labor Statistics and Economic Analysis were incorporated into the City's transportation model. The assumptions in this plan accommodate the anticipated employment and population growth.

The current zoning for Chelan and its UGA is illustrated in Exhibit 7-1**.**

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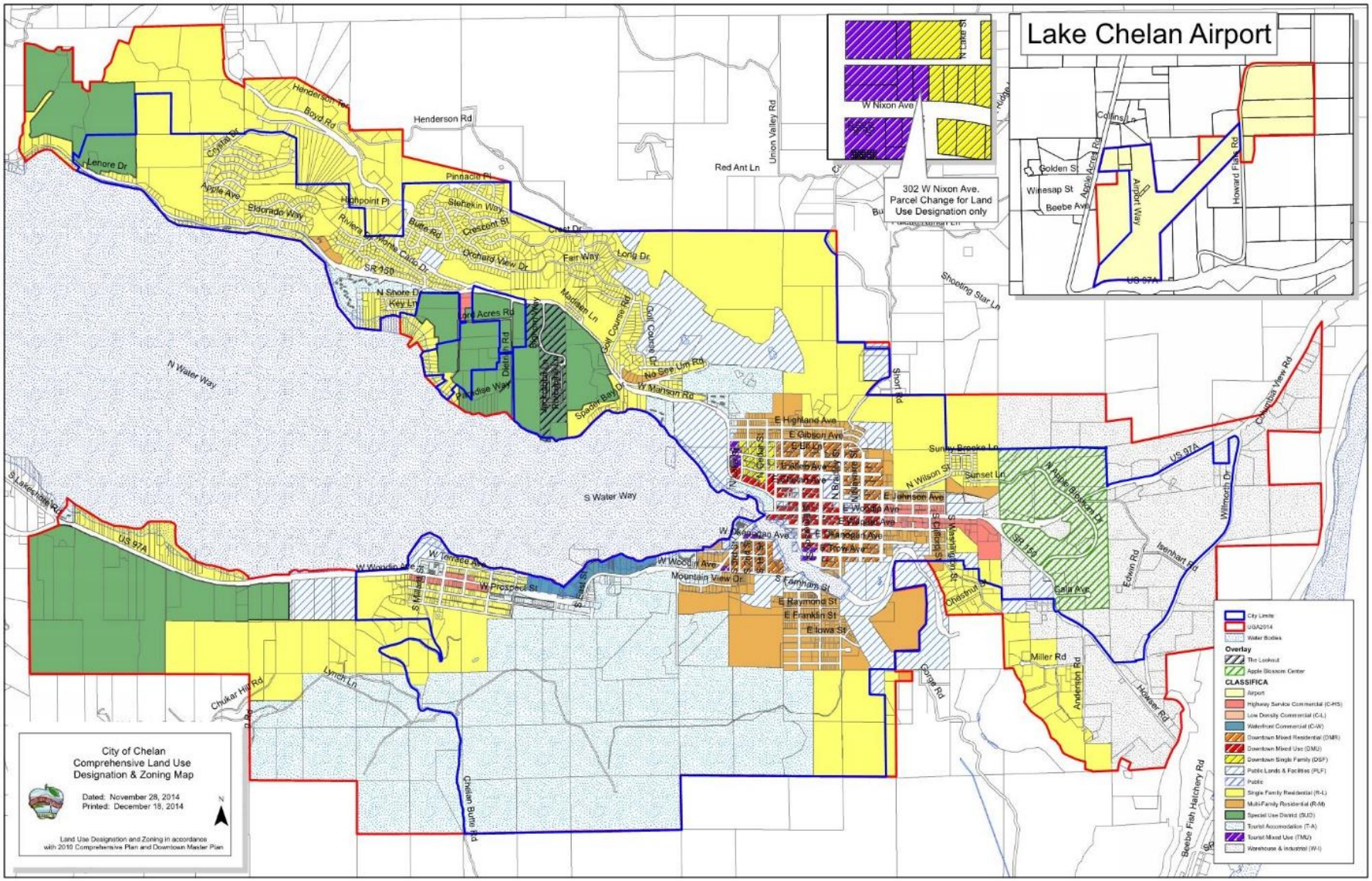
Exhibit 7-1. Zoning Map 2016



Related Transportation Planning Efforts

The Transportation Element identifies the transportation system that is needed to support the existing and proposed land uses identified in the Land Use Element and in the following studies and plans:

- City of Chelan Traffic Circulation Enhancement Study
- Lord Acres Subarea Plan
- Lakeside Trail Feasibility Study
- Northshore Pathway Feasibility Study
- Chelan Downtown Master Plan

Traffic Circulation Enhancement Study

The Traffic Circulation Enhancement Study was adopted in 2005. The study evaluated a number of improvement alternatives in the Central Business District (CBD) area of the City and recommended a preferred alternative, which is anticipated to accommodate expected growth over the next 20 years. Recommended improvements included:

- Park Road/Gibson Avenue/Nixon Avenue: center two-way left-turn lane, signage, channelization and pedestrian improvements;
- Construction of multi-use off-street trail (Lakeside Trail) from Gibson Avenue to Old Woodin Avenue Bridge and to Webster Avenue;
- CBD improvements:
- Construct roundabouts at Johnson Avenue/Sanders Street and Johnson Avenue/Emerson Street
- Restripe Johnson Avenue for two travel lanes, center turn lane between Columbia Street and Sanders Street
- Signalize intersection and add eastbound left-turn lane at Johnson Avenue/Columbia Street
- Upgrade traffic signal and add new northbound right-turn lane at Sanders Street/Woodin Avenue (US 97A)
- Provide median refuge along Woodin Avenue for southbound left-turns from Columbia Street
- Add advanced signage to Woodin Avenue Bridge approaches
- Add southbound left-turn lane and add advanced signage at Woodin Avenue/Webster Avenue intersection
- Provide pedestrian crossing improvements, including curb ramps, signals, crosswalks on Bradley Street and Gibson Avenue.

Lord Acres Subarea Plan

In 2009, the City adopted the Lord Acres Subarea Plan for the area generally located east of Key Bay, south and west of SR 150, and west of Spader Bay. Lord Acres had been classified as Special Use District (SUD) transitional zone, and the subarea plan sought to determine the best long-term zoning for the area. The preferred alternative recommended in the plan was to retain the SUD zoning designation, but to revise existing language in the zoning code. Revisions include:

- Requirement for buffers between non-conforming uses,

- Addition of maximum density, lot coverage and height limits,
- Provision of density bonuses for open space,
- Removal of single family parcels that are only partially in the SUD,
- Additional uses such as inns, boutique retail, agriculturally-related retail,
- Deletion of RV parks as permitted use,
- Provision for cottage and/or clustered housing, and
- Requirement of minimum waterfront for multifamily dock development.

Lakeside Trail Feasibility Study

The Lakeside Trail Feasibility Study investigated a bicycle and pedestrian trail between Don Morse Park and Lakeside Park and examined issues involved in developing various segments of the preferred route. The proposed trail will provide a 2.25-mile accessible bicycle and pedestrian trail as a part of the Lower Lake Chelan Shoreline Trail System. The paved multi-use trail was planned to be located within City-owned and WSDOT-owned right-of-way and public park lands. The trail was planned to be separated from motor vehicle travel lanes by a curb, divider, landscape buffer, or high visibility pavement markings and will incorporate access to bus stops, parks, neighborhoods, connecting streets and commercial areas. The City adopted the study in November 2002. Segments of the trail have been constructed since that time including portions adjacent to Lakeside Park and Don Morse Park.

Northshore Pathway Feasibility Study

The concept of a non-motorized trail system was outlined in the 1995 Lake Chelan Valley Public Trails Comprehensive Plan. The Northshore Pathway Feasibility Study was completed in 2000 and considered possible locations for a non-motorized trail along SR 150 between Manson and Chelan.

Chelan Downtown Master Plan

The Chelan Downtown Master Plan was completed in 2010. The Plan provides a plan for preferred downtown development and a clear guide for citizens and developers. The master plan:

- Recommends uses, building heights and scale, pedestrian and auto circulation, open space, landscaping and signage;
- Identifies a variety of street types and types of development frontages allowed along each street;
- Identifies desirable housing types for areas surrounding downtown;
- Identifies types of street improvements, fixtures and treatments;
- Evaluates multi-modal systems and transit opportunities;
- Provides a strategic plan for parking and non-motorized circulation;
- Recommends locations for public spaces/outdoor gathering areas;
- Identifies actions to display and showcase artistic and cultural work and events
- Develops implementation strategy that identifies actions, priorities, time frames for public and private sector.

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Coordination with Other Agencies

Capital Facilities Plan and Transportation Improvements Program

Short-term planned improvements to the City's transportation system are included in the Six-Year Transportation Improvement Program (TIP). The TIP is adopted by reference as part of the Transportation Element of the Comprehensive Plan. The TIP is updated annually. A copy of the current TIP is provided in Appendix E-1.

GMA also requires comprehensive plans to include a Capital Facility Element, which must include at least a six-year plan to finance capital facilities and identify sources of public money for such purposes. The CFP is an adopted element of the City's Comprehensive Plan.

Policy Development and Regional Coordination

The City of Chelan Transportation Plan is intended to be consistent and compatible with the plans and programs of the Washington State Department of Transportation (WSDOT), The North Central Washington Regional Transportation Planning Organization (NCRTPO), Chelan-Douglas Transportation Council (CDTC), Chelan County and LINK Transit as described below.

Regional Transportation Plan

The North Central Regional Transportation Planning Organization (NCTPO) was established in the early 1990s to create a regional transportation planning network for Chelan, Douglas and Okanagan counties. Federal law mandates a metropolitan planning process for urbanized areas that exceed 50,000 population. The Wenatchee Urbanized Area exceeded that threshold in 2003, and the Wenatchee Valley Transportation Council (WVTC) was established. In 2014, the Council merged its federal and state planning functions into a unified boundary that encompasses Chelan and Douglas counties and was renamed the Chelan-Douglas Transportation Council (CDTC). CDTC is the Metropolitan Planning Organization responsible for developing plans and programs for the urbanized area within the broader policy established by the NCRTPO for the larger region.

Both federal and state laws require the Regional Transportation Plan (RTP) to look at least 20 years into the future to project the transportation needs, opportunities and priorities for the region. The RTP identifies strategic priorities for regional transportation system improvements, 20-year regional transportation system improvements, legislative and policy priorities, and transportation planning and research priorities.

The Regional Program of Transportation Projects provides a regionally-approved list of current transportation improvement projects scheduled for construction with approved funding and a list of unfunded, short-term city and county transportation projects of regional significance.

Regionally significant projects must receive regional approval to be included in the RTP, and must be included in the RTP in order to proceed. The City of Chelan Transportation Plan was prepared to be consistent with the RTP.

Washington State Department of Transportation

The Highway System Plan (HSP) is a component of the state's long-range transportation plan, which guides investments on state routes in Washington. State projects must be included in the HSP before they can receive funding and move forward.

WSDOT has prepared Corridor Planning Studies (Route Development Plans) for US 97A, beginning at Wenatchee and ending at north Chelan, and for SR 150, beginning at Manson, through Chelan, to the Beebe Bridge over the Columbia River. The usual purpose of a corridor study is to determine the best way

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to serve existing and future travel demand. The studies define alignment, modes and facilities for at least a 20-year period and are intended to support local jurisdictions in implementation of the GMA.

The City's Transportation Plan is consistent with the WSDOT Multimodal Transportation Plan, which categorizes trips according to transportation mode, such as drive alone, carpool, vanpool, transit, bike or walk.

Chelan County Transportation Plan

Chelan County developed an initial Transportation Element in 2000 and the Transportation Element Update was adopted by the Chelan County Board of Commissioners in December 2009. The County is currently undergoing an update to their Comprehensive Plan which is expected to be complete by late 2017. As required by GMA, the Transportation Element is consistent with priorities in the Washington Transportation Plan (WTP) and in the Regional Transportation Plan (Transportation 2040) prepared by the Chelan-Douglas Transportation Council. The document considers Chelan County as a whole, organized by subarea. The Chelan Subarea section of the document lists improvement projects within the City of Chelan and County roadway improvements needed to support the residential growth north of the City limits and within the UGA.

Link Transit

The Chelan Douglas Public Transportation Benefit Area (dba Link Transit) provides year-round service for seventeen communities in Douglas and Chelan Counties, including Chelan and Manson. The City of Chelan Transportation Plan acknowledges the future role of transit in serving the transportation needs of the city and surrounding areas. The City supports Link Transit's strategic plans as contained in its Transit Development Plan and coordinates with the agency to identify how transit needs should be addressed, particularly as new development occurs. Serving on the Link Transit Board is an on-going Council committee assignment and Mark Spurgeon, Port of Douglas County Commissioner, currently serves as Chair of the Board of Directors.

7.3 Transportation Network Inventory

Roadway System

The roadway system provides for the orderly movement of people and freight throughout the city and region. The circulation network includes state, county, city and private roadways. The system primarily serves motorized vehicular travel; however, the City has incorporated design standards to enhance non-motorized circulation and requirements for shared use of the roadways.

Functional Classifications

Streets function as a network. Functional classification groups streets and highways into classes according to the type of service they are intended to provide. Classification of streets and highways in the State of Washington is based upon guidelines prepared by the Federal Highway Administration (FHWA) and administered by WSDOT. WSDOT classifies State highways as principal arterials, minor arterials, or collectors according to the following:

- Principal arterial system consists of a connected network of rural arterial routes with appropriate extensions into and through urban areas, including all routes designated as part of the interstate system, which serve corridor movements having travel characteristics indicative of substantial statewide and interstate travel;

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- Minor arterial system forms, in conjunction with the principal arterial system, a rural network of arterial routes linking cities and other activity centers which generate long distance travel and, with appropriate extensions into and through urban areas, form an integrated network providing interstate and interregional service;
- Collector system consists of routes which primarily serve the more important inter-county, intra-county, and intra-urban travel corridors, collect traffic from the system of local access roads and convey it to the arterial system, and on which, regardless of traffic volume, the predominant travel distances are shorter than on arterial routes.

WSDOT classifies US 97A as a Minor Arterial and SR 150 is classified as a Collector.

Within the City of Chelan, the classification of all streets is established by the Public Works Department. Exhibit 7-2 illustrates the Functional Classification System. Changes in street classification or classification applied to new streets shall be shown to meet the following criteria:

- **Arterial:** The Arterial will generally be a state road or other major facility that moves urban traffic along to the other urban areas or higher class state or federal highways. Arterials are intended for efficient movement of people and good and have the highest level of access control. They have limited access and accommodate controlled intersections. The Average Daily Traffic (ADT) and level of service standard for state-owned facilities will be established by WSDOT.
- Roadways classified as arterials are:
  - SR 97A
  - SR 150
- **Major Collector:** The Major Collector is the major street in the urban system and correspondingly has the highest ADT. The Major Collector generally receives many Minor Collector or Residential streets and/or is the major route to significant activity centers. These streets should not generally be encumbered with stop signs. Collectors generally connect commercial, industrial and residential projects to other collectors and arterials and have a moderate level of access control. ADT equal to or more than 2000.

  The following roadways classified as major collectors are:
  - Boyd Road (SR 150 to north City limits)
  - Gibson Avenue (SR 150 to Bradley Street)
  - Columbia Street (Woodin Avenue to Gibson Avenue)
  - West Woodin Avenue (SR 97A to Sanders Street)
  - Sanders Street (Johnson Avenue to Gibson Avenue)
  - Navarre Street
  - Emerson Street (Woodin Avenue to Johnson Avenue)
  - Farnham Street/Sanders Street/Iowa Street (South Chelan)
  - Union Valley Road (Gibson Avenue to north City limits)
- **Minor Collector:** The typical residential street, the minor collector is most commonly recognized as the lesser through street of a residential grid. While vehicular traffic could often travel through on a minor collector, intersections are either controlled or encumbered with stop signs, thus encouraging vehicles to use a major collector for through traffic. ADT greater than 1,000 and less than 2,000.

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The following roadways are classified as minor collectors:

- No-See-Um Road
- Orchard View Drive/Fairway Boulevard/Bogey Boulevard/Golf Course Drive
- Crystal Drive
- Emerson Street (Johnson Avenue to Gibson Avenue)
- Emerson Street (Woodin Avenue to Trow Avenue)
- Trow Avenue (Emerson Street to Saunders Street)
- Wapato Avenue (Emerson Street to Saunders Street)
- Bradley Street (Gibson Avenue to Woodin Avenue)
- Wilson Street
- Apple Blossom Drive
- Granite Ridge Drive

- **Local/Private Access Street:** 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. Local access streets interconnect with each other and with minor collectors and have a minimum level of access control. Local residential streets serve as land access from residences and generally connect with minor collectors. Safety is always the major consideration when determining intersection locations and connectivity. ADT less than or equal to 1,000.

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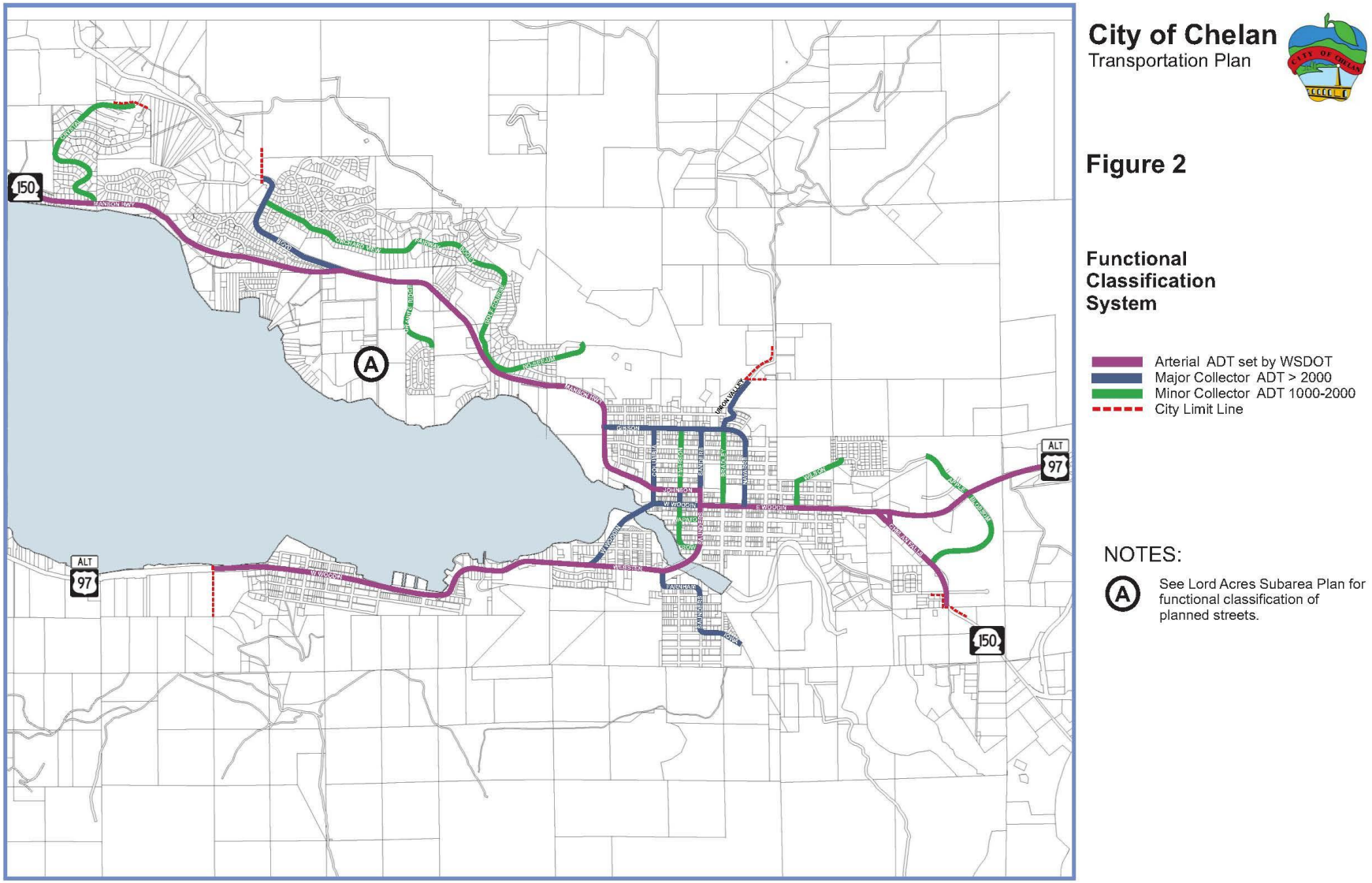
Exhibit 7-2. Functional Classifications



State-Owned Facilities

The state highway system provides access to and through Chelan. US Highway 97 Alt provides the main access to Chelan, connecting to the main Highway 97 at Wenatchee and just northeast of the city. SR 150 provides access to Manson and connects to Highway 97 at Chelan Falls. Highway 97 Alt travels along the south shore of Lake Chelan, while SR 150 travels along the north shore. The routes intersect on Woodin Avenue in downtown Chelan. There is one WSDOT bridge in the city: the Dan Gordon Bridge on Saunders Avenue

Highway of Statewide Significance

Highways of Statewide Significance (HSS) include interstate highways and other principal arterials that connect major communities in the state. The HSS was mandated by the 1998 legislature and codified in RCW 47.06.140. Although WSDOT consults with local governments when setting level of service standards for state highways of statewide significance, WSDOT retains the authority to establish the standard. There are no HSS highways in Chelan.

