East Omak Industrial Site Readiness Report

Confederated Tribes of the Colville Reservation
East Omak, Colville Reservation, Washington

Prepared For:
Confederated Tribes of the Colville Reservation

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CONSULTING SERVICES

East Omak Industrial Site Readiness Report

Project Information

Project:	East Omak Industrial Site Readiness Report
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1 Introduction

SCJ Alliance (SCJ) was engaged by the Confederated Tribes of the Colville Reservation (CCT) to develop a site readiness report for the Omak Industrial Site and Commerce Park, located in Omak Washington on the Colville Reservation. This readiness report provides existing conditions of water, wastewater, electrical, and transportation for the industrial site. The existing conditions assessment determined that the site is not currently ready for market-driven development, however, this report also includes a market and industry analysis, preferred development alternatives, and improvement recommendations. The Readiness Report is a comprehensive document to guide CCT in the next steps for site development from both an engineering and market feasibility perspective.

1.1 Study Area and Context

The East Omak Industrial Site and Commerce Park include 386 acres of land located in Okanogan County on the Colville Reservation. The site originally housed the Colville Indian Plywood and Veneer Plant (CIPV) before a recent wildfire. Located in East Omak, the site is outside of Omak city limits but relies on some infrastructure serviced by the city such as water and wastewater. South of the site is the 12 Tribes Casino and Hotel, which is also included in this report in consideration of wastewater treatment facilities. However, the transportation, water, and electrical assessments are specific to the 386-acre study area (Figure 1).

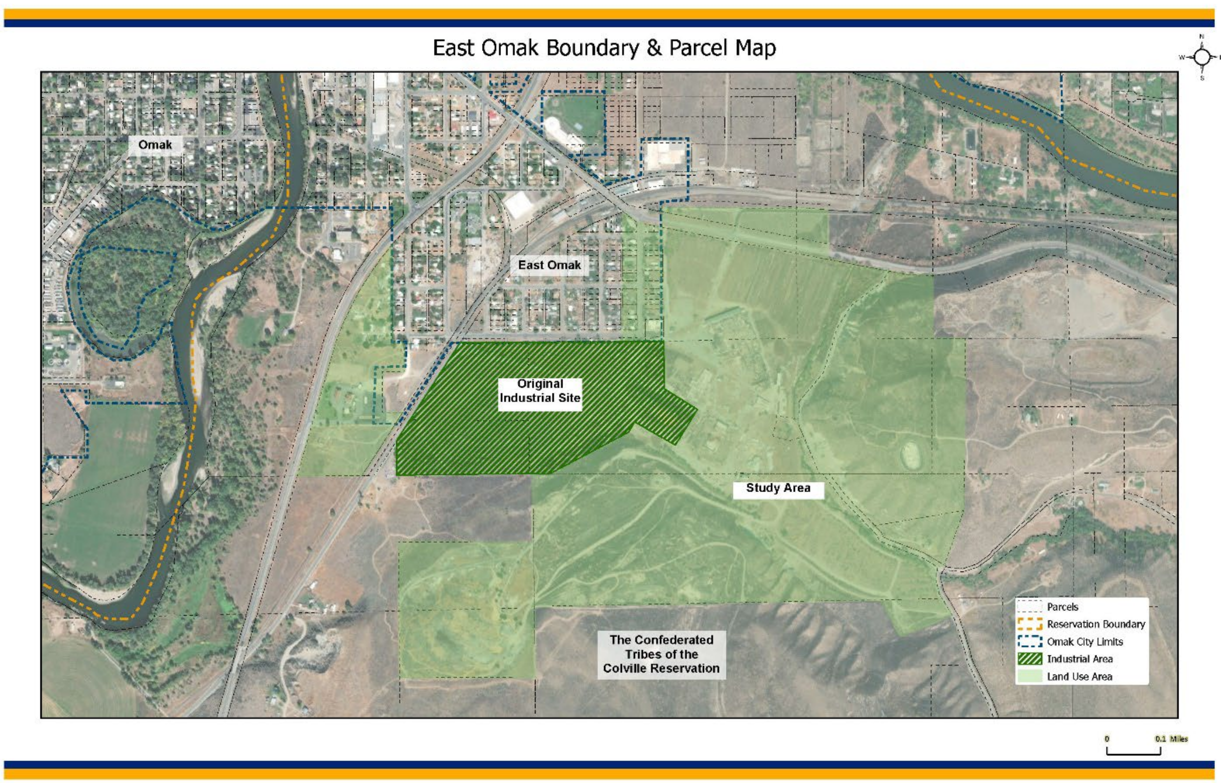


Figure 1. Overall Study Area

1.2 Report Content and Organization

This report includes a summary of existing conditions, market and industries study, and development alternatives regarding the site. Further analysis is also found in the Appendix:

- Appendix A: Map Portfolio
- Appendix B: Market and Cluster Study - a market and industry cluster analysis with identified market industries to locate on site;
- Appendix C: Transportation Access Study - an analysis of the existing and potential future transportation system serving the East Omak site, including rail;
- Appendix D: Water Supply Assessment – an assessment of existing water system infrastructure available to service the proposed 386-acre East Omak Industrial Site at full buildout and improvements;
- Appendix E: Electrical Grid Assessment and Demand – an assessment of the existing serving utility, voltage, and grid capacity for the East Omak Industrial Site and current availability to build on-site and build option recommendations; and
- Appendix F: Wastewater Collection System and Treatment – a review of the current wastewater utility conditions and an alternatives analysis, which explores different options for the construction of a new wastewater treatment plant (WWTP) to serve East Omak, the 12 Tribes Omak Casino Hotel, and the proposed future commercial developments.

2 Existing Conditions Summary

This chapter provides the overall findings and conclusions regarding the site's existing conditions. The area land uses, transportation network, water supply, electrical grid, and wastewater systems are assessed to provide context into the readiness of the East Omak site to be developed. This provides a baseline for better understanding the gaps in infrastructure and services for potential future development. An overall map of the existing utilities, critical areas, and road network is provided in Figure 2.