Public Transportation

Link Transit is the service name of the Chelan-Douglas Public Transportation Benefit Area (PTBA) which serves 17 communities year-round. The PTBA includes all of Chelan County and one-third of Douglas County. Columbia Station, an intermodal transportation center, is located in downtown Wenatchee, and houses Link Transit, Northwest Trailways and Amtrak. In 2008, Link Transit operated eight urban fixed routes, four rural deviated routes, three urban trolley routes, three regional commuter routes, and one seasonal route. Dial-a-Ride and LinkPlus paratransit services are provided to residents of Chelan and Douglas Counties.

Link Transit operates six Park and Ride lots, including a 29-space lot at SR 97A and Center Street (Lakeside) in the City of Chelan. Chelan is served by two fixed bus routes.

- Route 20 runs between Columbia Station and Mason, and travels through the communities of Orondo, Chelan Falls, and Chelan on SR 2 and SR 150. Five routes are operated Monday-Friday.
- Route 21 runs between Columbia Station and Chelan along SR 97A, through Entiat providing service Monday-Saturday with 30-minute headways during the PM commute.

Aviation Facilities and Services

The Lake Chelan Airport, a municipal general aviation airport, is jointly owned by the Port of Chelan County and the City of Chelan. The small airport is located three miles northeast of Chelan. No commercial flights serve this area, but the airport is used by private pilots, forest service, law enforcement, emergency medical and agriculture service personnel. Approximately 69 aircraft are based at the Chelan Airport, and charter flights are available through Chelan Airways.

Commercial flights are provided at Pangborn Memorial Airport in East Wenatchee by Horizon Air, which flies five flights daily departing from Wenatchee to Seattle and five flights daily arriving in Wenatchee from Seattle. Catlin Flying Service provides private direct flights between Lake Chelan and over 500 airports. Chelan Airways offers scheduled and charter seaplane flights from Chelan to Stehekin and other destinations.

Rail Facilities and Services

While there are rail services and facilities in Chelan County, there are none in the City of Chelan. The Cascade and Columbia River Railroad (CSCD) is a short line railroad that interchanges with the Burlington Northern-Santa Fe Railroad (BNSF) in Wenatchee, and runs north to Oroville through Entiat and Chelan Falls, near the eastern boundary of the Chelan UGA. The CSCD operates 148 miles of track and moves over 5,200 cars per year. The major commodities moving on the CSCD are pulpwood and lumber products and limestone.

The nearest passenger rail service is provided by Amtrak in Wenatchee, which offers daily service between Chicago and Seattle.

Water Transportation

The City's location on the shore of Lake Chelan make water transportation an important part of the overall circulation system. Water transportation includes passenger ferry boats, commercial barges, small commercial boat services, National Park Service boats, and privately-owned water craft.

The Lake Chelan Boat Company provides passenger boat service between the City of Chelan to Stehekin, with scheduled stops at Field's Point and Lucerne. Between May 1 and October 15, both the Lady of the Lake II and the Lady Express operate daily. During the Winter/Spring, the Lady Express operates on a reduced schedule, with three-to-four scheduled trips per week. Commercial water transport is primarily provided by the Lake Chelan Boat Company and Tom Courtney Tug & Barge, which offers scheduled freight service to all destinations on Lake Chelan approximately once a week, as well as charter runs. Docking facilities for private boats are located at various points around the City of Chelan.

Freight Mobility

The Washington State Freight and Goods Transportation System (FTGS) is used to classify state highways, county roads and city streets according to the average annual gross truck tonnage they carry. Freight corridors with statewide significance, usually designated as strategic freight corridors, are those routes that carry an average of four million or more gross tons by truck annually. The tonnage classifications used for designating the FTGS are as follows:

- T-1 more than 10 million tons per year
- T-2 4 million to 10 million tons per year
- T-3 300,000 to 4 million tons per year
- T-4 100,000 to 300,000 tons per year
- T-5 at least 20,000 tons in 60 days or less than 100,000 tons per year

The City of Chelan recognizes the importance of facilities for the movement of freight in order to maintain Washington's strong trade-related economy. State facilities in the city include SR 150 and SR 97A which are both classified as T-3 routes. It is expected that the majority of regional trips will occur on state highways; however, the City experiences considerable truck traffic and has classified Boyd Road as a T-4 route on the 2016 FTGS map.

All arterials support truck travel, although only the identified routes are required to be constructed to truck standards. All other roadways in the City will be for local deliveries only.

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Non-Motorized Facilities

Non-motorized facilities include sidewalks, bike lanes, and paths or separate mixed-use facilities that provide opportunities for both commuters and recreational users. The bulk of non-motorized facilities in the City are concentrated in or near the downtown core or in areas of recent development. As land is developed, the City's road standards require sidewalks to be constructed on all roads, and bike lanes are required to be built on major collectors and arterials. Non-motorized elements are identified as components of projects in the City's Transportation Improvement Program.

As a part of this update, the City of Chelan has implemented a new method of evaluating non-motorized facilities that focuses on the user experience. The details of this analysis can be found in the Transportation Element of the Comprehensive Plan. As of 2017, the City is beginning to evaluate pedestrian and bicycle facilities according to the new methodology. Future updates will include the results of the inventory as a way to track the state of the system, measure progress toward achieving goals, and identify and prioritize investments in the non-motorized network.

Pedestrian Facilities

Sidewalks are provided in the downtown area and newer residential neighborhoods, as well as some older residential neighborhoods. Many of the City's older residential areas don't have sidewalks, and some sidewalks in the downtown and residential areas to the north are narrow or in need of repair. The City's Six-Year TIP includes pedestrian facilities as an element of street and intersection projects, and may at times also list a number of independent pedestrian crosswalk and safety improvements. Street frontage improvements are also required to be installed by new developments. In addition, construction of segments of the Lakeside Trail is underway, and includes trail/pedestrian facilities. The Downtown Master Plan includes a trail/pedestrian route linking Don Morse Park, the Lakeside Trail, and Riverwalk Park with the downtown core, as well as upgrading pedestrian facilities along Woodin Avenue.

Bicycle Facilities

City road standards require bike lanes on all new construction of major collectors and arterials. However, the City lacks adequate bicycle facilities, and areas along Lake Chelan pose particular difficulties during summer months. Much of the traffic into Chelan arrives on SR 97A along the south shore of the lake. SR 97A/Woodin Avenue is essentially the only walking route between downtown and the numerous tourist accommodations and amenities along the lake. Only a few short sections of sidewalk exist along this route; therefore, bicyclists and pedestrians share the shoulder of a busy arterial roadway. Similarly, SR 150 from downtown to the west is a heavily-traveled route with conflicts between non-motorized and motorized uses.

The City is currently developing a multimodal plan system of safe and convenient pedestrian and bicycle routes throughout the City and its UGA. The proposed system will link new and existing neighborhoods and visitor lodging with the Lakeside Trail and other destinations in the City, as well as provide for the needs of recreational cyclists.

Trails

The City adopted the Lakeside Trail Feasibility Study in November 2002 and the Northshore Pathway Feasibility Study was completed the same year. In 2008, the first phase of the Lakeside Trail was begun with improvements to the sidewalk on SR 150 west of Columbia Street (Trail Segment "B"). All of Segment "A", the west portion of Segment "B", the north portion of Segment "E" and Segment "J" have now been completed. [Need confirmation from City]

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ADA Transition Plan

The Americans with Disabilities Act (ADA), enacted in 1990, extended comprehensive civil rights protections to people with disabilities. The law is comprised of five titles that prohibit discrimination against disabled persons within the United States. Title II of the ADA addresses the law's requirements of local governments in their interactions with people with disabilities. The United States Department of Justice (DOJ) regulations implementing Title II require local governments to evaluate their services, program, policies and practices, and identify barriers that may limit accessibility for people with disabilities and develop transition plans describing how they will address identified barriers.

At a minimum, an ADA Transition Plan should contain the following:

- A list of the physical barriers in the City's facilities that limit the accessibility of its programs, activities, or services to individuals with disabilities;
- A detailed outline of the methods to be utilized to remove these barriers and make the facilities accessible;
- The schedule for taking the necessary steps to achieve compliance with Title II. If the time period for achieving compliance is longer than one year, the plan should identify the interim steps that will be taken during each year of the transition period; and
- The name of the official responsible for the plan's implementation.

The City of Chelan has conducted a sidewalk inventory and has completed inspecting and documenting the condition of the sidewalks and curb ramps within the city limits, with priority given to areas with high pedestrian volumes. It is anticipated that roadway projects will correct a number of intersections per year. Every development project, whether City or private, is required to correct all deficiencies within the project limits. The City is committed to making all sidewalk and curb ramp areas accessible to everyone within as short a time frame as possible in order to ensure citizens can travel safely throughout the city. [Need confirmation from City]

Transportation Demand Management

Transportation Demand Management or TDM refers to various strategies that change travel behavior in order to increase and support the capacity and efficiency of the transportation system. Many factors affect people's travel decisions, including the relative convenience and safety of travel modes (such as whether streets have sidewalks and bike paths, and the quality of transit services available), prices (transit fares and the price of parking at destinations), and land use (such as whether or not schools, parks and shops are located close to residential neighborhoods). TDM strategies influence these factors to encourage more efficient travel patterns, such as shifts from peak to off-peak periods, from automobile to alternative modes, and from dispersed to closer destinations. TDM strategies include:

- Non-motorized improvements
- Transit Improvements
- Tourist transport management
- Parking management to discourage single occupant vehicle trips
- Carpooling and vanpooling
- Alternative work hours to compress the work week or shift the commute outside typical commute hours

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- Encouraging non-motorized travel through design features
- Eliminating the need for trips through land use planning.

TDM strategies in Chelan include provision of bicycle and pedestrian facilities and collaboration with Link Transit to provide facilities, ensure safety for transit passengers, and expand public transportation services in underserved areas. Longer term strategies include efforts to promote multi-modal transportation options.

7.4 2017 Traffic Conditions Analysis

The GMA requires the City to establish service levels for the street network and to provide a means for correcting current deficiencies and meeting future needs.

The operation of roadways is typically described using national standards that measure a roadway's level of service (LOS). LOS designations are qualitative measures of congestion that describe operational conditions within a traffic stream and consider such factors such as volume, speed, travel time and delay. Six categories of LOS – the letter designations A to F – are used to identify traffic conditions, with LOS A representing excellent conditions and LOS F representing extreme congestion. The definitions of level of service criteria and methodologies are provided in **Appendix E-2** of this plan. Any transportation facility, including City arterials and transit routes, that functions below the adopted standards is considered to be failing.

The volume to capacity (V/C) ratio is used to describe traffic flow on roadways and through intersections. Volume is established by a traffic count or by a forecast for a future point in time. Capacity is the ability of a roadway to carry vehicles at free flow speed. For roadways, the LOS designation is based directly upon V/C ratios calculated based on the roadway's capacity at LOS E conditions. For intersections, LOS takes into account the V/C ratios of all of the critical turning movements that take place at an intersection Level of Service Standards.

Level of Service Standards

Cities are required to adopt level of service (LOS) standards to establish the level of congestion the community is willing to accept and to determine when growth has consumed that available capacity. The GMA requires that transportation capacity is evaluated concurrent with development.

The City of Chelan has adopted a LOS D standard for all intersections within the City. Any transportation facility, including City arterials and transit routes, that functions below the adopted standard is considered to be failing.

Origin and Destination Survey

The City of Chelan is located at the intersection of two state highways (SR 150 and US 97A). As a result, many of the vehicle trips along both state highways travel through the City of Chelan and have end points external to the city. A vehicle travel origin/destination survey was conducted in October 2009 to obtain data on the regional traffic distribution trends within the City of Chelan and its environs. The survey was conducted during the afternoon peak period of a normal weekday (Tuesday, October 27 between 2:30 and 5:30). The study showed what percentage of the traffic entering the city remains within the city and how much continues through without stopping, as well as the percentage of vehicles using each of the major routes. If a vehicle traveled through the city without stopping, it constitutes an external to external trip (x-x trip). If the vehicle entered the UGA and did not immediately exit, it would be considered an

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external to internal trip (x-i) trip. Trips that began in Chelan and end outside the UGA are an internal to external (i-x) trip.

The origin of the trips, destination, and number of trips is summarized in the Exhibit 7-3. The study found that 19% of all vehicles entering the city during the weekday study period (2:30 pm – 5:30 pm) are through vehicle trips which do not end within the city. The remaining trips (81%) have a destination within the city. Approximately 91% of the vehicle trips entering the city along US 97A at the eastern city limits are internal, while only 75% of the vehicle trips entering the city along SR 150 at the northern city limits have a destination within the city. Exhibit 7-4illustrates the entering and exiting volumes and percentages of external trips.

Exhibit 7-3. ExhibitExternal Vehicle Trips Through City of Chelan and UGA

Origin	Destination	% of Origin	# of Vehicle Trips
1 SR 150 – North	US 97A East	14%	86
	SR 150 South	2%	12
	US 97A West	9%	55
	Destination in City	75%	459
			612
2 US 97A – East	SR 150 North	4%	17
	SR 150 South	2%	8
	US 97A West	3%	12
	Destination in City	91%	378
			415
3 SR 150 – South	SR 150 North	7%	20
	US 97A East	13%	37
	US 97A West	4%	11
	Destination in City	76%	214
			282
4 US 97A - West	SR 150 North	11%	68
	US 97A East	6%	37
	SR 150 South	2%	12
	Destination in City	81%	500
			617
Total Estimated External-External Trips		**19%**	**374**

Data collected on Tuesday, October 27, 2009 2:30 pm to 5:30 pm.

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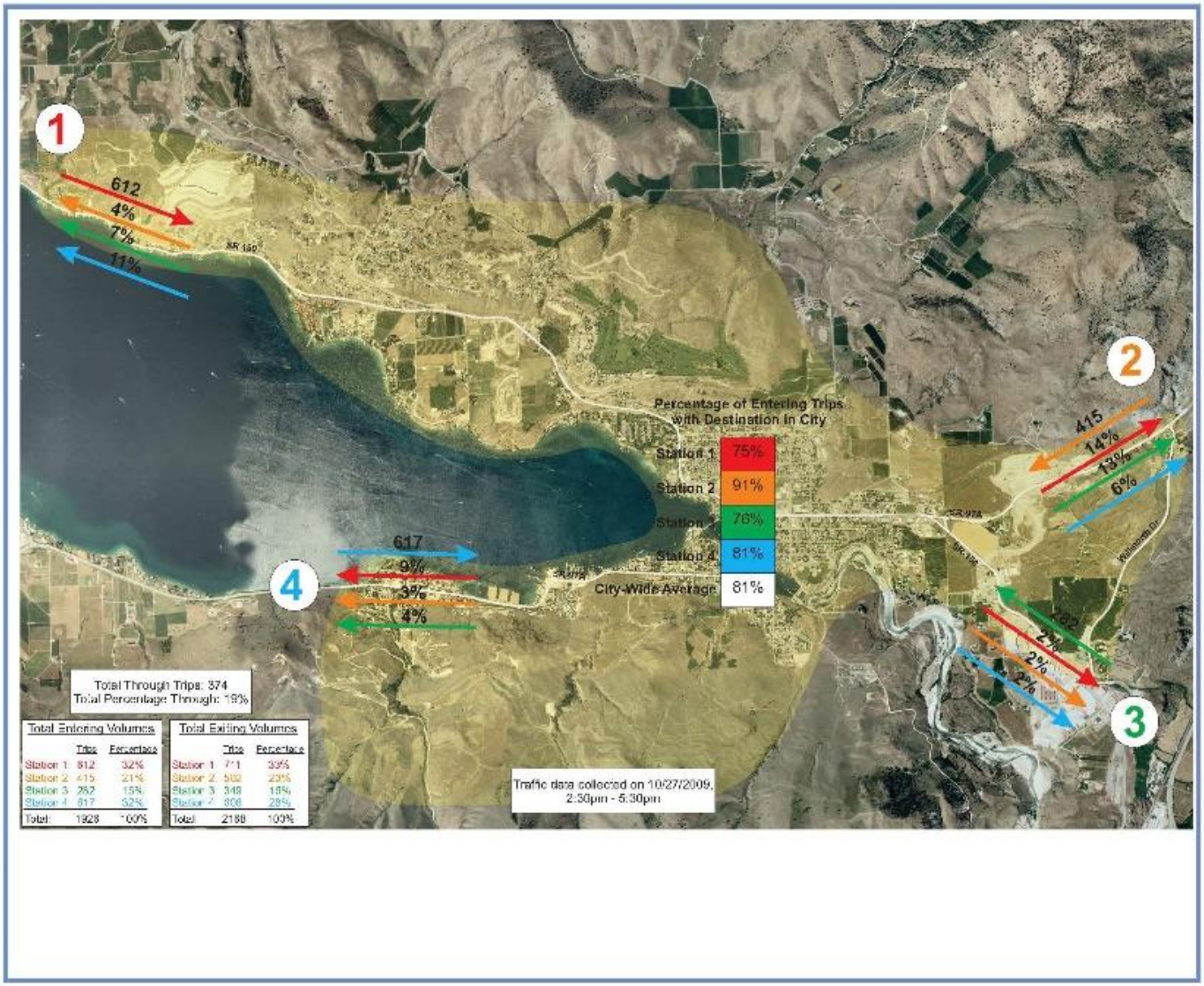
Exhibit 7-4. Entering and Exiting Traffic Patterns



City of Chelan
Transportation Plan

Figure X

External Vehicle Trips

Existing Traffic Operations

Traffic operations were evaluated based on the LOS methodologies of the Highway Capacity Manual. The methodology used to analyze roadway segments and signalized, unsignalized, or roundabout intersections is different for each type of facility.

Intersection levels of service were evaluated for 18 study intersections. Trafficount, a traffic data collection firm, collected evening peak period turning movement counts for the study intersections between 4:00 PM and 6:00 PM on May 19, 20 and 21, 2009. Exhibit 7-5shows the existing 2017 traffic volumes for the study intersections and Exhibit 7-6shows the existing level of service at each study intersection. The capacity analysis worksheets are provided in **Appendix E-3.**

Because the traffic counts were conducted several years ago, a comparison of key locations with more recent counts was completed to evaluate the validity of the data. Newer counts did not show a significant increase in traffic in Chelan, and in some cases volumes were lower. Therefore, the 2009 counts were used for this update.

These traffic volumes were used for our base year operations analysis and as the basis for future year traffic volume projections.

Exhibit 7-5. Existing 2017 Traffic Volumes

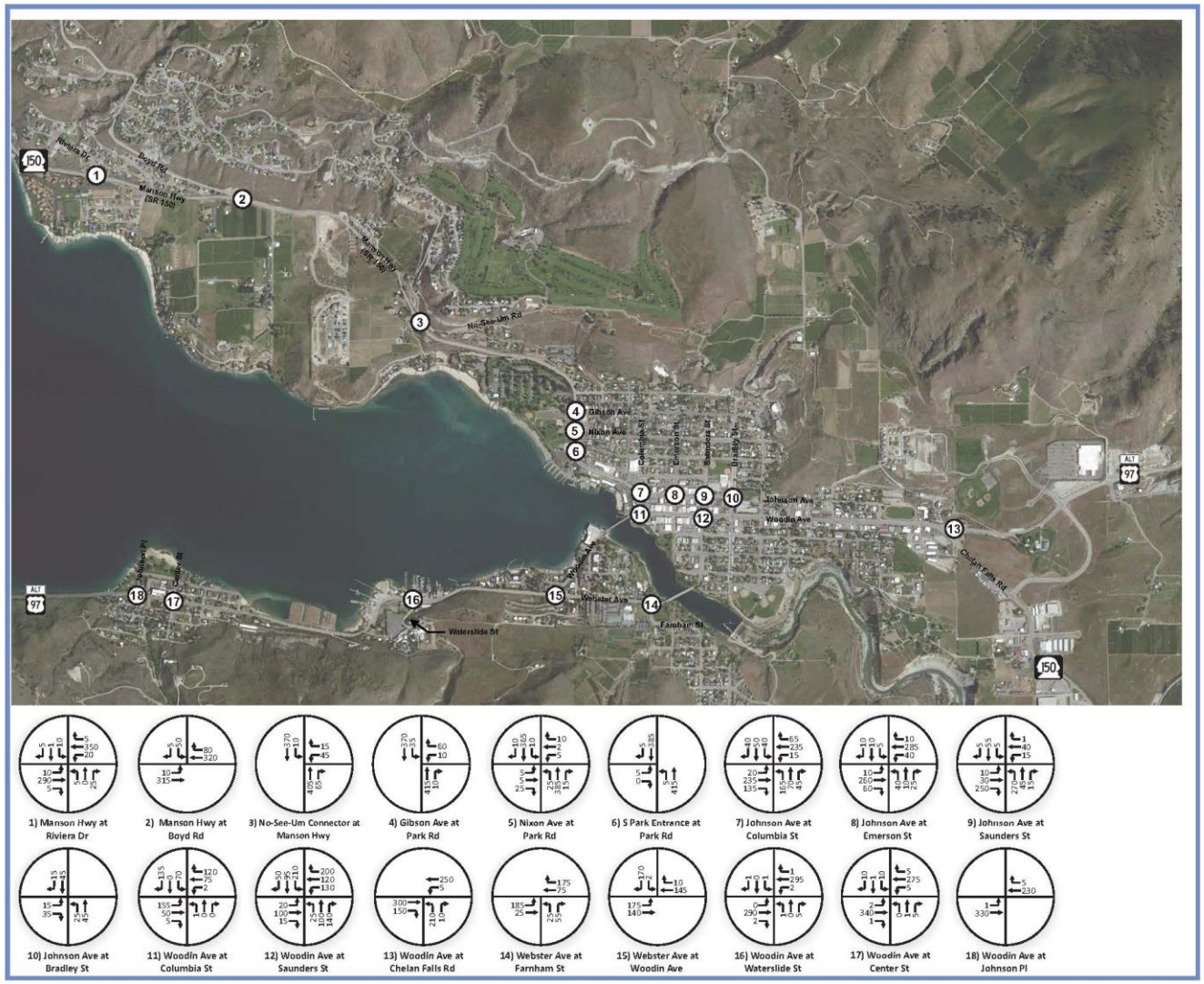


Exhibit 7-6. Existing Level of Service Summary

Intersection	2017 Base Year	
	LOS (Delay)	Worst V/C
Riviera Drive/ (SR 150)	B (14.7)	0.06
Boyd Road/ (SR 150)	B (12.8)	0.11
No-See-Um Road/ (SR 150)	C (17.8)	0.19
W Gibson Avenue/Park Road (SR 150)	B (12.5)	0.14
W Nixon Avenue/Park Road (SR 150)	C (20.0)	0.05
Lakeshore Park Entrance/Park Road (SR 150)	B (13.3)	0.01
Columbia Street/E Johnson Avenue (SR 150)	B (12.3)	0.53
Emerson Street/E Johnson Avenue (SR 150)	C (22.2)	0.29
Sanders Street/E Johnson Avenue	B (12.7)	0.53
Bradley Street/E Johnson Avenue	A (9.1)	0.06
Columbia Street/E Woodin Avenue (SR 97A)	C (17.7)	0.21
Sanders Street/Woodin Avenue (SR 97A)	B (17.1)	0.49
Chelan Falls Road (SR 150)/Woodin Avenue (SR 97A)	C (18.4)	0.46
Farnham Street/Webster Avenue (SR 97A)	B (12.0)	0.07
W Woodin Avenue/Webster Avenue (SR 97A)	B (10.2)	0.21
Waterslide Drive/Webster Avenue (SR 97A)	B (14.2)	0.01
Center Street/Webster Avenue (SR 97A)	B (12.8)	0.05
Johnson Place/Webster Avenue (SR 97A)	A (7.7)	0.01

Summary of Existing Operations

All intersections evaluated currently operate above the City of Chelan's adopted level of service, and no intersections on SR 97A or SR 140 operate below the State of Washington's LOS D standard for Highways of Statewide Significance.

7.5 Planned Improvements

Changes in land use or expected growth patterns have an effect on the future transportation system and transportation planning must evaluate conditions as they evolve. Some planned improvements may no longer be needed or specific improvements that were not included in future planning may now be needed. Planned improvements to the City of Chelan transportation system include short term needs identified in the Six-Year TIP, as well as long-term needs based on conditions expected to develop over the next 20 years.

Six-Year Transportation Program

The City of Chelan's Six-Year TIP (2016-2022) provides information on project locations, funding and schedule. The City is required to update its TIP annually, and it is adopted as part of the Transportation Element of the Transportation Plan. A copy of the current 6-Year TIP, which is available from the Public Works Department, identifies the following projects: [to be inserted from adopted TIP]

Chelan-Douglas Transportation Council Regional Transportation Improvements Program

The CDTC Regional Transportation Improvement Program (2017-2020) project list is prepared in cooperation with local jurisdictions, transit operators, and WSDOT. The plan is linked to local agency Six-Year Transportation Improvement Plans, Link Transit's Transit Development Plan, and the WSDOT North Central Region's Six-Year Plan of Capital Projects. The Regional TIP is 'fiscally constrained', meaning that only the CDTC can only approve and submit projects for inclusion in the Statewide Transportation Improvement Program (STIP) if adequate funding is reasonably expected to be available. The current project list includes the following projects within the City of Chelan:

- Woodin Avenue Bridge Renovation and Repair
- SR 150 and No See Um Road Intersection Improvements

Washington State Department of Transportation Highway Improvement Program

WSDOT's Six-Year TIP includes the preliminary design and construction of the Woodin Avenue Bridge which is planned to begin in 2017. There are no other major WSDOT projects planned in the Chelan area.

7.6 Future 2037 Traffic Conditions Analysis

The GMA requires that traffic operations be evaluated on a long-range planning horizon, considering the planned transportation projects and planned growth, to determine how the transportation network can accommodate future demand.

Forecasting Methodology

In order to assess the future transportation needs of the city and the ability of the existing roadway network to accommodate planned growth, traffic volumes were estimated for the 2037 horizon year. The traffic volume projections were prepared using the current Chelan transportation model. The transportation model was created using a computerized transportation network model program.

The Chelan study area was modeled using the Emme/4 software package. Existing land use and demographic information was provided by the City of Chelan, Chelan County and the Washington State Office of Financial Management (OFM). The model was developed beginning in 2008 and was completed in its present form in early 2010. Updates to growth rates and land use were made in February, 2017.

The modeling process developed for this study involved four major steps:

- Construction of a computerized street network system of the Chelan transportation system;

- Developing a computerized land use zone system and database inventory of households and employment;
- Preparing base year model traffic volumes using trip generation factors and land use types to calibrate the model to current conditions;
- Developing future traffic volumes using projected land use and changes.

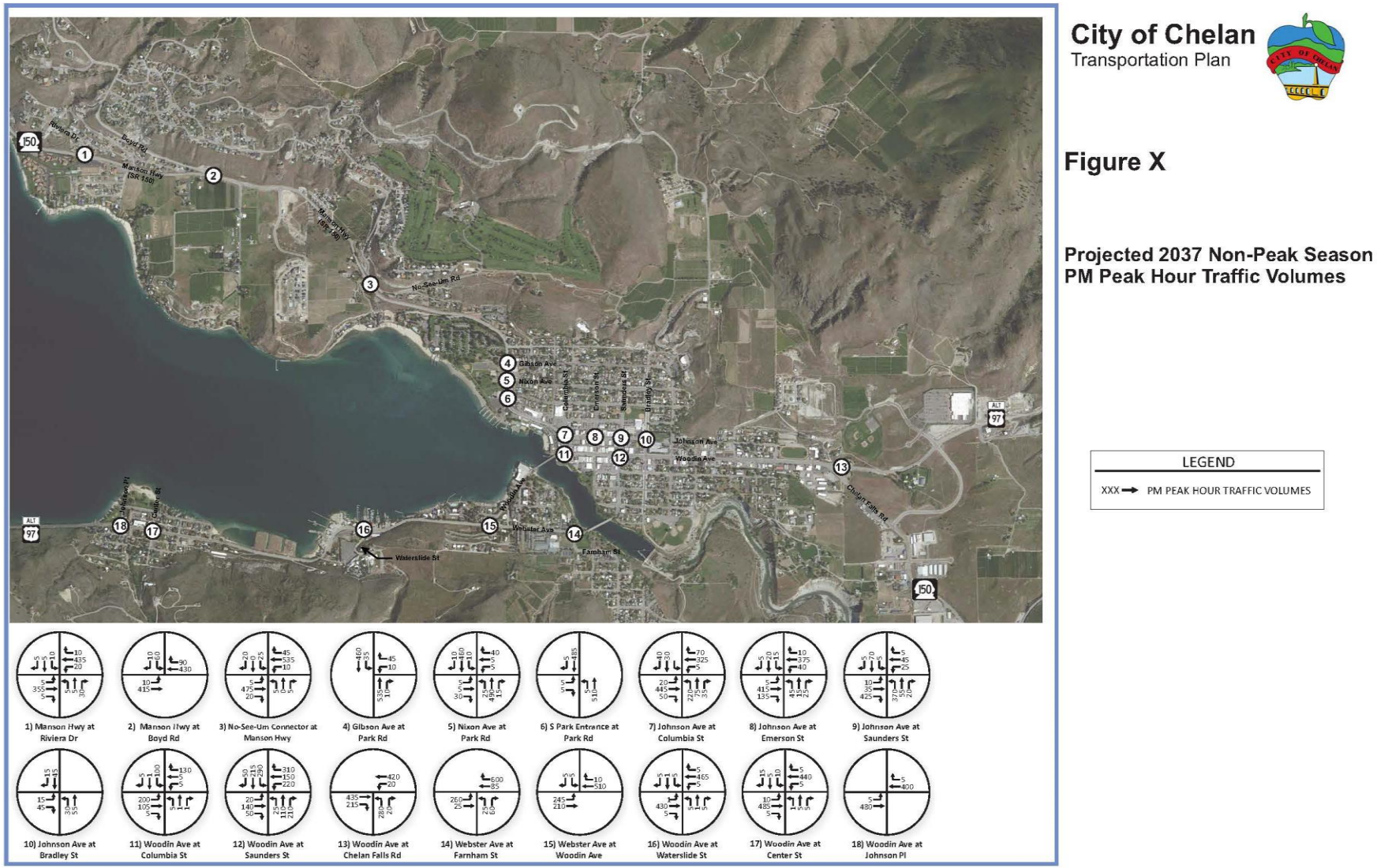
In addition to being used for preparing this transportation plan, the transportation model will continue to be a valuable tool for the City in assessing future roadway needs. The model will also be used to assess the traffic potential of larger developments that may have significant impacts to City roadways. The transportation model will continue to be refined and updated as necessary to accurately reflect existing transportation characteristics and to remain consistent with long-range land use planning efforts.

Model Post-Process Calibration

The transportation model has been calibrated to a high degree of accuracy for the system-wide roadway network. However, the accuracy of model volumes for particular roadway segments may vary based on a variety of factors. To account for the occurrence of local variation, a "post-process" calibration was applied to the model-generated traffic volumes.

The post-process calibration involved calculating the difference between the model-generated volumes for the 2017 base year and for the 2037 horizon year. This difference is considered the model volume growth increment. The model volume growth increment was then added to the actual traffic volume counts for each roadway segment. The post process calculation used to generate future year traffic volume estimates for this study is shown in **Appendix E-4**. The 2037 traffic volume projections are shown on Exhibit 7-7.

Exhibit 7-7. Projected 2037 Traffic Volumes



2037 Assumed Network Improvements

The list of improvements included in the Chelan 2037 baseline is shown in Exhibit 7-8.

Exhibit 7-8. 2037 Assumed Network Improvements

Facility	Improvements
Woodin Avenue Bridge	Convert bridge to one-way into downtown to allow for non-motorized uses.
SR 150/No-See-Um intersection	Re-align SR 150, No-See-Um Road and Golf Course Road intersection and construct roundabout.

Future Traffic Operations

Intersection levels of service were evaluated for 18 study intersections for 2037 operational analysis based upon the network described above. The LOS results are shown on Exhibit 7-9.

Exhibit 7-9. 2037 Conditions (with Assumed Improvements)

	Projected 2037	
Intersection	LOS (Delay)	Worst v/c
Riviera Drive/ (SR 150)	C (18.7)	0.09
Boyd Road/SR 150	B (14.7)	0.17
No-See-Um Road/SR 150	A (7.6)	0.49
W Gibson Avenue/Park Road (SR 150)	B (14.0)	0.13
W Nixon Avenue/Park Road (SR 150)	D (27.2)	0.14
Lakeshore Park Entrance/Park Road (SR 150)	B (13.3)	0.03
Columbia Street/E Johnson Avenue (SR 150)	B (14.6)	0.77
Emerson Street/E Johnson Avenue (SR 150)	**E (47.9)**	**0.55**
Sanders Street/E Johnson Avenue	D (27.3)	0.83
Bradley Street/E Johnson Avenue	A (9.2)	0.07
Columbia Street/E Woodin Avenue (SR 97A)	C (21.7)	0.34
Sanders Street/Woodin Avenue (SR 97A)	C (20.8)	0.72
Chelan Falls Road (SR 150)/Woodin Avenue (SR 97A)	**F (96.3)**	**1.03**
Farnham Street/Webster Avenue (SR 97A)	C (17.3)	0.09
W Woodin Avenue/Webster Avenue (SR 97A)	C (15.9)	0.26
Waterslide Drive/Webster Avenue (SR 97A)	C (21.2)	0.04
Center Street/Webster Avenue (SR 97A)	C (17.6)	0.10
Johnson Place/Webster Avenue (SR 97A)	A (8.2)	0.01

Summary of Future Operations

The results of the operational analysis show that with the identified improvements in the current TIP, only two intersections fall below the City's adopted LOS standards. Below is a description of each location:

- Emerson Street/E Johnson Avenue (SR 150): The level of service for this intersection is driven by the NB and SB left-turn movements. By implementing turn restrictions at Emerson Street/E Johnson Avenue (SR 150) for the NB and SB approaches, the intersection would improve to within City LOS standards. The City may elect to implement turn restrictions for safety reasons if observed conditions warrant the change.
- The Chelan Falls Road (SR 150)/Woodin Avenue (SR 97A) intersection is predicted to reach LOS F by 2037. It is recommended that this intersection be monitored as growth occurs. Due to the atypical nature of this intersection, the analysis software has a more difficult time assessing the operations and this intersection may perform better than currently predicted. Since this is the intersection of two state highways, WSDOT has primary responsibility for improvements at this location.

8.0 APPENDICES

Appendix A: Existing Land Uses by Zoning Class (2016)

By 2016 zoning district the current land uses are described in the table below. The table illustrates the range of current uses and which may someday change to the primary uses of the zoning district. The acre totals are color-coded similar to the zone color (see Exhibit 2-7).

Zone and Current Assessor Use 2016	City	UGA	Grand Total
A	61.6	61.8	123.4
AGRIC IN OPEN SPACE RCW 84.34		18.0	18.0
AGRICULTURE-NOT IN OPEN SPACE		20.3	20.3
GOVERNMENTAL SERVICES	58.5	2.1	60.6
SINGLE FAMILY UNITS		21.4	21.4
UNDEVELOPED LAND	3.1		3.1
C-HS	41.0		41.0
AUTOMOBILE PARKING	0.7		0.7
EDUCATIONAL SERVICES	1.0		1.0
FABRICATED METAL PRODUCTS	0.1		0.1
GOVERNMENTAL SERVICES	0.4		0.4
HOTELS/MOTELS	3.5		3.5
HOUSEHOLD 2-4 UNITS	0.3		0.3
MISCELLANEOUS SERVICES	3.4		3.4
MOBILE HOME PARKS/COURTS	0.6		0.6
OTHER RETAIL TRADE	0.2		0.2
PUBLIC ASSEMBLY	2.6		2.6
REPAIR SERVICES	3.0		3.0
RESIDENTIAL HOTELS-CONDOMINIUM	0.1		0.1
RETAIL TRADE-BLD MAT,FARM EQPT	0.2		0.2
RETAIL TRADE-EATING/DRINKING	0.8		0.8
RETAIL TRADE-TRANS/ACCESSORIES	9.0		9.0
SINGLE FAMILY UNITS	13.9		13.9
UTILITIES	1.0		1.0
WHOLESALE TRADE	0.2		0.2
C-W	23.2	0.4	23.5
ALL OTHER RESIDENTIAL	12.9		12.9
AUTOMOBILE PARKING	0.9	0.4	1.3
MARINE CRAFT TRANSPORTATION	2.6		2.6
NON-RESIDENTIAL CONDOMINIUMS	0.3		0.3
OTHER UNDEVELOPED LAND	0.8		0.8
PETROLEUM REFINING/RELATED IND	0.7		0.7
RESIDENTIAL HOTELS-CONDOMINIUM	0.3		0.3
RETAIL TRADE-EATING/DRINKING	1.8		1.8
RETAIL TRADE-FOOD	1.1		1.1
RETAIL TRADE-TRANS/ACCESSORIES	1.5		1.5
UNDEVELOPED LAND	0.3		0.3
DMR	57.8		57.8
ALL OTHER RESIDENTIAL	0.5		0.5
GOVERNMENTAL SERVICES	0.4		0.4
HOUSEHOLD 2-4 UNITS	3.6		3.6
MISCELLANEOUS SERVICES	0.0		0.0
MULTI-UNITS 5 OR MORE	0.3		0.3
OTHER CULTURAL & RECREATIONAL	0.2		0.2
PUBLIC ASSEMBLY	0.2		0.2
RESIDENTIAL HOTELS-CONDOMINIUM	0.8		0.8