2.1 Area Land Uses

The proposed *East Omak Industrial Site* development will be located south of 8th Avenue and east of the corridor shared by the Okanogan/Omak East Road (also known as Rodeo Trail Road) and the Cascade and Columbia River Railroad. To the east of the site lie several industrial uses that are accessed via Jackson Road or directly off SR 155 east of the Jackson Road intersection. The area south of the site is currently vacant. There is a residential neighborhood on the north side of 8th Avenue which includes the Colville Tribes Federation Corporation-Casino Headquarters. Further north is a variety of commercial uses along SR 155 and the East Omak Elementary School which lies between the Jackson Street intersection and the SR 20 overcrossing.

Figure 2. Existing Site Conditions, Infrastructure, and Critical Areas

2.2 Transportation Access Study

This section documents the analysis of the existing and potential future transportation system serving the East Omak site. The analysis included both the development and evaluation of options for developing an internal roadway system to provide access to future businesses located on the site, as well as any necessary improvements to the surrounding public street system that serves the site. Having a well-thought-out, multimodal transportation system to provide access to and circulation within the site benefits the community by providing ways for employees to get to work, resources and materials to reach manufacturers, and finished products to reach their intended markets. The system serving the site should be multimodal – that means serving more than just autos and trucks. As important as vehicular trips are, having safe, high-quality access for pedestrians, bicyclists, and/or transit opens up opportunities for reducing worker dependence on having a car. It would also accommodate future rail service on the site to provide more cost-efficient movement of completed products.

2.2.1 Existing Roadway System

The existing transportation system in the vicinity of the East Omak Industrial site includes two state highways, local roads, freight rail, and multimodal elements such as sidewalks. Key roadways include:

- *SR 155 (Omak Avenue)* – an Urban Minor Arterial and Highway of Regional Significance, this state highway runs east/west through Omak from Main Street to eastward beyond the city limits to other communities on the route to Grand Coulee and Coulee City.
- *SR 20/US 97* – an Urban Other Expressway and Highway of Statewide Significance, this state highway runs north/south through the study area. Via SR 20, the corridor connects the site to destinations to the east and west from Seattle to Idaho, and via US 97 to the north and south from the Canadian border to northern California.
- *Jackson Street* – a north/south Urban Minor Collector that links the project site with SR 155. There are limited sidewalks and no bicycle lanes on this two-lane road.
- *Garfield Street* – a north/south local road that connects the project area with SR 155. This street also provides a connection between the neighborhood north of the site and the East Omak Elementary School.
- *Hanford Street* - a north/south local road that connects the project area with SR 155. This street also connects to the East Omak Elementary School.
- *8th Avenue* – an east/west Urban Minor Collector that runs parallel to the northern site boundary and has an at-grade rail crossing between Edmonds Street and Okanogan/Omak East Road.
- *Highway 280 (Omak Riverside/Eastside Road)* – an east/west Rural Minor Collector north of the project site connecting SR 155 to various destinations east and north of the City of Omak including the Town of Riverside.
- *Dayton Street* – a north/south Urban Minor Arterial that connects SR 155 (Omak Avenue) to SR 20, providing the highway-to-highway connection that is not provided by a direct interchange between the two state routes.
- *Okanogan/Omak East Road* – a north/south Urban Minor Collector that links the project site to SR 20 further south via an intersection with the road that serves both the 12 Tribes Omak Casino and the Okanogan County Fairgrounds between Omak and Okanogan.

2.2.2 Traffic Volumes

Traffic data collected for this study focused on hourly and vehicle classification counts on the two state highways and AM/PM peak hour turning movements at eight study area intersections. Daily traffic volumes on SR 20/US97 between the Tribal Truck Stop and Dayton Street included approximately 9,200 vehicles. Hourly volumes were largely comprised of passenger cars and other smaller vehicles except during the very early morning hours which saw a higher percentage of trucks that were associated with freight movement. Daily traffic volumes on SR 155 between Jackson Street and Highway 280 (East Access Road) were about 4,400 vehicles.

Along with vehicle counts at the study area intersection, bicycle, and pedestrian traffic was also measured. The highest volumes occurred in the vicinity of SR 155 with Garfield and Hanford Streets and were largely associated with the school.

2.2.3 Crash History

Crash data was collected from the Washington State Department of Transportation (WSDOT) for the five years from January 1, 2018, through December 31, 2022. Only two intersections in the study area experienced reported crashes during this period – SR 20/US 97 at Dayton Street and SR 20/US 97 at the Tribal Truck Stop entrance. Crash rates calculated at these locations are within a reasonable range for a suburban/rural setting and do not suggest roadway geometric deficiencies. One fatal and one serious crash occurred at the intersection of SR 20 with Dayton Street. Both of these crashes involved pedestrians with contributing causes attributed to the pedestrian (either failure to yield to the vehicle or disregarding the traffic signal).

2.2.4 Transit Service

There are several transit providers in the Omak area, offering vital services that connect people and places within and across Okanogan County and beyond. Key transit operators serving the Omak area include:

- Okanogan County Transportation & Nutrition (OCTN) – private, non-profit service
- *TranGO*, Transit for Greater Okanogan (Okanogan County Transit Authority)
- Northwest Trailways Apple Line – intercity bus service
- People for People – non-emergency medical transportation broker

2.2.5 Bicycle and Pedestrian Facilities

There are limited bicycle and pedestrian facilities in the study area. SR 155 has intermittent sidewalks or widened shoulders coupled with areas with little or no shoulders for bicycle and pedestrian circulation. An improved sidewalk and wide shoulders are provided along the highway frontage adjacent to the East Omak Elementary School with crosswalks located on the west side of the Hanford Street intersection and the east side of the Garfield Street intersection. There are limited sidewalks or designated bicycle lanes on Jackson Street, and no sidewalks or bicycle lanes on 8^{th} Avenue, or Highway 280 but these functions can be accomplished on the wide shoulders that exist on both roads. Dayton Street and Okanogan/Omak East Road do not have sidewalks or bicycle lanes but do have narrow shoulders. Other local streets in the project area do not currently provide sidewalks or bicycle lanes and have minimal shoulders.