Zone and Current Assessor Use 2016	City	UGA	Grand Total
SINGLE FAMILY UNITS	51.7		51.7
DMU	34.0		34.0
AMUSEMENTS	0.1		0.1
AUTOMOBILE PARKING	0.9		0.9
BUSINESS SERVICES	0.3		0.3
COMMUNICATION	0.3		0.3
CULTURAL ACTIVITIES	0.1		0.1
EDUCATIONAL SERVICES	0.0		0.0
FINANCE, INS/REAL ESTATE SERV	1.6		1.6
GOVERNMENTAL SERVICES	0.5		0.5
HOTELS/MOTELS	0.4		0.4
HOUSEHOLD 2-4 UNITS	0.9		0.9
MISCELLANEOUS SERVICES	0.5		0.5
MULTI-UNITS 5 OR MORE	0.5		0.5
NON-RESIDENTIAL CONDOMINIUMS	0.7		0.7
OTHER RETAIL TRADE	0.7		0.7
PERSONAL SERVICES	0.3		0.3
PROFESSIONAL SERVICES	1.8		1.8
PUBLIC ASSEMBLY	2.3		2.3
REPAIR SERVICES	1.1		1.1
RETAIL TRADE-APPAREL/ACCESS	1.6		1.6
RETAIL TRADE-BLD MAT,FARM EQPT	1.2		1.2
RETAIL TRADE-EATING/DRINKING	1.5		1.5
RETAIL TRADE-FOOD	3.3		3.3
RETAIL TRADE-FURNITURE	0.1		0.1
RETAIL TRADE-GEN MERCHANDISE	1.0		1.0
RETAIL TRADE-TRANS/ACCESSORIES	0.5		0.5
SINGLE FAMILY UNITS	11.6		11.6
UTILITIES	0.2		0.2
DSF	11.3		11.3
MULTI-UNITS 5 OR MORE	1.3		1.3
PUBLIC ASSEMBLY	1.9		1.9
RESIDENTIAL HOTELS-CONDOMINIUM	0.0		0.0
SINGLE FAMILY UNITS	8.1		8.1
PLF	310.3	99.0	409.3
EDUCATIONAL SERVICES	30.3		30.3
GOVERNMENTAL SERVICES	37.2		37.2
MISCELLANEOUS SERVICES	75.5	47.1	122.7
MULTI-UNITS 5 OR MORE	1.2		1.2
RECREATIONAL ACTIVITIES	155.2		155.2
SINGLE FAMILY UNITS	6.0		6.0
UNDEVELOPED LAND		5.2	5.2
UTILITIES	4.6	46.6	51.3
VACATION AND CABIN	0.1		0.1
R-L	1,244.0	880.3	2,124.3
AGRICULTURE-NOT IN OPEN SPACE		48.0	48.0
ALL OTHER RESIDENTIAL	71.6	72.7	144.3
GOVERNMENTAL SERVICES	1.3		1.3
MISCELLANEOUS SERVICES	6.5	11.7	18.1
OTHER CULTURAL & RECREATIONAL	0.9		0.9
OTHER RESOURCE PRODUCTION		14.0	14.0
OTHER TRANS, COMM, & UTILITIES		0.4	0.4
OTHER UNDEVELOPED LAND	9.8		9.8
PRINTING AND PUBLISHING	0.2		0.2
PUBLIC ASSEMBLY	0.3		0.3

Zone and Current Assessor Use 2016	City	UGA	Grand Total
RESORTS AND GROUP CAMPS	0.3		0.3
SINGLE FAMILY UNITS	726.1	703.2	1,429.3
UNDEVELOPED LAND	345.6	21.3	366.9
VACATION AND CABIN	80.6	5.0	85.6
WHOLESALE TRADE		4.0	4.0
(blank)	1.0		1.0
R-M	239.7	1.9	241.6
AGRIC IN OPEN SPACE RCW 84.34	48.7		48.7
AGRICULTURE-NOT IN OPEN SPACE	0.2		0.2
ALL OTHER RESIDENTIAL	3.7		3.7
EDUCATIONAL SERVICES	0.9		0.9
GOVERNMENTAL SERVICES	1.4	1.9	3.3
HOUSEHOLD 2-4 UNITS	1.1		1.1
INSTITUTIONAL LODGING	9.8		9.8
MISCELLANEOUS SERVICES	9.9		9.9
MULTI-UNITS 5 OR MORE	4.3		4.3
PUBLIC ASSEMBLY	1.6		1.6
RESIDENTIAL HOTELS-CONDOMINIUM	2.6		2.6
RETAIL TRADE-FURNITURE	0.3		0.3
SINGLE FAMILY UNITS	153.6		153.6
UNDEVELOPED LAND	1.3		1.3
VACATION AND CABIN	0.2		0.2
SUD	218.8	480.2	699.0
AGRIC IN OPEN SPACE RCW 84.34	9.9	123.7	133.6
ALL OTHER RESIDENTIAL	12.3	7.8	20.1
MISCELLANEOUS SERVICES	1.2		1.2
OPEN SPACE RCW 84.34		20.1	20.1
PROFESSIONAL SERVICES	1.0		1.0
SINGLE FAMILY UNITS	166.7	328.6	495.3
UNDEVELOPED LAND	25.1		25.1
(blank)	2.5		2.5
T-A	1,042.1	332.1	1,374.2
ALL OTHER RESIDENTIAL	8.1	0.5	8.6
AMUSEMENTS	17.5		17.5
GOVERNMENTAL SERVICES	0.9		0.9
HOTELS/MOTELS	1.4		1.4
HOUSEHOLD 2-4 UNITS	0.2		0.2
MOBILE HOME PARKS/COURTS	0.5		0.5
MULTI-UNITS 5 OR MORE	0.7		0.7
OTHER RESOURCE PRODUCTION	69.7	55.5	125.2
PETROLEUM REFINING/RELATED IND	1.0		1.0
RECREATIONAL ACTIVITIES	3.9		3.9
REPAIR SERVICES	0.2		0.2
RESIDENTIAL HOTELS-CONDOMINIUM	4.6	0.2	4.8
RESORTS AND GROUP CAMPS	10.7		10.7
RETAIL TRADE-EATING/DRINKING	1.8		1.8
RETAIL TRADE-TRANS/ACCESSORIES	1.0		1.0
SINGLE FAMILY UNITS	98.2	130.8	229.0
UNDEVELOPED LAND	820.9	145.1	966.0
(blank)	0.7		0.7
TMU	5.6		5.6
AMUSEMENTS	0.5		0.5
AUTOMOBILE PARKING	0.3		0.3
BUSINESS SERVICES	0.2		0.2
MISCELLANEOUS SERVICES	0.4		0.4

Zone and Current Assessor Use 2016	City	UGA	Grand Total
RESIDENTIAL HOTELS-CONDOMINIUM	0.3		0.3
SINGLE FAMILY UNITS	3.9		3.9
W-I	420.4	499.2	919.6
AGRIC IN OPEN SPACE RCW 84.34	19.8	33.7	53.5
AGRICULTURE RELATED ACTIVITIES	13.4	74.5	87.9
AGRICULTURE-NOT IN OPEN SPACE		8.6	8.6
BUSINESS SERVICES		1.6	1.6
CONTRACT CONST SERVICES		0.4	0.4
EDUCATIONAL SERVICES	14.3		14.3
GOVERNMENTAL SERVICES	6.7	10.7	17.4
MISCELLANEOUS SERVICES	5.9	0.8	6.8
MOTOR VEHICLE TRANSPORTATION		3.4	3.4
OTHER RESOURCE PRODUCTION	13.6	25.4	39.0
PERSONAL SERVICES		5.0	5.0
REPAIR SERVICES	0.7	3.9	4.6
RETAIL TRADE-BLD MAT,FARM EQPT		3.9	3.9
RETAIL TRADE-GEN MERCHANDISE		0.4	0.4
RETAIL TRADE-TRANS/ACCESSORIES	1.5		1.5
SINGLE FAMILY UNITS	325.5	177.7	503.3
STONE, CLAY & GLASS PRODUCTS		5.8	5.8
UNDEVELOPED LAND	15.1	142.0	157.1
WHOLESALE TRADE	3.9	1.2	5.1
Grand Total	3,709.8	2,354.8	6,064.6

Appendix B: City of Chelan Comprehensive Plan Update

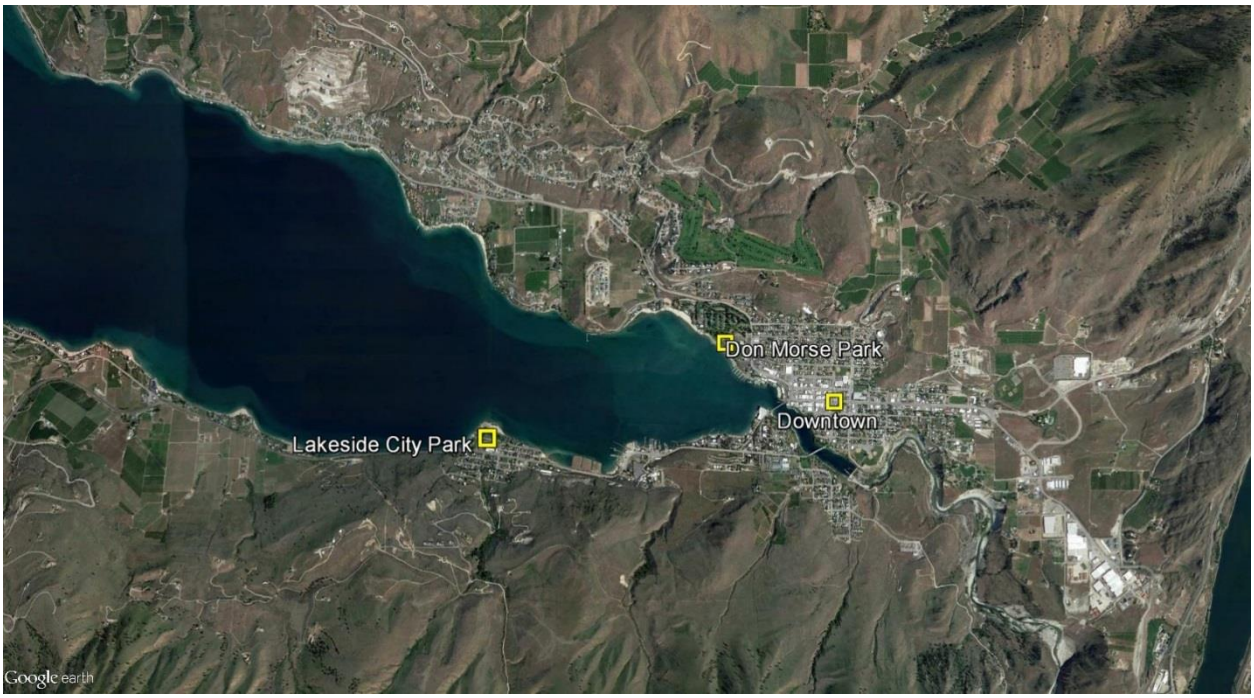
Viewshed Analysis

Introduction

The City of Chelan is defined by its beautiful natural setting and small town charm including a vibrant, historic, and walkable downtown. This connection between the natural and built environments affords opportunities for iconic views of the landscape from public spaces including parks, streets, and open spaces. Impacts to iconic views may occur from a structure or other feature physically blocking the view from a public space or from development occurring in the viewing area such as on the hillsides north and south of the lake. The City has an opportunity through the planning process to consider options for minimizing impacts to public views in the future. Options include design and development standards, focusing development densities in appropriate locations, revising zoning and land use designations, and others. This analysis addresses existing conditions, the potential for future impacts, and opportunities to maintain public views at the following three locations:

- Views from Downtown towards Lake Chelan
- Views from Don Morris Park towards the Lake and hillsides
- Views from Lakeside Park towards the Lake and the north slope

Exhibit 8-1. Viewshed Locations



Source: BERK, 2016; Google Earth, 2016

View from Downtown towards Lake Chelan

The view from Downtown to Lake Chelan used in this analysis is from the intersection of Sanders Street and E Woodin Avenue looking east along E Woodin Avenue towards the lake (See Exhibit 2-11). Views of the hillsides were also considered. The low building heights in Downtown maintain views of the Lake and surrounding hillsides. Large undeveloped areas along the Butte on the south side of the Lake can be seen from this location.

Exhibit 8-2. View from Downtown to Lake Chelan

Source: Google Earth, 2016

Views towards the lake and surrounding hillsides were analyzed in Google Earth as shown in Exhibit 2-12. The green shading identifies areas that are visible from the view location in Downtown and takes into consideration existing buildings that partially block views. The building height limit of 2-stories along E Woodin Ave in the Downtown core will minimize future view impacts from development. The Butte is largely undeveloped and abuts federal lands to the south. Development on the Butte would impact views, but design standards addressing grading and fill, site design, architecture, and landscape design could minimize view impacts. The north side of the lake is already more developed and less visible from this location.

Exhibit 8-3. Viewshed Analysis from Downtown towards the Lake

Source: BERK, 2016; Google Earth, 2016

Another issue raised by the community is the potential for view impacts from 4-story development along the Manson Highway. One 4-story building has already been built in this location. Development at 4-stories does have the potential to block views along public streets towards the west. There are no major public view places that would be impacted by development in this location such as at a park. Two or three story development would likely also block views, but less so for the hillsides on the north and south side of the lake. These properties are attractive for tourist accommodations because of the views, particularly from upper stories. Therefore, any changes to the building heights should be based on community values and trade-offs between view protection and economic development associated with increasing tourist accommodations in the City. Further analysis is required to determine differences in view impacts between development at 4-stories and three stories or less.

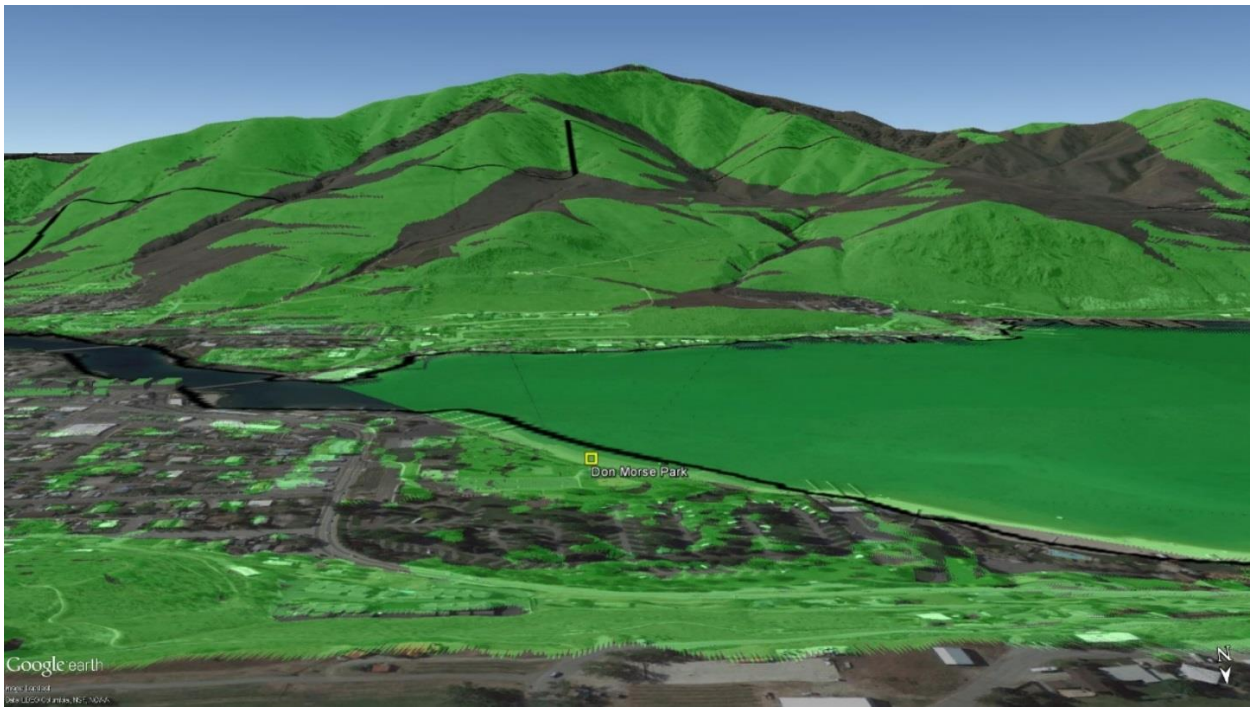
Exhibit 8-4. Four-Story Development and Potential View Impacts

Source: BERK, 2016; Google Earth, 2016

View from Don Morris Park towards the Lake and Hillsides

Don Morris Park is a large waterfront community park in Downtown that is busy used particularly in the Summer. The Park has sweeping views of the lake and surrounding hillsides, but the largely undeveloped Butte is the highly visible on the south side of the lake. Exhibit 2-13 shows the areas visible from Don Morris Park highlighted in green. Further consideration of future development on the Butte is an opportunity to minimize impacts from this location towards the Butte.

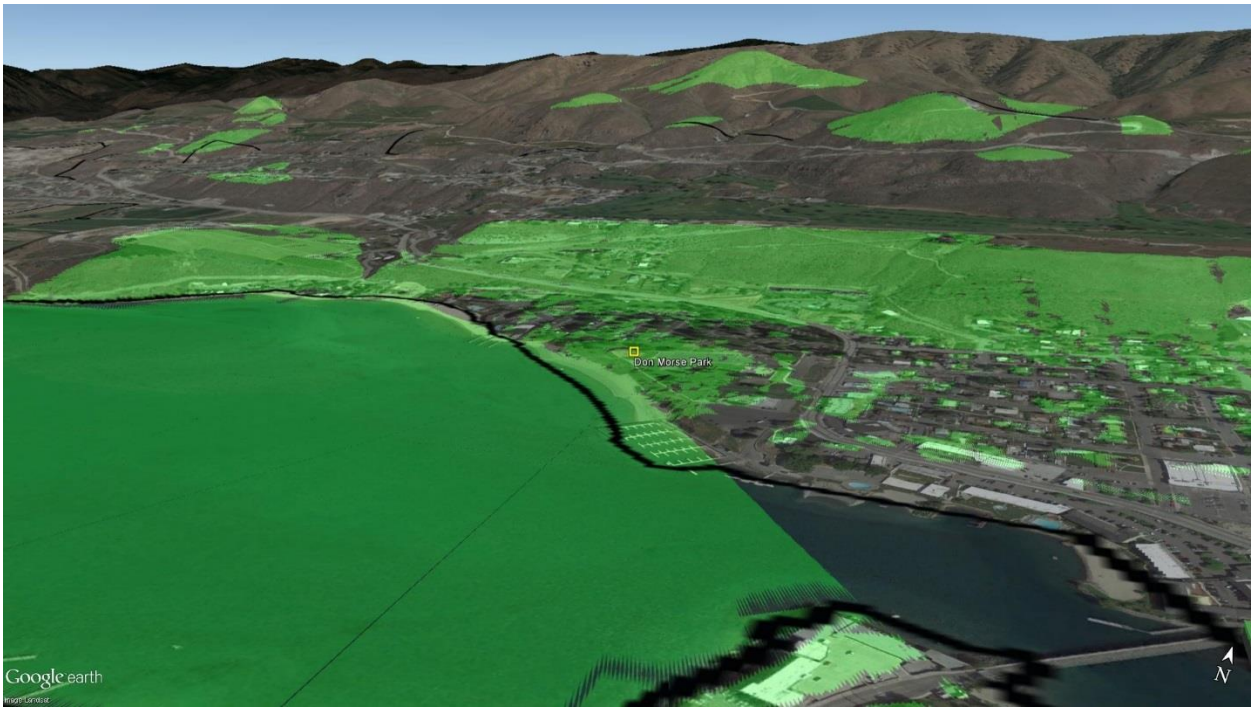
Exhibit 8-5. Viewshed Analysis from Don Morris Park towards the Butte



Source: BERK, 2016; Google Earth, 2016

Exhibit 8-6 shows the areas on the north slope that are visible from Don Morris Park. The areas at higher elevation are not as visible from this location. Some visible areas are already developed, but there are undeveloped areas that could impact views if developed.

Exhibit 8-6. Viewshed analysis from Don Morris Park towards the North Slope



Source: BERK, 2016; Google Earth, 2016

View from Lakeside Park towards the Lake and the North Slope

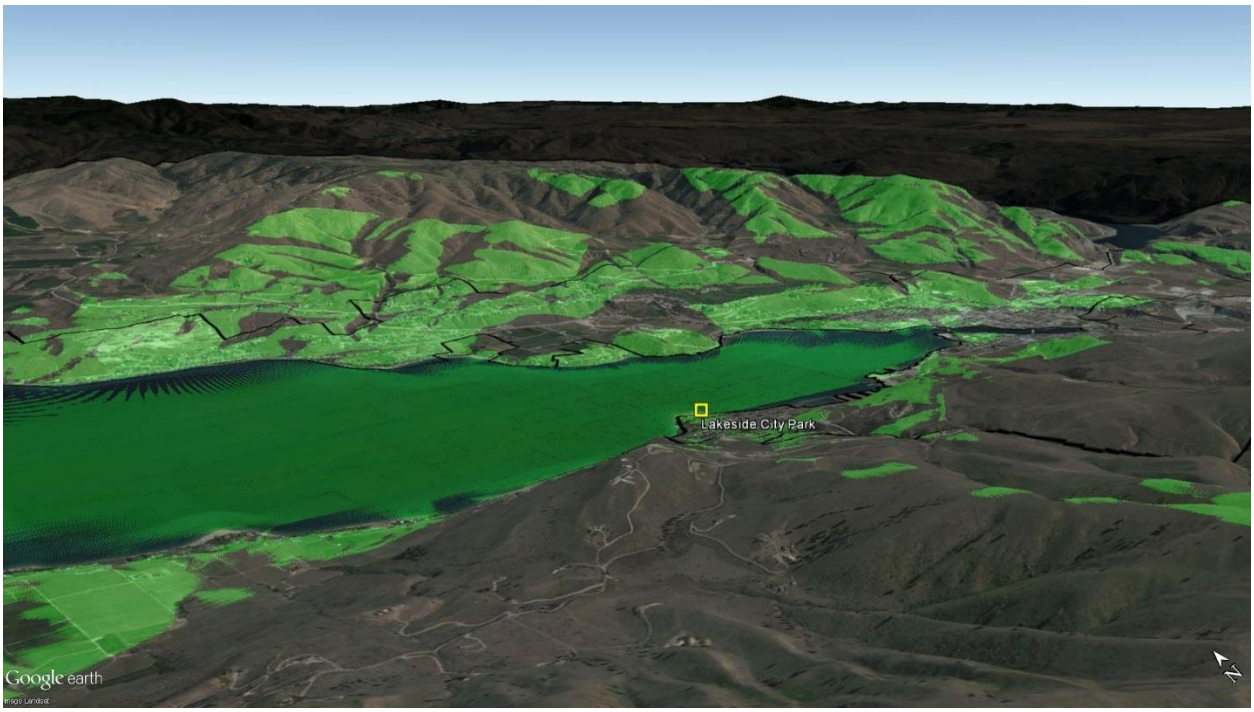
Lakeside Park is on the south shore of the lake and primary views are of the lake, the north slope, and Downtown. Exhibit 2-14 show the view from Lakeside Park towards the lake and north slope. Developed areas along the north slope are clearly visible in the background.

Exhibit 8-7. View from Lakeside Park towards the Lake and North Slope

Source: Google Earth, 2016

Exhibit 2-15 shows the areas that are visible from Lakeside Park towards the lake and north slope. Unlike at Don Morris Park areas higher up on the north slope are visible from this location including several already developed areas. Since the north slope is more developed than the Butte the potential for further view impacts is less, but updated design and development standards could minimize further view impacts.

Exhibit 8-8. Viewshed Analysis from Lakeside Park towards the Lake and North Slope



Source: Google Earth, 2016

Community Input and Hillside Development Design Concepts

The community, through the public outreach process to date, has identified views and view protection as an important issue and a high priority. Views from Downtown to Lake Chelan and to the Butte were identified as the most important, but all views are highly valued. The Butte contain large undeveloped hillside areas that if developed without properly considering and mitigating view impacts could be in conflict with community goals.

The following hillside development examples demonstrate options for updated design and development standards to minimize future impacts to public views. Exhibit 8-9 shows a hillside development that has a low-profile building and uses natural materials to blend with the surrounding natural environment.

Exhibit 8-9. Low-Profile and Natural Materials

Source: Tate Studio Architects, 2016

Exhibit 8-10 shows a development where the building steps down the slope rather than regrading the hillside. The building fits in better with the natural topography of the site.

Exhibit 8-10. Building Steps Down the Slope

Exhibit 8-11 shows a residential hillside development that uses natural materials. The use of natural wood creates a similar design aesthetic between buildings and provides a connection to the landscape.

Exhibit 8-11. Use of Natural Materials

The development example shown in Exhibit 8-12 has very minimal regrading of the site. Minimal regrading reduces impacts to the natural landscape and stormwater flow.

Exhibit 8-12. Minimal Regrading

Exhibit 8-13 shows a residential structure with exterior façade materials that blend with the surroundings. The use of grey materials blends with the large rock face in the background.

Exhibit 8-13. Materials Blend with Surroundings

The development shown in Exhibit 8-14 clusters buildings with similar architectural features to minimize the development footprint and protection open space.

Exhibit 8-14. Development Clustering

Source: Cave B, 2016

Findings + Recommendations

The following are the key findings and recommendations from the viewshed analysis:

1. The City of Chelan maintains great views of the lake, hillsides, and Downtown from public places and these assets are valued by the community.
2. Views have been impacted by hillside development particularly on the north slope, but the City has an opportunity to minimize these impacts while allowing reasonable growth consistent with community goals.
3. The large undeveloped areas of the Butte on the south side of the lake present the best opportunity to minimize future view impacts from public places.
4. The potential for view impacts is greatest from Don Morris Park from development on the Butte, but also from Downtown and Lakeside Park. The north slope is more heavily developed and presents less of a risk, but updated design and development standards should be considered for all hillside development areas.
5. The City's Downtown Master Plan limits building heights along E Woodin in the core of Downtown to two stories to minimize future view impacts towards the lake and hillsides. These height limits should remain in place to avoid blocking views.
6. Four-story development has the potential to block views from public streets towards the lake and hillsides along the Manson Highway. These properties are designated for 4-story development due to its proximity to the lake and potential for views from tourist accommodation development. More analysis should be completed to determine the difference in view impacts between 4-story and less intense development and to understand the community importance of views from these streets. Ultimately, it is a question of community trade-offs between protecting views and supporting economic development goals.
7. Focusing densities and land uses in other appropriate locations to reduce impacts from hillside development are also options that should be considered while meeting the City's requirements to accommodate growth and meet the Growth Management Act (GMA). These efforts should be focused primarily on the Butte since it is less developed and highly visible from public view locations.

Appendix C: Land Capacity Analysis

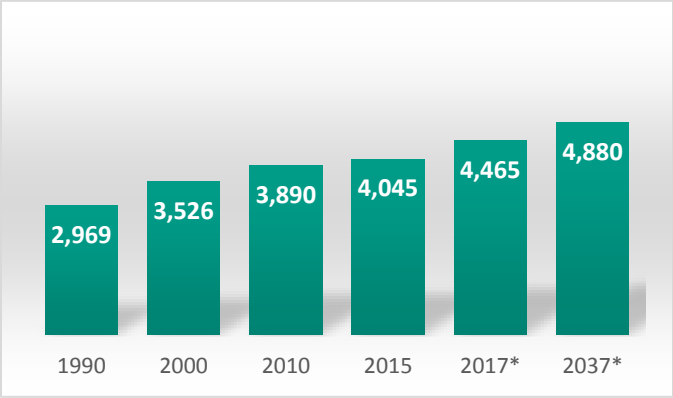
Overview

The City of Chelan is considering its appropriate boundary for growth in its Comprehensive Plan Update for the years 2017-2037.

Counties are responsible for allocating population growth and setting urban growth area (UGA) boundaries in consultation with cities (RCW 36.70A.110). UGAs are to include areas already characterized by urban development or adjacent to areas characterized by urban development. These UGAs should include "areas and densities sufficient to permit the urban growth that is projected to occur in the county or city for the succeeding twenty-year period." (RCW 36.70a.110 (2)) Designated UGAs must also have services available or planned to support future urban growth in these areas.

Chelan's permanent city population is about 4,045. The Unincorporated UGA is estimated to have another 355 residents, for a total City and UGA population of about 4,400 as of 2015. By 2017, the City and UGA are anticipated to grow slightly to 4,465 persons. Based on growth allocations developed by Chelan County, Chelan city limits and UGA would add about 415 people for a total of 4,880 people over the 2017 to 2037 period.

Exhibit 8-15. Chelan: Permanent Population 1990-2037



City population 1990-2015 *2017 and 2037 = City + unincorporated UGA

Source: Washington State Office of Financial Management 2015, Chelan County Resolution 2015-112, BERK Consulting 2016

Chelan's average annual growth rate was 1.24% during 1990-2015. During 2017-2037 the rate slows to 0.45% based on county targets. If the City grew at the rate of 1.24% over the 20-year period, the net change in permanent population would be more like 1,254.

While population is a key driver of the UGA sizing, the City and County must consider other uses: "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." (RCW 36.70a.110 (2))

Since the City's economy is tied to tourism and recreation, the incorporation of employment uses including resort and tourism accommodations is important to the mix of uses in the community. Further, the City has a traditional downtown, a large-format commercial area at the Apple Blossom Center, and an industrial and in the east part of town and wishes to have family wage jobs.

Chelan County Method

Chelan County uses a method that identifies vacant land as areas that are not tax exempt and that have a low improvement value of less than $15,000 and a parcel size greater than 4,000 square feet (0.092 of an acre). Land that does not meet these considerations is considered built and not part of the analysis. Other assumptions and steps include removing critical areas (based on zone-wide percentages) and land for public facilities, as well as market factor, and assumption that some land will be developed with larger lots. See Attachment A for the full method.

Between 2017 and 2037, the City of Chelan and corresponding UGA will increase from a population of 4,465 to 4,880 or 415 people. Given the current persons per household of 2.38, the City and UGA will need to provide an additional 174 dwellings. The Land Supply analysis, summarized below, indicates that the City and UGA has the capacity to serve 11,491 persons or 4,828 future residential building lots.

The County has concurred with a request by the City to reduce the UGA in three locations (see Attachment B) and to increase it in a minor way:

> *The City of Chelan has requested a reduction in the UGA boundary in three areas; one area to the north contains split, UGA and County, jurisdiction; and, the other two areas, south and east, were requested reductions from the property owners. The total reduction would be approximately 745 acres.*
>
> *Additionally, there is a property owner request to include 0.74 acre lot within the UGA boundary, west of Tuscan Village Planned Development. This minor inclusion is on land already developed residential lot would not impact the Land Supply analysis.*
>
> *The County is recommending a reduction in the UGA by approximately 745 acres, as requested by the City, and the minor expansion as requested by Lucas Evans for parcel 27-22-17-140-060 of 0.74 acres.*

Exhibit 8-16. Chelan County Land Capacity Analysis of the City of Chelan and its UGA

Chelan	Vacant Land	Public Infrastructure (25%)	Critical Areas (10%)	Market Factor (25%)	Economic Impact (0%)	Conversion of Use (30% in UGA)	Ancillary Uses (49%)	Density Allowance per acre	Possible Lots	2010 Census Persons Per Household	Estimated Population Served
City											
Single-Family Residential	711.3	533.5	480.1	360.1	360.1	360.1	183.6	0.14	1312		
Multi-Family Residential	75.7	56.8	51.1	38.3	38.3	38.3	19.5	0.12	163		
Tourist Accommodations	947.6	710.7	639.6	479.7	479.7	479.7	244.7	0.12	2039		
Special Use District	88.9	66.7	60.0	45.0	45.0	45.0	23.0	0.17	135		
CITY TOTALS	**1823.5**	**1367.6**	**1230.9**	**923.1**	**923.1**	**923.1**	**470.8**	**n/a**	**3648**	**2.38**	**8,683**
Urban Growth Area											
Single-Family Residential	269.7	202.3	182.0	136.5	136.5	95.6	48.7	0.14	348		
Multi-Family Residential	0	0.0	0.0	0.0	0.0	0.0	0.0	0.12	0		
Tourist Accommodations	253.2	189.9	170.9	128.2	128.2	89.7	45.8	0.12	381		
Special Use District	153.9	115.4	103.9	77.9	77.9	54.5	27.8	0.17	164		
UGA TOTALS	**676.8**	**507.6**	**456.8**	**342.6**	**342.6**	**239.8**	**122.3**	**n/a**	**893**	**2.38**	**2,126**

Source: Chelan County 2016

The County's analysis indicates a capacity for 10,809 persons.

UGA reductions would slightly reduce growth capacity as follows. Results show a loss of 18 dwelling units or 43 population capacity, approximately. It would not change the County's overall conclusions that the City and UGA can meet the growth target assigned.

Exhibit 8-17. Chelan County Method: Capacity to be Withdrawn with UGA Reductions

UGA Exclusion Areas	R-L	T-A	W-I
Vacant	88.54	245.36	110.29
Public (25%)	66.40	184.02	82.72
Critical Area (10%)	6.64	18.40	8.27
Market (25%)	1.66	4.60	2.07
Conversion (30%)	1.16	3.22	1.45
Ancillary (49%)	0.59	1.64	0.74
Density Allowance	0.14	0.12	-
Total Possible DU	4.23	13.69	-
PPDU	2.38	2.38	-
Pop Capacity	**10.08**	**32.57**	**-**

Source: BERK Consulting 2016

City Land Capacity Methods

The City's land capacity method is similar to Comprehensive Plan Appendices C and G, and summarized in Exhibit 8-18 below. The City deductions are more tailored by zone, and updated to the latest GIS information and American Community Survey (ACS) estimates for 2014.

Exhibit 8-18. City of Chelan Land Capacity: Table of Assumptions

Factor	Assumption	Sources
Vacant Land	Use Code	Assessor Code, Excluding Tax Exempt
Underutilized Land	Formula	Assessor Market Land Value > 50% of Improvement Value (e.g. Orchards); Excluding Tax Exempt
Slope Factor: GIS Based	40.00	GIS Deduction
Safety Market Deduction	0.25	Comp Plan Appendices C & G
Public Purpose Deduction	0.25	Comp Plan Appendices C & G
Unavailable Land Deduction		
R-L	0.30	Comp Plan Appendices C & G
R-M	0.20	Comp Plan Appendices C & G
SUD	0.50	Comp Plan Appendices C & G
T-A	0.50	Comp Plan Appendices C & G
Density Multiplier		
R-L	3.00	Comp Plan Appendices C & G
R-M	9.00	Comp Plan Appendices C & G
SUD	3.00	Comp Plan Appendices C & G
T-A	3.00	Comp Plan Appendices C & G
Seasonal Occupancy: General Discount	0.32	ACS 2010-2014
Seasonal Occupancy: T-A Discount	0.75	Comp Plan Appendices C & G
Persons Per Dwelling Unit	2.35	ACS 2010-2014

Note: ACS = American Community Survey

Source: City of Chelan 2011; BERK Consulting 2016

Results of the City's methods show less population capacity than the County's method, though growth targets can be met in the city limits.

Exhibit 8-19. City of Chelan Land Capacity Analysis: City Limits

City	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	779.4	129.8	172.6	963.8
2. 40% Slopes	260.5	6.2	-	272.3
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	518.9	123.7	172.6	691.6
4. Deduct Safety Market Factor (25%)	389.2	92.7	129.4	518.7
5. Deduct Streets/Roads/Public Purposes (25%)	291.9	69.6	97.1	389.0
6. Deduct Land Unavailable (20-50%)	204.3	55.6	48.5	194.5
7. Multiply by Density Assumption for Zone	3	9	3	3
8. Gross Units	613.0	500.8	145.6	583.5
9. Deduct Seasonal Unit Occupancy (32-75%)	416.8	340.6	99.0	145.9
10. Total year Round Population (PPDU 2.35)	980	800	233	343
Total Population Capacity: City Limits	2,355			

Source: BERK Consulting 2016

If excluding the Butte area (TA zone upslope from state route in city limits) from residential capacity – such as if it were predominantly used for recreation and trail uses – the capacity loss would be 272 persons.

Exhibit 8-20.City of Chelan Land Capacity Analysis: Chelan Butte

City	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	35.0	-	-	820.7
2. 40% Slopes	35.0	-	-	272.3
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	-	-	-	548.4
4. Deduct Safety Market Factor (25%)	-	-	-	411.3
5. Deduct Streets/Roads/Public Purposes (25%)	-	-	-	308.5
6. Deduct Land Unavailable (20-50%)	-	-	-	154.2
7. Multiply by Density Assumption for Zone	3	9	3	3.00
8. Gross Units	-	-	-	462.7
9. Deduct Seasonal Unit Occupancy (32-75%)	-	-	-	115.7
10. Total year Round Population (PPDU 2.35)	-	-	-	272
Total Population Capacity: Butte	272			
City Capacity Excluding Butte	2,084			

Source: BERK Consulting 2016

The population capacity of the UGA is less than the city limits but still consequential.

Exhibit 8-21. City of Chelan Land Capacity Analysis: UGA

UGA	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	533.41	-	392.42	285.46
2. 40% Slopes	32.66	-	0.84	-
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	500.8	-	391.6	285.5
4. Deduct Safety Market Factor (25%)	375.6	-	293.7	214.1
5. Deduct Streets/Roads/Public Purposes (25%)	281.7	-	220.3	160.6
6. Deduct Land Unavailable (20-50%)	197.2	-	110.1	80.3
7. Multiply by Density Assumption for Zone	3.00	9.00	3.00	3.00
8. Gross Units	591.5	-	330.4	240.9
9. Deduct Seasonal Unit Occupancy (32-75%)	402.2	-	224.7	60.2
10. Total year Round Population (PPDU 2.35)	945	-	528	142
Total Population Capacity: UGA	1,615			

Source: BERK Consulting 2016

If excluding the proposed UGA reduction areas, the loss of capacity would be about 175 persons.

Exhibit 8-22. City of Chelan Land Capacity Analysis UGA Reduction Areas

UGA Exclusion Area	R-L	R-M	SUD	T-A
1.Sum Gross Vacant and Underutilized Acres, Excluding Tax Exempt	122.08			145.10
2. 40% Slopes	67.23			0.00
3. Net Vacant and Underutilized Acres, Excluding Slopes (1-2)	54.8			145.1
4. Deduct Safety Market Factor (25%)	41.1			108.8
5. Deduct Streets/Roads/Public Purposes (25%)	30.9			81.6
6. Deduct Land Unavailable (20-50%)	21.6	-	-	40.8
7. Multiply by Density Assumption for Zone	3.00			3.00
8. Gross Units	64.8			122.4
9. Deduct Seasonal Unit Occupancy (32-75%)	44.1	-	-	30.6
10. Total year Round Population (PPDU 2.35)	104			72
Total Population Capacity: UGA Exclusion	175			
UGA Capacity Excluding Reduction Areas	1,439			

Source: BERK Consulting 2016

In summary, the City's land capacity shows one-third the population capacity of the County's method. Growth targets can be met with or without the capacity of the Butte or the UGA exclusion areas.

Exhibit 8-23. City of Chelan Land Capacity Analysis: Summary

City + UGA Capacity Full 2016 Boundaries	3,970
Butte Population	272
UGA Exclusion Population	175
City +UGA with Butte as non-residential and reducing UGA	3,523
Growth Target City+UGA: 2017-2037	415
Surplus (Deficit)	3,108

Source: BERK Consulting 2016

Appendix D: Chelan Vision Outreach Summary | December 2016

How should Chelan grow? That is the central question facing the City of Chelan in its Comprehensive Plan Update. To help answer this question, the City invited residents, business and property owners, and visitors to participate in an online survey and interactive vision workshop in November 2016. Advertisements were made on the radio, in local print and online media and utility billing flyers.

Overall, 227 people responded to the survey from November 9 to November 30, 2016: 188 people took the full online version of the survey, and 39 took a shortened postcard version. About 50 people attended the workshop on November 16, 2016. The table below shows top answers to survey questions and small group discussions and comment sheets.