2.2.6 Freight Mobility

Freight mobility is an essential transportation function as the movement of commodities is essential to maintaining a strong economy. The street and highway system in the study area has been classified by WSDOT following the tonnage moved. SR 20/US 97 is classified as a T-2 facility (carrying between 4 million to 10 million tons of freight per year), while SR 155 is a T-3 facility (carrying between 300,000 and 4 million tons per year. US 97 is designated as a Truck Freight Economic Corridor.

A freight rail corridor is operated to/from Omak by the Cascade and Columbia River (CSCD) short-line railroad, linking the community to the BNSF railroad in Wenatchee on the south and a regionally significant intermodal terminal near the Canadian border on the north. This rail system is an integral part of the regional transportation system supporting freight mobility and includes both mainline and industry track service in Omak. The CSCD trackage has been designated as a Rail Freight Economic Corridor by WSDOT. There are two at-grade rail crossings in the study area (on 8th Avenue and Okanogan/Omak East Road). Track speed is 25 mph and there are generally two trains per week with 20 to 30 cars each.

2.2.7 Traffic Forecasts

Traffic volume forecasts were prepared for AM and PM peak hour conditions for the 2045 horizon year. The future traffic volume forecast includes baseline traffic growth not related to the development of the East Omak Industrial site as well as “pipeline” development projects. For the baseline traffic growth, historical rates of traffic growth on SR 155 and SR 20 were evaluated. Based on this evaluation a 0.5 percent annual growth rate (non-compounded) was selected and applied to existing traffic counts for all intersection movements except north/south through trips on US 20. Historic through-traffic growth on SR 20 exhibited a rate of about 1.5 percent per year. This rate was applied to the north/south through movements at study area intersections on SR 20.

Traffic associated with the pending “pipeline” development of the Colville Clinic, Wellness Center, and Head Start program was added to the baseline traffic projections using the information provided in the project’s February 2021 *Traffic Impact Analysis*.

2.2.8 Traffic Operations

Based on existing and projected future traffic volumes at study area intersections, analyses were conducted to identify any deficiencies for AM and PM peak hours in the 2023 base year and the 2045 horizon year. The analysis was conducted based on methods in the *Highway Capacity Manual* that calculate the extent of delay expected at study area intersections (give their peak hour volumes, traffic control, and lane channelization). This delay is then correlated with various levels of service from A to F that are used to determine when physical or operational improvements should be made. The threshold for improvement adopted by the City of Omak is Level of Service (LOS) D.

The operational analysis results of the study intersections for the AM and PM peak hours are provided in Table 1. The LOS analysis worksheets are included in an appendix to the full Transportation Access Report in Appendix C.

Table 1. Intersection Level of Service Results

		Existing 2023		Baseline 2045	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Highway 280	TWSC[1]	B (10.3)	B (12.8)	B (13.6)	C (20.1)
	Roundabout	--	--	A (5.7)	A (6.6)
SR 155 at Jackson Street	TWSC[1]	B (10.2)	B (10.8)	B (11.9)	B (13.7)
SR 155 at Hanford Street	TWSC[1]	B (11.8)	B (10.7)	B (13.5)	B (12.1)
SR 155 at Garfield Street	TWSC[1]	B (13.5)	C (15.9)	C (17.2)	C (20.4)
SR 155 at Dayton Street	TWSC[1]	C (18.4)	C (23.3)	C (24.6)	**F (72.3)**
SR 20/US 97 at Dayton Street	Signal	A (9.8)	B (10.8)	B (12.5)	B (15.8)
SR 20/US 97 at Tribal Truck Stop	TWSC[1]	B (12.5)	B (14.4)	B (14.8)	C (18.5)
Okanogan/Omak East Road at 8th Avenue E	TWSC[1]	A (8.6)	A (8.9)	A (8.7)	A (8.9)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

As shown in the table, all study area intersections are currently operating at LOS C or better during the AM and PM peak hours. By 2045 with baseline traffic growth, all intersections continue to operate at LOS D or better except for the 2045 PM peak hour at the intersection of SR 155 with Dayton Street. This intersection is expected to drop to LOS F resulting in unacceptable delays for side street traffic on Dayton Street. This finding indicates that improvements at this intersection will need to be considered in the longer-term future. The table also shows the operational effect of adding a roundabout at the intersection of SR 155 with Highway 280 as is currently proposed by WSDOT. This improvement would provide added capacity to accommodate long-term growth but may be more beneficial from the standpoint of reducing travel speeds as vehicles enter the community.

2.3 Water System Assessment

This section provides an overview of the existing water systems for the City of Omak, Colville Confederated Tribes, and deficiencies in those systems.

2.3.1 Site Conditions

A pump house booster station owned and operated by the CCT exists southeast of the Okanogan-Omak East Road and 8th Avenue intersection. The booster station ties into the city system via a water main that runs from the booster station north and connects to the municipal system. Currently, the booster station only serves the Colville Tribal Federation Corporation's owned and operated 12 Tribes Casino Hotel to the south.

Southeast of the booster station is the City of Omak's OWP Well Number 2. The Well was originally constructed to serve the CIPV site via a 20-inch main that has since been put out of service after the closure of the CIPV. Currently, the well is owned by the CCT and operated under a lease by the City of Omak.

2.3.2 CCT System

Though the CCT possesses substantial water rights at the industrial site, no wells which are both active and independently CCT-owned exist at the site. Overall, the on-site CCT water system:

- Does not include active wells.
- Does not include water storage facilities.
- Is in a low-pressure zone of 96-psi with known fire flow issues.
- Available water rights not in use
- The booster station on site is owned by CCT but leased to the city.

2.3.3 City of Omak System

The City of Omak's Water System includes eight water sources, four storage facilities holding 3 million gallons of water, and three pressure zones. The East Omak neighborhood adjacent to the site is in the lower pressure zone but the study area is outside of the city's pressure zone. The city has available water capacity for providing water to the industrial site.

2.3.4 Deficiencies Summary

Several known deficiencies will need to be addressed to provide water to the industrial site, especially if tying into the city's water system:

- Lower pressure zones and insufficient fire flow
- Booster station maintenance issues
- Water hardness
- Lack of water sources on site
- City of Omak deficiencies identified in their Water System Plan

2.4 Existing Electrical System

This section summarizes the existing electrical system servicing the East Omak Industrial Site. The Colville Confederated Tribes (CCT) East Omak Industrial Site is serviced by the Okanogan Public Utility District #1, which receives its power from three primary sources, Bonneville Power Administration (BPA), the Wells Dam, and Energy Northwest. The East Omak Industrial Site has (4) Transmission lines located on or near the site.

As of June 2023, the East Omak Industrial Site has a standing power grid capacity of <1MW provided by Okanogan PUD #1; as the CCT Substation owned by the Colville Confederated Tribes and powered by BPA via Okanogan PUD #1 was destroyed in September 2021 by the Cold Springs Canyon fire and robbed of electrical conduit and equipment shortly thereafter. Before the damage and theft there existed a 115/13.8 kV Transformer Delta/Wye that provided 240V, 3-Phase and 120/208V, 3-Phase power to the site.

The nearest active substation (Omak Substation) is owned by Okanogan PUD #1 with a capacity of 20MW of which 15-25% on average is utilized monthly. Lastly, the East Omak Substation is operated by BPA and outside of the East Omak Industrial Site utility jurisdiction without operating the CCT-owned substation.

2.5 Wastewater Systems

This section includes the existing conditions assessment for wastewater systems servicing the East Omak area and the 12 Tribes Casino Hotel.

2.5.1 Existing Sewer System Details

CCT representatives provided information about an existing sanitary sewer line running from the 12 Tribes Omak Casino Hotel to a connection point with the existing sewer line in East Omak. There are known issues with the flow of sewage and odor from the Casino to the connection with the existing sanitary sewer at the intersection of 8th Avenue and the alley between Ferry Street and Garfield Street. This is also the wastewater tie-in location for the East Omak site used when the mill was previously operating. The line connection from 8th Avenue to the Casino does not include manholes but has periodic cleanouts.

2.5.2 Existing Conditions Summary

The existing sewer system presents challenges and constraints to tribal sovereignty that support the need for a new wastewater treatment facility to service East Omak, the 12 Tribes Omak Casino Hotel, and planned development areas. The ideal location for the WWTP, based on these existing conditions is Site 1, which was originally outlined in the 2011 Master Plan for Omak Business and Industrial Park Wastewater Treatment, as Option 2. Many factors exclude the other sites considered for potential wastewater treatment facility development. Those factors include issues with private property, archaeological sites, stringent EPA permitting requirements for river discharging, and proximity to the Casino.

Another consideration is the design and construction of the macerator and lift station by the 12 Tribes Omak Casino Hotel to address flow and odor issues impacting the existing sewer main from the Casino to East Omak. Any new WWTP is likely to necessitate design revisions for the lift station by PACE. The lack of available flow data from East Omak provided challenges when trying to calculate flow rates. All available data was gathered to inform our flow estimates for the area. The absence of available certified and experienced wastewater treatment facility operators is another important consideration for the type of treatment selected. All these factors and constraints will be considered when determining what type of wastewater treatment system will best suit the estimated future needs of the CCT.

3 Market Analysis and Industry Study

This chapter provides the Confederated Tribes of the Colville Reservation (CCT) with an updated market analysis and target industry study for the CCT’s East Omak Industrial Site and Business Park. Before this study, the CCT completed a 2011 Master Plan which included a detailed market study and industry analysis for the site. This previous work included a baseline demographic and employment analysis, as well as recommendations for targeted industries based on regional real estate conditions and the site’s competitive advantages or opportunities for future investment and development.

Despite the Master Plan having been completed nearly 12 years ago, many of its recommendations are still relevant today. However, the permanent loss of the Colville Indian Plywood and Veneer Plant (CIPV) in 2017 has certainly altered the market for the site, and in the wake of COVID-19, it is important to understand how the broader regional market conditions have changed. To provide the CCT with a better understanding of current market conditions and assist them in marketing the site to potential customers interested in locating their business in East Omak.

3.1 Introduction and Background

3.1.1 Site Context

The East Omak Industrial Site is located within the CCT Reservation in Okanogan County (shown in orange). It is east of US 97 and south of WA 155. US 97 stretches from Weed, California to Canada, while WA 155 connects Omak to Grand Coulee and the Coulee Dam.