	Survey		Workshop
Chelan Strengths	Natural setting Safe place to live Sense of community – caring, community events Community character – look and feel Tourism	Headlines – Chelan in 2037 Summary of Themes	Chelan's small town feel is retained. The lake continues to be a jewel. A variety of year-round jobs and housing are available. Agriculture frames the community. Opportunities to walk are plentiful. Provide efficient roads and services.
Chelan Improvements Needed	Housing choices and prices Transportation options – sidewalks, bike lanes, transit Parks and recreation opportunities Access to jobs Good roads and travel corridors	Like/dislike about Chelan	Like: Lake and the Butte; should protect them. Dislike: Blocking view from old bridge.
3 words that best describe Chelan	Beautiful Lake Friendly Community Small Town	Hillside Development Types	Liked the low profile, blending building massing with surroundings hillside form. Clustering was also a preferred development type.
Key Vision Concepts for 2037	Quality of life Recreation access to the lake Healthy economy Affordable housing Protecting iconic views	Chelan Viewsheds	Views from Lake Chelan, from Lakeside City Park, and from Don Morse Park are all very important. The view from Don Morse Park looking towards the Butte received the most votes for very important.
Top 3 Open Space Priorities	Protecting water quality Protecting iconic views Promoting community health through accessible trails and parks	Five small groups marked a map of assets, challenges, and connections.	**Assets:** Lake water quality, Chelan Butte, lake and ridge views, parks and public access, Riverwalk, Downtown entry neighborhood, wineries / grapes
Very Important and Important Housing Types	Housing for senior citizens or disabled Single family detached homes – small lots Multifamily-multiplex and townhomes Single family detached homes – moderate to large lots Multifamily-apartment style		**Challenges:** Visibility and density of development, greater lake access and parking, infill in core downtown, sufficient affordable housing and location in Downtown or Apple Blossom area, year-round businesses
Top Choices – Job Types to Encourage	Health Manufacturing and light industry Agriculture Education Tourism		**Connections**: Extensive trail connections – Northshore, Apple Blossom, Southshore, improve commercial access, connect sidewalks and bike lanes

Appendix E: Transportation

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	260	0	20	330	10	5	2	25	10	1	5
Future Vol, veh/h	5	260	0	20	330	10	5	2	25	10	1	5
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	-	-	-	-	-	-	-	-	-	-	-	-
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	5	283	0	22	359	11	5	2	27	11	1	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	370	0	0	283	0	0	704	706	283	716	701	364
Stage 1	-	-	-	-	-	-	293	293	-	408	408	-
Stage 2	-	-	-	-	-	-	411	413	-	308	293	-
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	1189	-	-	1279	-	-	352	361	756	345	363	681
Stage 1	-	-	-	-	-	-	715	670	-	620	597	-
Stage 2	-	-	-	-	-	-	618	594	-	702	670	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1189	-	-	1279	-	-	341	351	756	324	353	681
Mov Cap-2 Maneuver	-	-	-	-	-	-	341	351	-	324	353	-
Stage 1	-	-	-	-	-	-	711	667	-	617	584	-
Stage 2	-	-	-	-	-	-	598	581	-	671	667	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.4	11.4	14.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	599	1189	-	-	1279	-	-	390
HCM Lane V/C Ratio	0.058	0.005	-	-	0.017	-	-	0.045
HCM Control Delay (s)	11.4	8	0	-	7.9	0	-	14.7
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.1

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	315	320	80	50	5
Future Vol, veh/h	10	315	320	80	50	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	200	-	-	350	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	335	340	85	53	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	340	0	-	0	696	340
Stage 1	-	-	-	-	340	-
Stage 2	-	-	-	-	356	-
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	1219	-	-	-	408	702
Stage 1	-	-	-	-	721	-
Stage 2	-	-	-	-	709	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1219	-	-	-	404	702
Mov Cap-2 Maneuver	-	-	-	-	509	-
Stage 1	-	-	-	-	721	-
Stage 2	-	-	-	-	703	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1219	-	-	-	522
HCM Lane V/C Ratio	0.009	-	-	-	0.112
HCM Control Delay (s)	8	-	-	-	12.8
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.4

Intersection	
Int Delay, s/veh	1.3

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	10	370	405	65	45	15
Future Vol, veh/h	10	370	405	65	45	15
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	11	402	440	71	49	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	511	0	-	0	900	476
Stage 1	-	-	-	-	476	-
Stage 2	-	-	-	-	424	-
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	1054	-	-	-	309	589
Stage 1	-	-	-	-	625	-
Stage 2	-	-	-	-	660	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1054	-	-	-	305	589
Mov Cap-2 Maneuver	-	-	-	-	305	-
Stage 1	-	-	-	-	625	-
Stage 2	-	-	-	-	651	-

Approach	SE	NW	SW
HCM Control Delay, s	0.2	0	17.8
HCM LOS			C

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1054	-	347
HCM Lane V/C Ratio	-	-	0.01	-	0.188
HCM Control Delay (s)	-	-	8.5	0	17.8
HCM Lane LOS	-	-	A	A	C
HCM 95th %tile Q(veh)	-	-	0	-	0.7

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	60	415	10	35	370
Future Vol, veh/h	10	60	415	10	35	370
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	67	461	11	39	411

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	956	467	0	0	472	0
Stage 1	467	-	-	-	-	-
Stage 2	489	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	286	596	-	-	1090	-
Stage 1	631	-	-	-	-	-
Stage 2	616	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	276	596	-	-	1090	-
Mov Cap-2 Maneuver	405	-	-	-	-	-
Stage 1	631	-	-	-	-	-
Stage 2	594	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.5	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	558	1090	-
HCM Lane V/C Ratio	-	-	0.139	0.036	-
HCM Control Delay (s)	-	-	12.5	8.4	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	5	25	5	2	10	25	385	15	10	365	10
Future Vol, veh/h	5	5	25	5	2	10	25	385	15	10	365	10
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	-	-	-	150	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	5	27	5	2	11	27	423	16	11	401	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	916	918	401	912	909	431	401	0	0	440	0	0
Stage 1	423	423	-	486	486	-	-	-	-	-	-	-
Stage 2	493	495	-	426	423	-	-	-	-	-	-	-
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	253	272	649	255	275	624	1158	-	-	1120	-	-
Stage 1	609	588	-	563	551	-	-	-	-	-	-	-
Stage 2	558	546	-	606	588	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	240	262	649	234	265	624	1158	-	-	1120	-	-
Mov Cap-2 Maneuver	240	262	-	234	265	-	-	-	-	-	-	-
Stage 1	595	580	-	550	538	-	-	-	-	-	-	-
Stage 2	533	533	-	567	580	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.4	15	0.5	0.2
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1158	-	-	251	649	378	1120	-	-
HCM Lane V/C Ratio	0.024	-	-	0.044	0.042	0.049	0.01	-	-
HCM Control Delay (s)	8.2	-	-	20	10.8	15	8.2	0	-
HCM Lane LOS	A	-	-	C	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0.2	0	-	-

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	0	5	415	385	5
Future Vol, veh/h	5	0	5	415	385	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
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	5	0	5	451	418	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	883	421	424	0	-	0
Stage 1	421	-	-	-	-	-
Stage 2	462	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	316	632	1135	-	-	-
Stage 1	662	-	-	-	-	-
Stage 2	634	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	315	632	1135	-	-	-
Mov Cap-2 Maneuver	438	-	-	-	-	-
Stage 1	662	-	-	-	-	-
Stage 2	631	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.3	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1135	-	438	-	-
HCM Lane V/C Ratio	0.005	-	0.012	-	-
HCM Control Delay (s)	8.2	-	13.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	235	135	15	235	65	165	70	45	40	50	40
Future Volume (veh/h)	20	235	135	15	235	65	165	70	45	40	50	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)	0.98		0.95	0.98		0.96	0.94		0.96	0.95		0.91
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	1676	1676	1676	1676	1676	1676	1676	1676	1710	1676	1676	1710
Adj Flow Rate, veh/h	21	250	144	16	250	69	176	74	48	43	53	43
Adj No. of Lanes	1	1	1	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	350	483	553	338	475	387	515	261	169	450	166	135
Arrive On Green	0.02	0.29	0.29	0.02	0.28	0.28	0.11	0.28	0.28	0.04	0.20	0.20
Sat Flow, veh/h	1597	1676	1358	1597	1676	1365	1597	933	605	1597	818	664
Grp Volume(v), veh/h	21	250	144	16	250	69	176	0	122	43	0	96
Grp Sat Flow(s),veh/h/ln	1597	1676	1358	1597	1676	1365	1597	0	1538	1597	0	1481
Q Serve(g_s), s	0.4	5.3	3.0	0.3	5.3	1.6	3.4	0.0	2.6	0.9	0.0	2.3
Cycle Q Clear(g_c), s	0.4	5.3	3.0	0.3	5.3	1.6	3.4	0.0	2.6	0.9	0.0	2.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.39	1.00		0.45
Lane Grp Cap(c), veh/h	350	483	553	338	475	387	515	0	430	450	0	301
V/C Ratio(X)	0.06	0.52	0.26	0.05	0.53	0.18	0.34	0.00	0.28	0.10	0.00	0.32
Avail Cap(c_a), veh/h	469	635	676	463	635	517	598	0	728	542	0	596
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	10.7	12.6	8.5	10.8	12.7	11.4	10.3	0.0	11.9	12.5	0.0	14.3
Incr Delay (d2), s/veh	0.1	0.9	0.2	0.1	0.9	0.2	0.4	0.0	0.4	0.1	0.0	0.6
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	2.5	1.1	0.1	2.5	0.6	1.5	0.0	1.2	0.4	0.0	1.0
LnGrp Delay(d),s/veh	10.8	13.4	8.7	10.8	13.6	11.6	10.7	0.0	12.3	12.6	0.0	14.9
LnGrp LOS	B	B	A	B	B	B	B		B	B		B
Approach Vol, veh/h		415			335			298			139	
Approach Delay, s/veh		11.7			13.1			11.4			14.2	
Approach LOS		B			B			B			B	

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	5.6	15.8	4.7	16.2	8.8	12.6	4.9	16.0
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	4.0	20.0	4.0	16.0	7.0	17.0	4.0	16.0
Max Q Clear Time (g_c+I1), s	2.9	4.6	2.3	7.3	5.4	4.3	2.4	7.3
Green Ext Time (p_c), s	0.0	1.1	0.0	2.6	0.1	1.0	0.0	2.6

Intersection Summary	
HCM 2010 Ctrl Delay	12.3
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	260	60	40	285	10	40	10	25	5	10	10
Future Vol, veh/h	10	260	60	40	285	10	40	10	25	5	10	10
Conflicting Peds, #/hr	33	0	33	7	0	7	64	0	64	11	0	11
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	292	67	45	320	11	45	11	28	6	11	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	364	0	0	393	0	0	872	835	423	881	864	423
Stage 1	-	-	-	-	-	-	381	381	-	449	449	-
Stage 2	-	-	-	-	-	-	491	454	-	432	415	-
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	1195	-	-	1166	-	-	271	304	631	267	292	631
Stage 1	-	-	-	-	-	-	641	613	-	589	572	-
Stage 2	-	-	-	-	-	-	559	569	-	602	592	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1131	-	-	1104	-	-	227	272	581	218	262	581
Mov Cap-2 Maneuver	-	-	-	-	-	-	227	272	-	218	262	-
Stage 1	-	-	-	-	-	-	616	589	-	566	534	-
Stage 2	-	-	-	-	-	-	487	531	-	526	569	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	1	22.2	17.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	293	1131	-	-	1104	-	-	319
HCM Lane V/C Ratio	0.288	0.01	-	-	0.041	-	-	0.088
HCM Control Delay (s)	22.2	8.2	0	-	8.4	-	-	17.4
HCM Lane LOS	C	A	A	-	A	-	-	C
HCM 95th %tile Q(veh)	1.2	0	-	-	0.1	-	-	0.3

Intersection	
Intersection Delay, s/veh	12.7
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	10	30	250	0	15	40	1	0	270	45	15
Future Vol, veh/h	0	10	30	250	0	15	40	1	0	270	45	15
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	34	284	0	17	45	1	0	307	51	17
Number of Lanes	0	0	1	1	0	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	2	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	2
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	1
HCM Control Delay	11.5	10.3	14.6
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	25%	0%	27%	8%
Vol Thru, %	0%	75%	75%	0%	71%	85%
Vol Right, %	0%	25%	0%	100%	2%	8%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	270	60	40	250	56	65
LT Vol	270	0	10	0	15	5
Through Vol	0	45	30	0	40	55
RT Vol	0	15	0	250	1	5
Lane Flow Rate	307	68	45	284	64	74
Geometry Grp	7	7	7	7	6	6
Degree of Util (X)	0.532	0.105	0.077	0.42	0.114	0.128
Departure Headway (Hd)	6.245	5.564	6.121	5.317	6.445	6.225
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	577	644	586	682	556	575
Service Time	3.976	3.295	3.851	3.017	4.488	4.267
HCM Lane V/C Ratio	0.532	0.106	0.077	0.416	0.115	0.129
HCM Control Delay	15.9	9	9.4	11.8	10.3	10.2
HCM Lane LOS	C	A	A	B	B	B
HCM 95th-tile Q	3.1	0.4	0.2	2.1	0.4	0.4

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	5	55	5
Future Vol, veh/h	0	5	55	5
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	6	63	6
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	2
HCM Control Delay	10.2
HCM LOS	B

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	15	35	25	45	45	10
Future Vol, veh/h	15	35	25	45	45	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	40	29	52	52	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	166	57	63	0	-	0
Stage 1	57	-	-	-	-	-
Stage 2	109	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	824	1009	1540	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	808	1009	1540	-	-	-
Mov Cap-2 Maneuver	808	-	-	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	899	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.1	2.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1540	-	939	-	-
HCM Lane V/C Ratio	0.019	-	0.061	-	-
HCM Control Delay (s)	7.4	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	155	50	75	120	70	135
Future Vol, veh/h	155	50	75	120	70	135
Conflicting Peds, #/hr	46	0	0	98	20	20
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	161	52	78	125	73	141

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	176	0	-	0	571	196
Stage 1	-	-	-	-	176	-
Stage 2	-	-	-	-	395	-
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	1400	-	-	-	482	845
Stage 1	-	-	-	-	855	-
Stage 2	-	-	-	-	681	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1377	-	-	-	359	763
Mov Cap-2 Maneuver	-	-	-	-	359	-
Stage 1	-	-	-	-	785	-
Stage 2	-	-	-	-	552	-

Approach	EB	WB	SB
HCM Control Delay, s	6	0	13.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1377	-	-	-	359	763
HCM Lane V/C Ratio	0.117	-	-	-	0.203	0.184
HCM Control Delay (s)	8	-	-	-	17.6	10.8
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.7	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	100	15	130	120	200	25	100	140	210	95	50
Future Volume (veh/h)	20	100	15	130	120	200	25	100	140	210	95	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		0.96	0.97		0.99	0.96		0.99	0.99		0.95
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	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	22	109	16	141	130	217	27	109	152	228	103	54
Adj No. of Lanes	1	2	0	1	1	1	1	2	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	388	670	96	509	523	443	494	363	321	502	285	149
Arrive On Green	0.02	0.22	0.22	0.08	0.28	0.28	0.09	0.21	0.21	0.14	0.25	0.25
Sat Flow, veh/h	1774	3090	443	1774	1863	1575	1774	1770	1563	1774	1131	593
Grp Volume(v), veh/h	22	61	64	141	130	217	27	109	152	228	0	157
Grp Sat Flow(s),veh/h/ln	1774	1770	1764	1774	1863	1575	1774	1770	1563	1774	0	1725
Q Serve(g_s), s	0.5	1.6	1.6	3.3	3.0	6.4	0.6	2.9	4.8	5.4	0.0	4.2
Cycle Q Clear(g_c), s	0.5	1.6	1.6	3.3	3.0	6.4	0.6	2.9	4.8	5.4	0.0	4.2
Prop In Lane	1.00		0.25	1.00		1.00	1.00		1.00	1.00		0.34
Lane Grp Cap(c), veh/h	388	384	382	509	523	443	494	363	321	502	0	434
V/C Ratio(X)	0.06	0.16	0.17	0.28	0.25	0.49	0.05	0.30	0.47	0.45	0.00	0.36
Avail Cap(c_a), veh/h	509	853	850	548	932	788	495	853	754	578	0	986
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	0.00	1.00
Uniform Delay (d), s/veh	16.5	17.8	17.8	14.4	15.6	16.8	14.2	18.8	19.6	14.2	0.0	17.2
Incr Delay (d2), s/veh	0.1	0.2	0.2	0.3	0.2	0.8	0.0	0.5	1.1	0.6	0.0	0.5
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	0.3	0.8	0.8	1.6	1.6	2.9	0.3	1.5	2.2	2.7	0.0	2.0
LnGrp Delay(d),s/veh	16.5	18.0	18.0	14.7	15.8	17.6	14.2	19.3	20.7	14.9	0.0	17.7
LnGrp LOS	B	B	B	B	B	B	B	B	C	B		B
Approach Vol, veh/h		147			488			288			385	
Approach Delay, s/veh		17.8			16.3			19.5			16.0	
Approach LOS		B			B			B			B	

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	12.6	16.5	9.8	17.1	10.0	19.1	6.2	20.7
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	10.0	27.0	6.0	27.0	5.0	32.0	5.0	28.0
Max Q Clear Time (g_c+I1), s	7.4	6.8	5.3	3.6	2.6	6.2	2.5	8.4
Green Ext Time (p_c), s	0.2	2.5	0.0	2.2	0.0	2.7	0.0	2.1

Intersection Summary	
HCM 2010 Ctrl Delay	17.1
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	5.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	300	0	5	250	210	10
Future Vol, veh/h	300	0	5	250	210	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	275	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	313	0	5	260	219	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	313	0	584	313
Stage 1	-	-	-	-	313	-
Stage 2	-	-	-	-	271	-
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	-	0	1247	-	474	727
Stage 1	-	0	-	-	741	-
Stage 2	-	0	-	-	775	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1247	-	472	727
Mov Cap-2 Maneuver	-	-	-	-	472	-
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	772	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	18.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	494	-	1247	-
HCM Lane V/C Ratio	0.464	-	0.004	-
HCM Control Delay (s)	18.4	-	7.9	-
HCM Lane LOS	C	-	A	-
HCM 95th %tile Q(veh)	2.4	-	0	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	185	25	75	175	25	55
Future Vol, veh/h	185	25	75	175	25	55
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	40	-	0	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	199	27	81	188	27	59

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	226	0	561	212
Stage 1	-	-	-	-	212	-
Stage 2	-	-	-	-	349	-
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	-	-	1342	-	489	828
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	714	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1342	-	459	828
Mov Cap-2 Maneuver	-	-	-	-	541	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	671	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	10.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	541	828	-	-	1342	-
HCM Lane V/C Ratio	0.05	0.071	-	-	0.06	-
HCM Control Delay (s)	12	9.7	-	-	7.9	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.2	0.2	-	-	0.2	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	175	140	145	10	2	170
Future Vol, veh/h	175	140	145	10	2	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	200	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	188	151	156	11	2	183

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	167	0	-	0	688	161
Stage 1	-	-	-	-	161	-
Stage 2	-	-	-	-	527	-
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	1411	-	-	-	412	884
Stage 1	-	-	-	-	868	-
Stage 2	-	-	-	-	592	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1411	-	-	-	357	884
Mov Cap-2 Maneuver	-	-	-	-	435	-
Stage 1	-	-	-	-	868	-
Stage 2	-	-	-	-	513	-

Approach	EB	WB	SW
HCM Control Delay, s	4.4	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1411	-	-	-	874
HCM Lane V/C Ratio	0.133	-	-	-	0.212
HCM Control Delay (s)	7.9	-	-	-	10.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.5	-	-	-	0.8