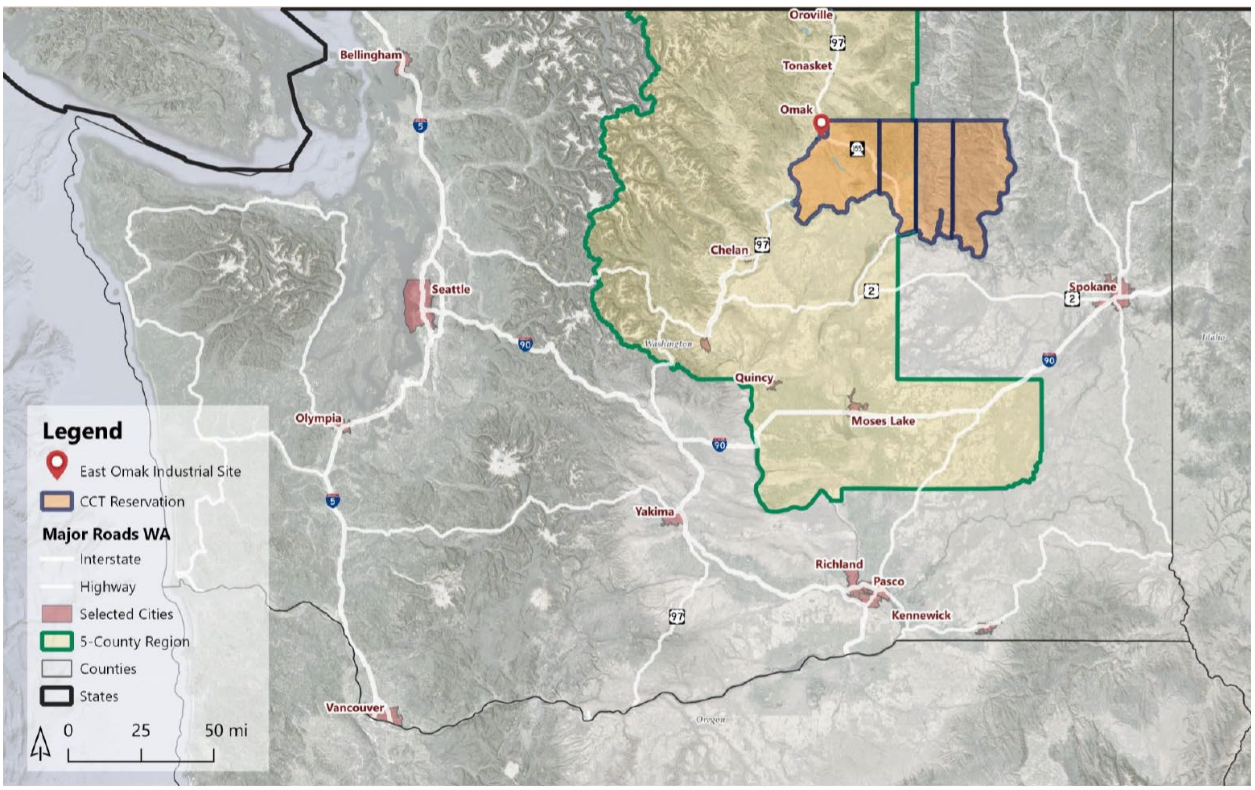


Figure 3. Market Context

The site is adjacent to the Tribal Trails Truck Stop and about 2 miles north of the 12 Tribes Omak Casino Hotel.

3.1.2 Past Planning Efforts

The East Omak Industrial Site has been the subject of recent planning efforts, including the 2011 Master Plan discussed previously, conducted before the loss of the former mill. The conclusions of that plan have informed the current process, updated to reflect the new realities of the site and regional economy post-fire and post-pandemic. Several other regional and tribal plans relating to economic development in the area were reviewed in developing recommendations for the site, including:

- CCT Comprehensive Plan 2020-2040
- CCT Comprehensive Economic Development Strategy (CEDS) 2017-2021
- North Central Washington Economic Development District (NCWEDD) Comprehensive Economic Development Strategy (CEDS) 2022 Annual Update
- 2020-2024 North Central Regional Workforce Plan
- 2017 Okanogan Economic Recovery Plan
- 2019 Greater Omak Area Comprehensive Plan Update
- 2021 Okanogan County Comprehensive Plan

The previous market and industry analysis for the site identified the following recommended industries:

- Wood products (construction materials cluster)
- Food products (processed food cluster)
- Recreational and travel vehicles (prefabricated enclosures cluster)
- Power generation and transmission cluster (including renewable energy)
- Metal manufacturing cluster
- Plastics cluster

Some of these recommendations are still relevant, such as food products, which reflect the agglomeration of value-added fruit manufacturing in the area, as well as prefabricated enclosures manufacturing. However, wood products and power generation are less relevant industry recommendations today since the closure of the Power & Veneer (CIPV) plant and the loss of the existing mill on the site. The study also identified several advantages and disadvantages of the site which can provide useful perspective and informed the SWOT Analysis found later in this report:

- Lack of specialized local labor force
- Absence of commercial air services
- Potential capital from the Economic Alliance and North Central Washington Business Loan Fund
- Opportunity for a business-friendly environment through tax advantages of operating on reservation lands
- Potential for several uses on the site due to its size.

The East Omak site has been the subject of several previous planning efforts and is identified as an important site in other regional planning efforts as well. Although the realities of industrial development on the site have changed significantly over the past decade, many key elements and goals of past plans remain relevant. Past community engagement efforts by the CCT and external consultants have found community support for site improvements, new job creation, job training, and industrial uses that further tribal sovereignty.

Figure 3 presents a SWOT analysis based on the project team's review of background information on the site as well as interviews conducted by Leland Consulting Group and SCJ Alliance with Tribal staff and regional stakeholders in May 2023. A SWOT analysis presents four categories of considerations that can help inform and clarify decision-making processes about the CCT's next steps in economic development investments: Strengths, Weaknesses, Opportunities, and Threats. Strengths and weaknesses are internal attributes to be considered or addressed, whereas opportunities and threats are external factors that can be leveraged or mitigated.

Strengths	**Weaknesses**
• Labor force, if use is agricultural, food processing, wood manufacturing • Transportation access at a regional scale is a strength – Hwy 97 provides access to both regional and national freight, as well as southeastern British Columbia - though site access needs to be improved • Existing broadband and fiber optic available on site • Access to capital for small businesses - Small Business Administration (SBA) funding available with Economic Alliance assistance; NCW Business Loan Fund • Post-high school education and workforce training programs at local universities • Quality of life for those that enjoy a rural lifestyle	• Lack of specialized labor force for more technical industries • Lack of commercial air services, and existing road access a challenge for freight • Utilities: Power and waste heat are no longer available due to the closure of CIPV, and water and wastewater capacity may not meet the needs of some business sectors • The business services sector – rural location not ideal for some companies • Lack of functional rail spur at the site location
Opportunities	**Threats**
• Local and regional housing shortages combined with a labor force with experience in construction and wood manufacturing • Potential to sell and showcase products made by local artists, artisans, and craftspeople, generating revenue and supporting the community • Proximity to an active international border crossing • Access to local agricultural products including fruits, legumes, grains, and timber • Sustained demand for data centers located in the NCW region • Lack of quality, modern industrial properties in the region, particularly warehousing and food processing & storage facilities	• Closure of CIPV reduces the advantage of locating wood products or bio-mass-to-fuel production facilities • The cost of power in neighboring counties puts the site at a competitive disadvantage • Disagreements of access to the existing well and servicing the site from adjacent PUD • Poor coordination within and between CCT stakeholder groups has led to ineffective marketing of the site

Figure 4. SWOT Analysis

3.2 Demographic and Economic Profile

The following section highlights the most prominent demographic and economic trends for the CCT and Okanogan County concerning neighboring counties and the State of Washington, as a whole. This context is important in understanding the competitive advantages or disadvantages of the East Omak Industrial Site and establishing market potential both now and in the future.

While the data shown below will further detail how this context has changed since the 2011 Master Plan was completed, below are some key takeaways from the past decade:

- Overall population has declined within the CCT Reservation, and growth has slowed countywide, since 2010.
- Median Household Incomes have increased by 90%, though rates of poverty in both the Reservation and Okanogan County have remained steady.

- Both the county and the Reservation have aging populations. Together with the impacts of COVID-19, the overall labor force has declined over the past decade.
- While agriculture, forestry, fishing, and hunting have maintained the highest rates of employment in the County, industrial jobs overall have declined since 2016, which is likely tied in part to the closure of the Colville Indian Plywood and Veneer Plant (CIPV).
- Growth in transportation and warehousing jobs between 2017 and 2020 in Okanogan County outpaced statewide growth.
- Housing growth has not kept up with the needs of the size of the workforce, further constraining workforce development opportunities.

PROFILE KEY FINDINGS

While the largest sectors of the economy have remained mostly unchanged since 2010, some key considerations may factor into the market appeal of the site.

- More, and diversified, employment opportunities will be important in attracting and retaining younger workers given the trends of population decline and an aging population in the county.
- The lack of housing options in the area may be a barrier to attracting large employers or a younger workforce.
- The level of education of the existing labor force is not well suited for attracting employers in advanced manufacturing or other highly specialized industries. Job training, potentially in partnership with a new employer, which focuses on increasing the skills of the local workforce may be an important consideration in attracting further industrial development.
- The existing workforce is well suited to the value-added food & beverage processing industries already prevalent in the county.

3.3 Regional Market Industry Analysis

The following section analyzes national and regional market trends that help to determine a baseline of market demand for the Omak industrial site.

The analysis is based on projected employment growth by industry, as well as existing or proposed industrial square footage, which together help estimate the approximate absorption of new industrial development in the region.

It should be noted that while these market trends may inform strategic decisions for the future of the site, they should not be considered the only possibilities for development. Market data in rural areas tend to show slow, or moderate growth, especially in industries outside of the historical norm for the region. However, through proactive marketing and forward-thinking strategies, the CCT may be able to encourage other types of development that can meet their economic development goals.

3.3.1 Industry Cluster Analysis

The industry analysis paints a picture of slow to moderate growth within Okanogan County and the area surrounding the Omak industrial site. According to the market data, most of this growth can be expected to occur in the industries already with an active presence in the county, particularly in food & beverage manufacturing or processing, refrigeration and cold storage, and general warehousing. With moderate investment into the infrastructure readiness of the site, the development of a new industrial facility for these uses could be likely. Overall, the industry cluster analysis reveals:

- Nationally, warehousing growth is expected to slow but still outpaces other proposed uses.
- Food manufacturing is expected to see nationwide growth in employment annually through 2031
- Okanogan has a much smaller industrial footprint when compared to its neighbors in Grant and Chelan
- Okanogan industrial uses are primarily warehousing, cold storage, and food processing
- Okanogan County saw the highest growth rate for Transportation & Warehousing Jobs, from 2002-2020
- Okanogan County gained industrial jobs between 2002 and 2020 but lost jobs in manufacturing
- Okanogan County has a relatively low share of manufacturing jobs in the 5-county region
- Okanogan County specializes in natural resources
- The fastest-growing industries do not require industrial space
- There is no obvious industrial sector CCT should be pursuing
- Leisure & Hospitality is the fastest-growing industry in North Central Washington
- Continued growth in Food and Beverages Manufacturing
- The majority of industrial rentable building area (RBA) in North-Central WA is in Grant County
- Okanogan can expect to absorb additional food manufacturing and warehousing by 2030

The closure, and subsequent removal, of the wood mill on the site has changed some of its market outlook. Without an active rail spur or wood manufacturing facility, there is not strong enough demand in the market, or locational advantages for the site, to suggest a high likelihood of a new rail-user or wood manufacturing facility location on site. That said, as the following section on connectivity and freight states, the CCT may be able to attract potential freight users through active marketing and partnership development for the site, in which case the CCT should maintain their ability to reactivate the rail spur in the future.

One of the most highly active markets for new industrial development in the region is data centers and colocation facilities. However, nearly all of this activity has been in neighboring Chelan and Grant Counties, in and around the Wenatchee and Quincy area. Access to reliable and cheap power is the major driver of locating these facilities, and while Okanogan County does not currently have any data centers, some of these same competitive advantages are present on the Omak site, and it is not unrealistic to expect a data center could locate there were investments made to provide adequate infrastructure.

3.3.2 Incentives and Connectivity

There are multiple incentives and connectivity options for the CCT to consider for the East Omak Industrial Site.

FOREIGN TRADE ZONE (FTZ)

Omak Business Park & Foreign Trade Zone was named an NCWEDD priority project in 2019.
2019 Project description: The development of the Colville Tribes' Business Park to include a biomass-to-energy operation, foreign trade zone, and technology businesses will support the preservation of

Eastern Washington forests, increase access to living wage jobs in an area adversely impacted by a mill closing, and will improve Washington's resiliency.

The Omak FTZ was never formally registered but could be in the future if it would incentivize the types of businesses CCT would like to see. The advantages of a FTZ include foreign and domestic merchandise that may be moved into zones for operations, not otherwise prohibited by law, including storage, exhibition, assembly, manufacturing, and processing. Under zone procedures, the usual formal Customs and Border Patrol (CBP) entry procedures and payments of duties are not required on the foreign merchandise unless and until it enters CBP territory for domestic consumption, at which point the importer generally has the choice of paying duties at the rate of either the original foreign materials or the finished product.

FREIGHT RAIL – CASCADE & COLUMBIA RIVER RAILROAD

Cascade & Columbia River Railroad (CSCD) runs adjacent to the site (owned by Genesee & Wyoming, Inc., formerly owned by RailAmerica). CSCD is a short-line railroad (Class III), which provides collector/distributor services for larger railroads. It operates 145 route miles. A rail spur formerly served the East Omak site, but it has been removed and would need to be rebuilt to accommodate rail-supported industrial uses.

The CSCD connects Omak to Wenatchee to the south to Oroville at the Canadian border and hauls forest, agricultural, and mineral products. It runs concurrently with a trucking route along 97 until Omak. At this point, the CSCD rail is the only freight connection with Oroville.