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	290	2	2	295	1	1	0	5	1	0	1
Future Vol, veh/h	0	290	2	2	295	1	1	0	5	1	0	1
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	100	-	-	100	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	309	2	2	314	1	1	0	5	1	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	315	0	0	311	0	0	629	629	310	631	630	314
Stage 1	-	-	-	-	-	-	310	310	-	319	319	-
Stage 2	-	-	-	-	-	-	319	319	-	312	311	-
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	1245	-	-	1249	-	-	395	399	730	394	399	726
Stage 1	-	-	-	-	-	-	700	659	-	693	653	-
Stage 2	-	-	-	-	-	-	693	653	-	699	658	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1245	-	-	1249	-	-	394	398	730	391	398	726
Mov Cap-2 Maneuver	-	-	-	-	-	-	394	398	-	391	398	-
Stage 1	-	-	-	-	-	-	700	659	-	693	652	-
Stage 2	-	-	-	-	-	-	691	652	-	694	658	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	10.7	12.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	394	730	1245	-	-	1249	-	-	508
HCM Lane V/C Ratio	0.003	0.007	-	-	-	0.002	-	-	0.004
HCM Control Delay (s)	14.2	10	0	-	-	7.9	-	-	12.1
HCM Lane LOS	B	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	340	1	5	275	5	0	1	5	10	1	10
Future Vol, veh/h	2	340	1	5	275	5	0	1	5	10	1	10
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	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	358	1	5	289	5	0	1	5	11	1	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	295	0	0	359	0	0	671	668	358	669	666	292
Stage 1	-	-	-	-	-	-	363	363	-	303	303	-
Stage 2	-	-	-	-	-	-	308	305	-	366	363	-
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	1266	-	-	1200	-	-	370	379	686	371	380	747
Stage 1	-	-	-	-	-	-	656	625	-	706	664	-
Stage 2	-	-	-	-	-	-	702	662	-	653	625	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1266	-	-	1200	-	-	362	377	686	366	378	747
Mov Cap-2 Maneuver	-	-	-	-	-	-	362	377	-	366	378	-
Stage 1	-	-	-	-	-	-	655	624	-	705	661	-
Stage 2	-	-	-	-	-	-	688	659	-	646	624	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	11	12.8
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	604	1266	-	-	1200	-	-	484
HCM Lane V/C Ratio	0.01	0.002	-	-	0.004	-	-	0.046
HCM Control Delay (s)	11	7.8	-	-	8	-	-	12.8
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	330	230	5	0	0
Future Vol, veh/h	1	330	230	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	347	242	5	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	247	0	-	0	594	245
Stage 1	-	-	-	-	245	-
Stage 2	-	-	-	-	349	-
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	1319	-	-	-	468	794
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	714	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1319	-	-	-	468	794
Mov Cap-2 Maneuver	-	-	-	-	555	-
Stage 1	-	-	-	-	796	-
Stage 2	-	-	-	-	713	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1319	-	-	-	-
HCM Lane V/C Ratio	0.001	-	-	-	-
HCM Control Delay (s)	7.7	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	355	5	20	435	10	5	5	30	10	1	5
Future Vol, veh/h	5	355	5	20	435	10	5	5	30	10	1	5
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	-	-	-	-	-	-	-	-	-	-	-	-
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	5	386	5	22	473	11	5	5	33	11	1	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	484	0	0	391	0	0	924	926	389	940	924	478
Stage 1	-	-	-	-	-	-	399	399	-	522	522	-
Stage 2	-	-	-	-	-	-	525	527	-	418	402	-
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	1079	-	-	1168	-	-	250	269	659	244	269	587
Stage 1	-	-	-	-	-	-	627	602	-	538	531	-
Stage 2	-	-	-	-	-	-	536	528	-	612	600	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1079	-	-	1168	-	-	241	260	659	223	260	587
Mov Cap-2 Maneuver	-	-	-	-	-	-	241	260	-	223	260	-
Stage 1	-	-	-	-	-	-	623	598	-	535	517	-
Stage 2	-	-	-	-	-	-	516	514	-	573	596	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	13.5	18.7
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	468	1079	-	-	1168	-	-	280
HCM Lane V/C Ratio	0.093	0.005	-	-	0.019	-	-	0.062
HCM Control Delay (s)	13.5	8.4	0	-	8.1	0	-	18.7
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.2

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	415	430	90	60	10
Future Vol, veh/h	10	415	430	90	60	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	200	-	-	350	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	441	457	96	64	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	457	0	-	0	920	457
Stage 1	-	-	-	-	457	-
Stage 2	-	-	-	-	463	-
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	1104	-	-	-	301	604
Stage 1	-	-	-	-	638	-
Stage 2	-	-	-	-	634	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1104	-	-	-	298	604
Mov Cap-2 Maneuver	-	-	-	-	425	-
Stage 1	-	-	-	-	638	-
Stage 2	-	-	-	-	628	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	14.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1104	-	-	-	444
HCM Lane V/C Ratio	0.01	-	-	-	0.168
HCM Control Delay (s)	8.3	-	-	-	14.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.6

Intersection	
Int Delay, s/veh	1.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	20	475	5	10	535	45	5	1	5	25	1	20
Future Vol, veh/h	20	475	5	10	535	45	5	1	5	25	1	20
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	-	-	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	516	5	11	582	49	5	1	5	27	1	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	630	0	0	522	0	0	1202	1215	519	1194	1193	606
Stage 1	-	-	-	-	-	-	563	563	-	628	628	-
Stage 2	-	-	-	-	-	-	639	652	-	566	565	-
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	952	-	-	1044	-	-	161	181	557	163	187	497
Stage 1	-	-	-	-	-	-	511	509	-	471	476	-
Stage 2	-	-	-	-	-	-	464	464	-	509	508	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	952	-	-	1044	-	-	148	172	557	155	178	497
Mov Cap-2 Maneuver	-	-	-	-	-	-	148	172	-	155	178	-
Stage 1	-	-	-	-	-	-	494	492	-	455	468	-
Stage 2	-	-	-	-	-	-	436	457	-	486	491	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.4	0.1	21.8	23.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER	SWLn1	SWLn2
Capacity (veh/h)	226	1044	-	-	952	-	-	155	294
HCM Lane V/C Ratio	0.053	0.01	-	-	0.023	-	-	0.117	0.108
HCM Control Delay (s)	21.8	8.5	0	-	8.9	0	-	31.3	18.7
HCM Lane LOS	C	A	A	-	A	A	-	D	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0.4	0.4

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	10	45	535	10	35	460
Future Vol, veh/h	10	45	535	10	35	460
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	50	594	11	39	511

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1189	600	0	0	606	0
Stage 1	600	-	-	-	-	-
Stage 2	589	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	208	501	-	-	972	-
Stage 1	548	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	200	501	-	-	972	-
Mov Cap-2 Maneuver	338	-	-	-	-	-
Stage 1	548	-	-	-	-	-
Stage 2	532	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	461	972	-
HCM Lane V/C Ratio	-	-	0.133	0.04	-
HCM Control Delay (s)	-	-	14	8.9	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

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	5	5	30	5	5	40	25	480	15	10	460	10
Future Vol, veh/h	5	5	30	5	5	40	25	480	15	10	460	10
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	-	-	-	150	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	5	33	5	5	44	27	527	16	11	505	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1142	1126	505	1121	1118	536	505	0	0	544	0	0
Stage 1	527	527	-	591	591	-	-	-	-	-	-	-
Stage 2	615	599	-	530	527	-	-	-	-	-	-	-
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	177	205	567	183	207	545	1060	-	-	1025	-	-
Stage 1	535	528	-	493	494	-	-	-	-	-	-	-
Stage 2	479	490	-	533	528	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	154	197	567	164	199	545	1060	-	-	1025	-	-
Mov Cap-2 Maneuver	154	197	-	164	199	-	-	-	-	-	-	-
Stage 1	521	520	-	480	481	-	-	-	-	-	-	-
Stage 2	424	478	-	489	520	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.6	15.8	0.4	0.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1060	-	-	173	567	388	1025	-	-
HCM Lane V/C Ratio	0.026	-	-	0.064	0.058	0.142	0.011	-	-
HCM Control Delay (s)	8.5	-	-	27.2	11.7	15.8	8.6	0	-
HCM Lane LOS	A	-	-	D	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.2	0.5	0	-	-

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	5	5	5	510	485	5
Future Vol, veh/h	5	5	5	510	485	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	100	-	-	-
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	5	5	5	554	527	5

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1095	530	533	0	-	0
Stage 1	530	-	-	-	-	-
Stage 2	565	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	236	549	1035	-	-	-
Stage 1	590	-	-	-	-	-
Stage 2	569	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	235	549	1035	-	-	-
Mov Cap-2 Maneuver	371	-	-	-	-	-
Stage 1	590	-	-	-	-	-
Stage 2	566	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.3	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1035	-	443	-	-
HCM Lane V/C Ratio	0.005	-	0.025	-	-
HCM Control Delay (s)	8.5	-	13.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	445	50	5	325	70	220	75	35	60	30	40
Future Volume (veh/h)	20	445	50	5	325	70	220	75	35	60	30	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)	0.99		0.94	0.98		0.97	0.92		0.95	0.95		0.90
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	1676	1676	1676	1676	1676	1676	1676	1676	1710	1676	1676	1710
Adj Flow Rate, veh/h	21	473	53	5	346	74	234	80	37	64	32	43
Adj No. of Lanes	1	1	1	1	1	1	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	346	611	613	256	585	480	457	242	112	416	114	153
Arrive On Green	0.02	0.36	0.36	0.01	0.35	0.35	0.09	0.23	0.23	0.05	0.19	0.19
Sat Flow, veh/h	1597	1676	1337	1597	1676	1376	1597	1065	492	1597	609	818
Grp Volume(v), veh/h	21	473	53	5	346	74	234	0	117	64	0	75
Grp Sat Flow(s),veh/h/ln	1597	1676	1337	1597	1676	1376	1597	0	1557	1597	0	1427
Q Serve(g_s), s	0.4	11.3	1.0	0.1	7.6	1.7	4.0	0.0	2.8	1.4	0.0	2.0
Cycle Q Clear(g_c), s	0.4	11.3	1.0	0.1	7.6	1.7	4.0	0.0	2.8	1.4	0.0	2.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.32	1.00		0.57
Lane Grp Cap(c), veh/h	346	611	613	256	585	480	457	0	354	416	0	267
V/C Ratio(X)	0.06	0.77	0.09	0.02	0.59	0.15	0.51	0.00	0.33	0.15	0.00	0.28
Avail Cap(c_a), veh/h	455	743	718	389	743	609	457	0	552	479	0	506
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	9.8	12.7	7.0	10.7	12.1	10.1	14.6	0.0	14.6	13.7	0.0	15.7
Incr Delay (d2), s/veh	0.1	4.2	0.1	0.0	1.0	0.1	1.0	0.0	0.5	0.2	0.0	0.6
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	5.8	0.4	0.0	3.6	0.6	1.0	0.0	1.3	0.6	0.0	0.8
LnGrp Delay(d),s/veh	9.8	16.9	7.1	10.7	13.0	10.3	15.5	0.0	15.1	13.9	0.0	16.3
LnGrp LOS	A	B	A	B	B	B	B		B	B		B
Approach Vol, veh/h		547			425			351			139	
Approach Delay, s/veh		15.7			12.5			15.4			15.2	
Approach LOS		B			B			B			B	

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	6.2	14.3	4.2	20.4	8.0	12.5	4.9	19.8
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	4.0	16.0	4.0	20.0	4.0	16.0	4.0	20.0
Max Q Clear Time (g_c+I1), s	3.4	4.8	2.1	13.3	6.0	4.0	2.4	9.6
Green Ext Time (p_c), s	0.0	0.8	0.0	3.2	0.0	0.8	0.0	4.3

Intersection Summary	
HCM 2010 Ctrl Delay	14.6
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	5.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	415	135	40	375	10	45	15	25	15	20	5
Future Vol, veh/h	5	415	135	40	375	10	45	15	25	15	20	5
Conflicting Peds, #/hr	33	0	33	7	0	7	64	0	64	11	0	11
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	466	152	45	421	11	51	17	28	17	22	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	466	0	0	651	0	0	1181	1141	639	1190	1212	524
Stage 1	-	-	-	-	-	-	586	586	-	550	550	-
Stage 2	-	-	-	-	-	-	595	555	-	640	662	-
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	1095	-	-	935	-	-	167	201	476	165	182	553
Stage 1	-	-	-	-	-	-	496	497	-	519	516	-
Stage 2	-	-	-	-	-	-	491	513	-	464	459	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1037	-	-	885	-	-	130	179	438	126	162	509
Mov Cap-2 Maneuver	-	-	-	-	-	-	130	179	-	126	162	-
Stage 1	-	-	-	-	-	-	478	479	-	500	476	-
Stage 2	-	-	-	-	-	-	416	474	-	393	442	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.9	47.9	36.3
HCM LOS			E	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	175	1037	-	-	885	-	-	159
HCM Lane V/C Ratio	0.546	0.005	-	-	0.051	-	-	0.283
HCM Control Delay (s)	47.9	8.5	0	-	9.3	-	-	36.3
HCM Lane LOS	E	A	A	-	A	-	-	E
HCM 95th %tile Q(veh)	2.8	0	-	-	0.2	-	-	1.1

Intersection	
Intersection Delay, s/veh	27.3
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	10	35	425	0	25	45	5	0	370	55	20
Future Vol, veh/h	0	10	35	425	0	25	45	5	0	370	55	20
Peak Hour Factor	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	11	40	483	0	28	51	6	0	420	63	23
Number of Lanes	0	0	1	1	0	0	1	0	0	1	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	2	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	2
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	1
HCM Control Delay	28.1	12.4	31.7
HCM LOS	D	B	D

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1
Vol Left, %	100%	0%	22%	0%	33%	6%
Vol Thru, %	0%	73%	78%	0%	60%	88%
Vol Right, %	0%	27%	0%	100%	7%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	370	75	45	425	75	80
LT Vol	370	0	10	0	25	5
Through Vol	0	55	35	0	45	70
RT Vol	0	20	0	425	5	5
Lane Flow Rate	420	85	51	483	85	91
Geometry Grp	7	7	7	7	6	6
Degree of Util (X)	0.829	0.151	0.098	0.814	0.182	0.192
Departure Headway (Hd)	7.219	6.52	6.896	6.071	7.699	7.591
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	505	553	523	599	467	474
Service Time	4.919	4.22	4.596	3.771	5.728	5.629
HCM Lane V/C Ratio	0.832	0.154	0.098	0.806	0.182	0.192
HCM Control Delay	36	10.4	10.3	30	12.4	12.4
HCM Lane LOS	E	B	B	D	B	B
HCM 95th-tile Q	8.2	0.5	0.3	8.2	0.7	0.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	5	70	5
Future Vol, veh/h	0	5	70	5
Peak Hour Factor	0.92	0.88	0.88	0.88
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	6	80	6
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	2
HCM Control Delay	12.4
HCM LOS	B

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	15	45	30	55	45	10
Future Vol, veh/h	15	45	30	55	45	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	17	52	34	63	52	11

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	189	57	63	0	-	0
Stage 1	57	-	-	-	-	-
Stage 2	132	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	800	1009	1540	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	894	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	782	1009	1540	-	-	-
Mov Cap-2 Maneuver	782	-	-	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	873	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.1	2.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1540	-	941	-	-
HCM Lane V/C Ratio	0.022	-	0.073	-	-
HCM Control Delay (s)	7.4	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.2	-	-

Intersection	
Int Delay, s/veh	7.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	200	105	5	130	100	5
Future Vol, veh/h	200	105	5	130	100	5
Conflicting Peds, #/hr	46	0	0	98	20	20
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	50	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	208	109	5	135	104	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	103	0	-	0	649	123
Stage 1	-	-	-	-	103	-
Stage 2	-	-	-	-	546	-
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	1489	-	-	-	434	928
Stage 1	-	-	-	-	921	-
Stage 2	-	-	-	-	580	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1464	-	-	-	314	838
Mov Cap-2 Maneuver	-	-	-	-	314	-
Stage 1	-	-	-	-	846	-
Stage 2	-	-	-	-	457	-

Approach	EB	WB	SB
HCM Control Delay, s	5.2	0	21.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1464	-	-	-	324
HCM Lane V/C Ratio	0.142	-	-	-	0.338
HCM Control Delay (s)	7.9	-	-	-	21.7
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.5	-	-	-	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	140	50	220	150	310	25	110	210	290	215	50
Future Volume (veh/h)	20	140	50	220	150	310	25	110	210	290	215	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		0.96	0.98		0.99	0.97		0.99	1.00		0.96
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	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	22	152	54	239	163	337	27	120	228	315	234	54
Adj No. of Lanes	1	2	0	1	1	1	1	2	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	332	547	186	474	552	467	430	408	361	488	457	105
Arrive On Green	0.02	0.21	0.21	0.10	0.30	0.30	0.07	0.23	0.23	0.16	0.31	0.31
Sat Flow, veh/h	1774	2566	871	1774	1863	1575	1774	1770	1565	1774	1453	335
Grp Volume(v), veh/h	22	103	103	239	163	337	27	120	228	315	0	288
Grp Sat Flow(s),veh/h/ln	1774	1770	1667	1774	1863	1575	1774	1770	1565	1774	0	1789
Q Serve(g_s), s	0.7	3.3	3.5	6.9	4.6	13.0	0.7	3.8	8.9	8.5	0.0	8.9
Cycle Q Clear(g_c), s	0.7	3.3	3.5	6.9	4.6	13.0	0.7	3.8	8.9	8.5	0.0	8.9
Prop In Lane	1.00		0.52	1.00		1.00	1.00		1.00	1.00		0.19
Lane Grp Cap(c), veh/h	332	377	355	474	552	467	430	408	361	488	0	562
V/C Ratio(X)	0.07	0.27	0.29	0.50	0.30	0.72	0.06	0.29	0.63	0.65	0.00	0.51
Avail Cap(c_a), veh/h	427	679	640	474	770	651	430	653	577	522	0	845
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	0.00	1.00
Uniform Delay (d), s/veh	20.2	22.3	22.4	17.0	18.4	21.3	16.7	21.5	23.5	15.2	0.0	19.0
Incr Delay (d2), s/veh	0.1	0.4	0.4	0.9	0.3	2.4	0.1	0.4	1.8	2.5	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	0.3	1.6	1.7	3.4	2.4	5.9	0.4	1.9	4.0	4.5	0.0	4.5
LnGrp Delay(d),s/veh	20.3	22.6	22.8	17.9	18.7	23.7	16.8	21.9	25.3	17.7	0.0	19.7
LnGrp LOS	C	C	C	B	B	C	B	C	C	B		B
Approach Vol, veh/h		228			739			375			603	
Approach Delay, s/veh		22.5			20.7			23.6			18.7	
Approach LOS		C			C			C			B	

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	15.7	20.6	12.0	19.4	10.0	26.3	6.4	25.1
Change Period (Y+Rc), s	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Max Green Setting (Gmax), s	12.0	25.0	7.0	26.0	5.0	32.0	5.0	28.0
Max Q Clear Time (g_c+I1), s	10.5	10.9	8.9	5.5	2.7	10.9	2.7	15.0
Green Ext Time (p_c), s	0.2	3.5	0.0	3.4	0.0	4.1	0.0	2.9

Intersection Summary	
HCM 2010 Ctrl Delay	20.8
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	24.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑		↖	↑	↟	
Traffic Vol, veh/h	435	0	20	420	280	20
Future Vol, veh/h	435	0	20	420	280	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Yield
Storage Length	-	-	275	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	453	0	21	438	292	21

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	453	0	932	453
Stage 1	-	-	-	-	453	-
Stage 2	-	-	-	-	479	-
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	-	0	1108	-	296	607
Stage 1	-	0	-	-	640	-
Stage 2	-	0	-	-	623	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1108	-	~ 290	607
Mov Cap-2 Maneuver	-	-	-	-	~ 290	-
Stage 1	-	-	-	-	640	-
Stage 2	-	-	-	-	611	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	96.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	305	-	1108	-
HCM Lane V/C Ratio	1.025	-	0.019	-
HCM Control Delay (s)	96.3	-	8.3	-
HCM Lane LOS	F	-	A	-
HCM 95th %tile Q(veh)	11.3	-	0.1	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	260	25	85	600	25	60
Future Vol, veh/h	260	25	85	600	25	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	40	-	0	100
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	280	27	91	645	27	65

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	306	0	1121	293
Stage 1	-	-	-	-	293	-
Stage 2	-	-	-	-	828	-
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	-	-	1255	-	228	746
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	429	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1255	-	211	746
Mov Cap-2 Maneuver	-	-	-	-	320	-
Stage 1	-	-	-	-	757	-
Stage 2	-	-	-	-	398	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	12.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	320	746	-	-	1255	-
HCM Lane V/C Ratio	0.084	0.086	-	-	0.073	-
HCM Control Delay (s)	17.3	10.3	-	-	8.1	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.3	0.3	-	-	0.2	-

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	245	210	510	10	5	5
Future Vol, veh/h	245	210	510	10	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	200	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	263	226	548	11	5	5