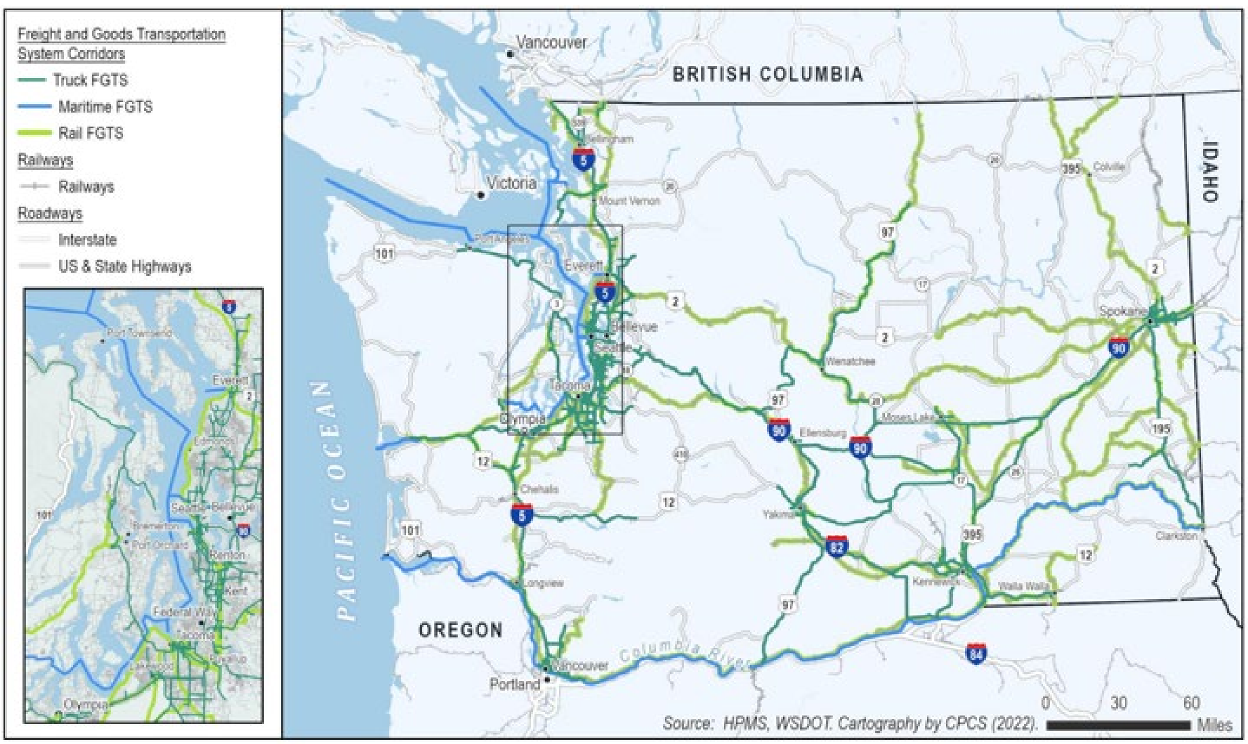


Figure 5. Freight Transportation System Corridors, 2022

As of 2017, the freight rail system in WA moved 42.8 million tons of cereal grains and other agricultural products, accounting for 35% of total statewide rail shipments. The CSCD rail line carries between

100,000 and 500,000 tons of freight per year. It provides a direct connection from North Central Washington to the freight cluster at Wenatchee.

Freight rail tonnage in Washington has been increasing over the past several years, reaching 128 million tons in 2017, up from a low of 103 million tons in 2012. The state's moderate forecast for 2040 predicts that 216 million tons of freight will be moved by rail in Washington. A labor shortage in the trucking industry could result in increased reliance on rail for freight movement.

AGRICULTURAL FREIGHT IN NORTH CENTRAL WASHINGTON

Wenatchee is a minor freight rail cluster in Washington, which connects by truck and rail to larger clusters in Seattle and Spokane. Agricultural and other goods traveling from North Central Washington by truck and rail to Wenatchee pass the industrial site in East Omak via rail and/or Highway 97. There are no other freight routes to Wenatchee from the north. Highway 97 is not a major trucking route. In 2019, it had a truck volume of under 2,500 trucks. It has far fewer truck parking locations and facilities than other Washington highways. The two private truck stops located in Omak are the only ones on Highway 97 between Wenatchee and the Canadian border.

According to Washington's 2022 Freight System Plan, wheat (a major agricultural product in central and eastern WA) typically travels less than 20 miles to a grain elevator for storage until it can be moved by train. However, wheat production is concentrated in Southwest Washington.