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	559	0	-	0	1307	554
Stage 1	-	-	-	-	554	-
Stage 2	-	-	-	-	753	-
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	1012	-	-	-	176	532
Stage 1	-	-	-	-	575	-
Stage 2	-	-	-	-	465	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1012	-	-	-	130	532
Mov Cap-2 Maneuver	-	-	-	-	251	-
Stage 1	-	-	-	-	575	-
Stage 2	-	-	-	-	344	-

Approach	EB	WB	SW
HCM Control Delay, s	5.3	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SWLn1
Capacity (veh/h)	1012	-	-	-	341
HCM Lane V/C Ratio	0.26	-	-	-	0.032
HCM Control Delay (s)	9.8	-	-	-	15.9
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	1	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	430	5	5	465	5	5	1	5	5	1	5
Future Vol, veh/h	1	430	5	5	465	5	5	1	5	5	1	5
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	100	-	-	100	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	457	5	5	495	5	5	1	5	5	1	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	500	0	0	463	0	0	973	973	460	973	973	497
Stage 1	-	-	-	-	-	-	462	462	-	508	508	-
Stage 2	-	-	-	-	-	-	511	511	-	465	465	-
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	1064	-	-	1098	-	-	231	252	601	231	252	573
Stage 1	-	-	-	-	-	-	580	565	-	547	539	-
Stage 2	-	-	-	-	-	-	545	537	-	578	563	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1064	-	-	1098	-	-	227	251	601	227	251	573
Mov Cap-2 Maneuver	-	-	-	-	-	-	227	251	-	227	251	-
Stage 1	-	-	-	-	-	-	579	564	-	546	537	-
Stage 2	-	-	-	-	-	-	536	535	-	571	562	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	16.5	16.8
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	227	488	1064	-	-	1098	-	-	317
HCM Lane V/C Ratio	0.023	0.013	0.001	-	-	0.005	-	-	0.037
HCM Control Delay (s)	21.2	12.5	8.4	-	-	8.3	-	-	16.8
HCM Lane LOS	C	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0	0	-	-	0	-	-	0.1

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	10	485	5	5	440	5	1	5	5	10	5	15
Future Vol, veh/h	10	485	5	5	440	5	1	5	5	10	5	15
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	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	511	5	5	463	5	1	5	5	11	5	16

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	468	0	0	516	0	0	1021	1013	513	1015	1013	466
Stage 1	-	-	-	-	-	-	534	534	-	476	476	-
Stage 2	-	-	-	-	-	-	487	479	-	539	537	-
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	1094	-	-	1050	-	-	215	239	561	217	239	597
Stage 1	-	-	-	-	-	-	530	524	-	570	557	-
Stage 2	-	-	-	-	-	-	562	555	-	527	523	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1094	-	-	1050	-	-	203	235	561	209	235	597
Mov Cap-2 Maneuver	-	-	-	-	-	-	203	235	-	209	235	-
Stage 1	-	-	-	-	-	-	525	519	-	564	554	-
Stage 2	-	-	-	-	-	-	539	552	-	512	518	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	16.9	17.6
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	313	1094	-	-	1050	-	-	318
HCM Lane V/C Ratio	0.037	0.01	-	-	0.005	-	-	0.099
HCM Control Delay (s)	16.9	8.3	-	-	8.4	-	-	17.6
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	480	400	5	0	0
Future Vol, veh/h	5	480	400	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	150	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	505	421	5	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	426	0	-	0	940	424
Stage 1	-	-	-	-	424	-
Stage 2	-	-	-	-	516	-
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	1133	-	-	-	293	630
Stage 1	-	-	-	-	660	-
Stage 2	-	-	-	-	599	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1133	-	-	-	292	630
Mov Cap-2 Maneuver	-	-	-	-	418	-
Stage 1	-	-	-	-	660	-
Stage 2	-	-	-	-	596	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1133	-	-	-	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	8.2	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Chelan Intersections
Traffic Volume Worksheet

				Existing Off-Peak 2009 Traffic Volumes	Existing Raw Model Volumes	Growth Delta	Future Raw Model Volumes	*Model Delta*	95% Model Delta Factor	Adjustments	**Projected Future 2037 Volumes**
May-09	1	Manson Hwy (SR-150)/Riviera Dr									
		rt	1	**3**	2	1	2	*0*	0		**3**
	SB	th	2	**1**	0	1	0	*0*	0		**1**
		lt	3	**8**	7	1	9	*2*	2		**10**
		rt	4	**9**	12	-3	14	*2*	2		**11**
	WB	th	5	**330**	390	-60	499	*109*	104		**434**
		lt	6	**21**	8	13	9	*1*	1		**22**
		rt	7	**27**	9	18	10	*1*	1		**28**
	NB	th	8	**2**	0	2	0	*0*	0		**2**
		lt	9	**7**	3	4	3	*0*	0		**7**
		rt	10	**0**	2	-2	3	*1*	1		**1**
	EB	th	11	**259**	329	-70	430	*101*	96		**355**
		lt	12	**4**	3	1	3	*0*	0		**4**
May-09	2	Manson Hwy (SR-150)/Boyd Rd									
		rt	1	**7**	4	3	5	*1*	1		**8**
	SB	th	2	**0**	-	-	-	-	-		**-**
		lt	3	**51**	36	15	45	*9*	9		**60**
		rt	4	**78**	52	26	64	*12*	11		**89**
	WB	th	5	**320**	406	-86	523	*117*	111		**431**
		lt	6	**0**	-	-	-	-	-		**-**
		rt	7	**0**	-	-	-	-	-		**-**
	NB	th	8	**0**	-	-	-	-	-		**-**
		lt	9	**0**	-	-	-	-	-		**-**
		rt	10	**0**	-	-	-	-	-		**-**
	EB	th	11	**314**	339	-25	447	*108*	103		**417**
		lt	12	**11**	7	4	8	*1*	1		**12**
May-09	3	No-See-Um Connector/Manson Hwy (SR-150)									
		rt	1	**0**	0	0	3	*3*	3		**3**
	SB	th	2	**370**	372	-2	480	*108*	103		**473**
		lt	3	**8**	9	-1	19	*10*	10		**18**
		rt	4	**13**	8	5	13	*5*	5		**18**
	WB	th	5	**0**	0	0	0	*0*	0		**0**
		lt	6	**45**	52	-7	32	*-20*	-19		**26**
		rt	7	**65**	74	-9	53	*-21*	-20		**45**
	NB	th	8	**404**	466	-62	601	*135*	129		**533**
		lt	9	**0**	0	0	13	*13*	12		**12**
		rt	10	**0**	0	0	7	*7*	7		**7**
	EB	th	11	**0**	0	0	0	*0*	0		**0**
		lt	12	**0**	0	0	1	*1*	1		**1**

Chelan Intersections
Traffic Volume Worksheet

					Existing Off-Peak 2009 Traffic Volumes	Existing Raw Model Volumes	Growth Delta	Future Raw Model Volumes	*Model Delta*	95% Model Delta Factor	Adjustments	Projected Future 2037 Volumes
May-09	4	Gibson Ave/Park Rd (SR-150)										
			rt	1	**0**	3	-1	3	*0*	0		**0**
		SB	th	2	**368**	385	-19	483	*98*	93		**461**
			lt	3	**35**	28	7	27	*-1*	-1		**34**
			rt	4	**58**	32	26	17	*-15*	-14		**44**
		WB	th	5	**0**	2	-1	2	*0*	0		**0**
			lt	6	**11**	3	8	3	*0*	0		**11**
			rt	7	**11**	3	8	3	*0*	0		**11**
		NB	th	8	**414**	498	-86	624	*126*	120		**534**
			lt	9	**0**	13	-2	14	*1*	1	-1	**0**
			rt	10	**0**	14	-3	15	*1*	1	-1	**0**
		EB	th	11	**0**	2	0	2	*0*	0		**0**
			lt	12	**0**	3	-1	3	*0*	0		**0**
May-09	5	Nixon Ave/Park Rd (SR-150)										
			rt	1	**9**	5	2	5	*0*	0		**9**
		SB	th	2	**365**	383	-16	482	*99*	94		**459**
			lt	3	**11**	14	-3	14	*0*	0		**11**
			rt	4	**11**	13	-2	42	*29*	28		**39**
		WB	th	5	**2**	1	0	1	*0*	0		**2**
			lt	6	**7**	0	7	0	*0*	0		**7**
			rt	7	**14**	0	14	0	*0*	0		**14**
		NB	th	8	**386**	497	-100	595	*98*	93		**479**
			lt	9	**25**	9	5	10	*1*	1		**26**
			rt	10	**27**	9	7	11	*2*	2		**29**
		EB	th	11	**4**	1	1	0	*-1*	-1		**3**
			lt	12	**4**	5	-3	5	*0*	0		**4**
May-09	6	S. Park Entrance/Park Rd (SR-150)										
			rt	1	**4**	5	-1	5	*0*	0		**4**
		SB	th	2	**387**	388	-1	489	*101*	96		**483**
			lt	3	**0**	-	-	-	-	-		**-**
			rt	4	**0**	-	-	-	-	-		**-**
		WB	th	5	**0**	-	-	-	-	-		**-**
			lt	6	**0**	-	-	-	-	-		**-**
			rt	7	**0**	-	-	-	-	-		**-**
		NB	th	8	**416**	502	-86	601	*99*	94		**510**
			lt	9	**4**	8	-4	9	*1*	1		**5**
			rt	10	**0**	8	-8	9	*1*	1		**1**
		EB	th	11	**0**	-	-	-	-	-		**-**
			lt	12	**3**	5	-2	4	*-1*	-1		**2**
May-09	7	Johnson Ave (SR-150)/Columbia St										
			rt	1	**38**	0	38	0	*0*	0		**38**
		SB	th	2	**48**	27	21	7	*-20*	-19		**29**
			lt	3	**41**	25	16	45	*20*	19		**60**
			rt	4	**65**	20	45	24	*4*	4		**69**
		WB	th	5	**234**	356	-122	453	*97*	92		**326**
			lt	6	**16**	20	-4	1	*-19*	-18	7	**5**
			rt	7	**44**	12	32	4	*-8*	-8		**36**
		NB	th	8	**68**	23	45	30	*7*	7		**75**
			lt	9	**165**	191	-26	249	*58*	55		**220**
			rt	10	**134**	166	-32	76	*-90*	-86		**48**
		EB	th	11	**236**	266	-30	485	*219*	209		**445**
			lt	12	**18**	0	18	0	*0*	0		**18**
May-09	8	Johnson Ave (SR-150)/Emerson St										
			rt	1	**9**	22	-13	3	*-19*	-18	14	**5**
		SB	th	2	**12**	19	-7	26	*7*	7		**19**
			lt	3	**6**	15	-9	25	*10*	10		**16**
			rt	4	**8**	11	-3	15	*4*	4		**12**
		WB	th	5	**285**	303	-18	400	*97*	92		**377**
			lt	6	**39**	3	36	3	*0*	0		**39**
			rt	7	**23**	3	20	7	*4*	4		**27**
		NB	th	8	**10**	24	-14	28	*4*	4		**14**
			lt	9	**40**	68	-28	74	*6*	6		**46**
			rt	10	**60**	47	13	128	*81*	77		**137**
		EB	th	11	**260**	244	16	409	*165*	157		**417**
			lt	12	**11**	15	-4	4	*-11*	-10	4	**5**

Chelan Intersections
Traffic Volume Worksheet

					Existing Off-Peak 2009 Traffic Volumes	Existing Raw Model Volumes	Growth Delta	Future Raw Model Volumes	*Model Delta*	95% Model Delta Factor	Adjustments	Projected Future 2037 Volumes
May-09	9	Johnson Ave/Saunders St										
			rt	1	**7**	1	6	1	*0*	0		**7**
		SB	th	2	**57**	54	3	70	*16*	15		**72**
			lt	3	**6**	0	6	1	*1*	1		**7**
			rt	4	**1**	0	1	1	*1*	1		**2**
		WB	th	5	**39**	39	0	44	*5*	5		**44**
			lt	6	**17**	17	0	23	*6*	6		**23**
			rt	7	**13**	10	3	15	*5*	5		**18**
		NB	th	8	**44**	59	-15	71	*12*	11		**55**
			lt	9	**270**	267	3	370	*103*	98		**368**
			rt	10	**251**	235	16	417	*182*	173		**424**
		EB	th	11	**29**	27	2	32	*5*	5		**34**
			lt	12	**12**	2	10	2	*0*	0		**12**
May-09	10	Johnson Ave/Bradley St										
			rt	1	**14**	0	14	0	*0*	0		**14**
		SB	th	2	**46**	33	13	33	*0*	0		**46**
			lt	3	**0**	-	-	-	-	-		**-**
			rt	4	**0**	-	-	-	-	-		**-**
		WB	th	5	**0**	-	-	-	-	-		**-**
			lt	6	**0**	-	-	-	-	-		**-**
			rt	7	**0**	-	-	-	-	-		**-**
		NB	th	8	**44**	29	15	38	*9*	9		**53**
			lt	9	**25**	28	-3	35	*7*	7		**32**
			rt	10	**33**	14	19	28	*14*	13		**46**
		EB	th	11	**0**	-	-	-	-	-		**-**
			lt	12	**13**	0	13	0	*0*	0		**13**
May-09	11	Woodin Ave/Columbia St										
			rt	1	**135**	164	-29	0	*-164*	-156	21	**0**
		SB	th	2	**0**	-	-	-	-	-		**-**
			lt	3	**68**	49	19	84	*35*	33		**101**
			rt	4	**120**	66	54	77	*11*	10		**130**
		WB	th	5	**73**	91	-18	17	*-74*	-70		**3**
			lt	6	**2**	-	-	-	-	-		**-**
			rt	7	**0**	-	-	-	-	-		**-**
		NB	th	8	**0**	-	-	-	-	-		**-**
			lt	9	**1**	-	-	-	-	-		**-**
			rt	10	**3**	-	-	-	-	-		**-**
		EB	th	11	**52**	72	-20	126	*54*	51		**103**
			lt	12	**154**	160	-6	206	*46*	44		**198**
May-09	12	Woodin Ave (SR-97A)/Sanders St										
			rt	1	**50**	12	38	12	*0*	0		**50**
		SB	th	2	**97**	76	21	201	*125*	119		**216**
			lt	3	**212**	220	-8	300	*80*	76		**288**
			rt	4	**202**	262	-60	373	*111*	106		**308**
		WB	th	5	**122**	77	45	106	*29*	28		**150**
			lt	6	**128**	168	-40	263	*95*	90		**218**
			rt	7	**141**	132	9	203	*71*	68		**209**
		NB	th	8	**99**	59	40	69	*10*	10		**109**
			lt	9	**23**	6	17	7	*1*	1		**24**
			rt	10	**15**	8	7	46	*38*	36		**51**
		EB	th	11	**98**	110	-12	152	*42*	40		**138**
			lt	12	**22**	15	7	15	*0*	0		**22**
May-09	13	Woodin Ave (SR-97A)/Chelan Falls Rd (SR-150)										
			rt	1	**0**	-	-	-	-	-		**-**
		SB	th	2	**0**	-	-	-	-	-		**-**
			lt	3	**0**	-	-	-	-	-		**-**
			rt	4	**0**	-	-	-	-	-		**-**
		WB	th	5	**251**	256	-5	433	*177*	169		**420**
			lt	6	**5**	14	-9	24	*10*	10	4	**19**
			rt	7	**10**	13	-3	21	*8*	8		**18**
		NB	th	8	**0**	-	-	-	-	-		**-**
			lt	9	**208**	239	-31	317	*78*	74		**282**
			rt	10	**149**	192	-43	261	*69*	66		**215**
		EB	th	11	**302**	263	39	402	*139*	132		**434**
			lt	12	**0**	-	-	-	-	-		**-**

Chelan Intersections
Traffic Volume Worksheet

					Existing Off-Peak 2009 Traffic Volumes	Existing Raw Model Volumes	Growth Delta	Future Raw Model Volumes	*Model Delta*	95% Model Delta Factor	Adjustments	**Projected Future 2037 Volumes**
May-09	14	Webster Ave (SR-97A)/Farnham St										
			rt	1	**0**	-	-	-	-	-		**-**
		SB	th	2	**0**	-	-	-	-	-		**-**
			lt	3	**0**	-	-	-	-	-		**-**
			rt	4	**0**	-	-	-	-	-		**-**
		WB	th	5	**174**	217	-43	662	*445*	424		**598**
			lt	6	**76**	44	32	52	*8*	8		**84**
			rt	7	**55**	24	31	27	*3*	3		**58**
		NB	th	8	**0**	-	-	-	-	-		**-**
			lt	9	**26**	7	19	8	*1*	1		**27**
			rt	10	**24**	13	11	14	*1*	1		**25**
		EB	th	11	**183**	175	8	255	*80*	76		**259**
			lt	12	**0**	-	-	-	-	-		**-**
May-09	15	Webster Ave (SR-97A)/Woodin Ave										
			rt	1	**172**	213	-41	2	*-211*	-201	34	**5**
		SB	th	2	**0**	-	-	-	-	-		**-**
			lt	3	**2**	0	2	0	*0*	0		**2**
			rt	4	**8**	0	8	1	*1*	1		**9**
		WB	th	5	**144**	198	-54	584	*386*	368		**512**
			lt	6	**0**	-	-	-	-	-		**-**
			rt	7	**0**	-	-	-	-	-		**-**
		NB	th	8	**0**	-	-	-	-	-		**-**
			lt	9	**0**	-	-	-	-	-		**-**
			rt	10	**0**	-	-	-	-	-		**-**
		EB	th	11	**142**	159	-17	233	*74*	70		**212**
			lt	12	**176**	177	-1	251	*74*	70		**246**
May-09	16	Woodin Ave (SR-97A)/Waterslide St										
			rt	1	**1**	-	-	-	-	0		**1**
		SB	th	2	**0**	-	-	-	-	0		**0**
			lt	3	**1**	-	-	-	-	0		**1**
			rt	4	**1**	-	-	-	-	0		**1**
		WB	th	5	**297**	388	-91	562	*174*	166		**463**
			lt	6	**2**	20	-18	20	*0*	0		**2**
			rt	7	**6**	24	-18	24	*0*	0		**6**
		NB	th	8	**0**	-	-	-	-	-		**-**
			lt	9	**1**	9	-8	13	*4*	4		**5**
			rt	10	**2**	7	-5	11	*4*	4		**6**
		EB	th	11	**289**	311	-22	459	*148*	141		**430**
			lt	12	**0**	-	-	-	-	-		**-**
May-09	17	Woodin Ave (SR-97A)/Center St										
			rt	1	**8**	11	-3	17	*6*	6		**14**
		SB	th	2	**1**	0	1	0	*0*	0		**1**
			lt	3	**12**	45	-33	45	*0*	0		**12**
			rt	4	**6**	59	-53	59	*0*	0		**6**
		WB	th	5	**273**	336	-63	511	*175*	167		**440**
			lt	6	**7**	0	7	0	*0*	0		**7**
			rt	7	**7**	0	7	0	*0*	0		**7**
		NB	th	8	**1**	0	1	0	*0*	0		**1**
			lt	9	**0**	0	0	0	*0*	0		**0**
			rt	10	**1**	0	1	0	*0*	0		**1**
		EB	th	11	**341**	272	69	422	*150*	143		**484**
			lt	12	**2**	13	-11	19	*6*	6		**8**
May-09	18	Woodin Ave (SR-97A)/Johnson Pl										
			rt	1	**0**	0	0	0	*0*	0		**0**
		SB	th	2	**0**	-	-	-	-	-		**-**
			lt	3	**0**	0	0	0	*0*	0		**0**
			rt	4	**7**	0	7	0	*0*	0		**7**
		WB	th	5	**230**	334	-104	513	*179*	170		**400**
			lt	6	**0**	-	-	-	-	-		**-**
			rt	7	**0**	-	-	-	-	-		**-**
		NB	th	8	**0**	-	-	-	-	-		**-**
			lt	9	**0**	-	-	-	-	-		**-**
			rt	10	**0**	-	-	-	-	-		**-**
		EB	th	11	**332**	279	53	434	*155*	148		**480**
			lt	12	**1**	0	1	0	*0*	0		**1**