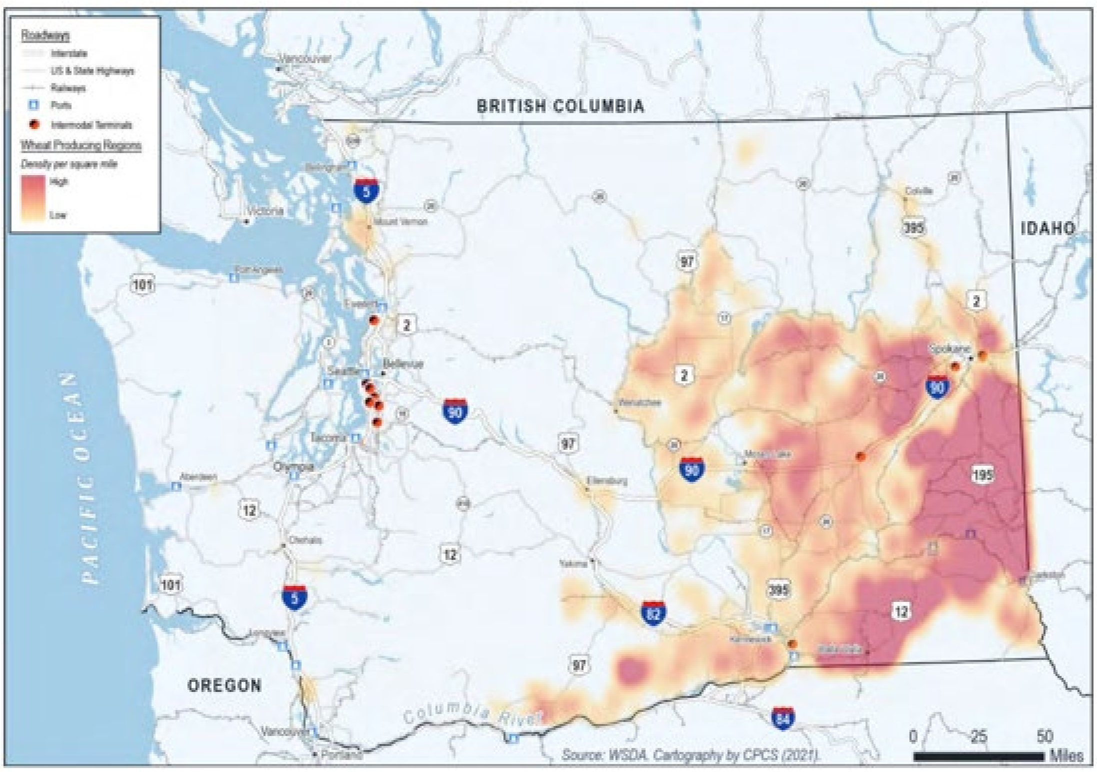


Figure 6. Grain Production in Washington, 2021

As of 2017, Okanogan County ranked 6th in the state for crop production. It ranked 4th for the production of fruits, tree nuts, and berries and 18th for grains, oilseeds, dry beans, and dry peas. 8,597 acres of county land are dedicated to wheat production for grain. These agricultural products are typically brought by truck to the CSCD rail facilities, where freight trains transport them to larger markets. There is currently a grain elevator in Brewster, south of Omak, and an intermodal facility at Oroville, near the Canadian border.

RAIL SPUR ANALYSIS

Inexpensive goods like grains and other agricultural products as well as high-end goods like cars are the most amenable to rail freight. The CSCD railroad is the only connection to the hub at Wenatchee from the north. There may be an opportunity to build an intermodal facility or agricultural goods warehouses adjacent to the rail spur in East Omak if it is rebuilt. However, CCT should first determine whether it can attract enough freight volume to justify a regular train stop at this site. If rail-using facilities are unlikely to locate on-site, the Tribes may choose to de-prioritize rebuilding the rail spur.

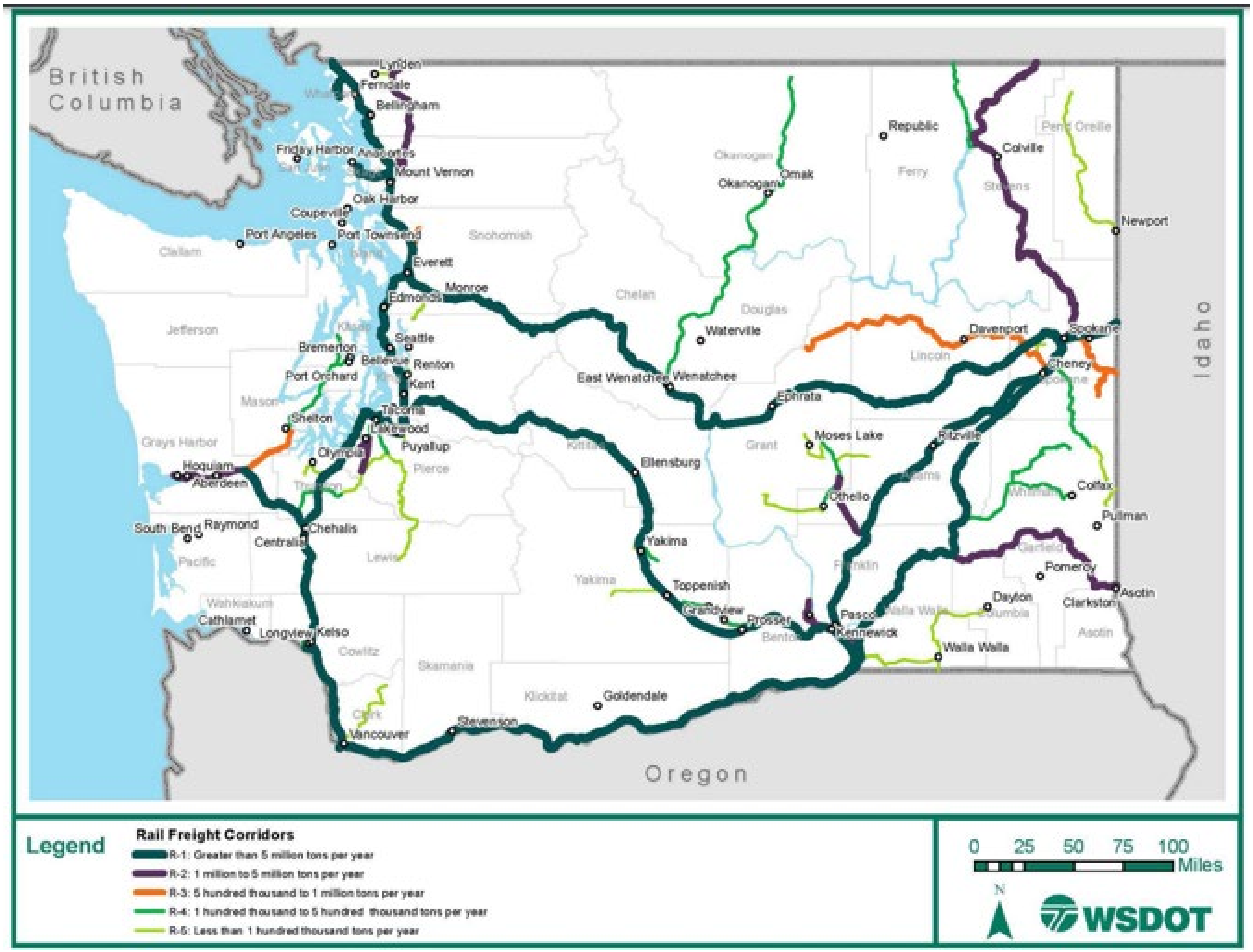


Figure 7. Rail Freight Corridors in WA, 2021

Because Okanogan County is a top producer of fruits, tree nuts, and berries, agricultural processing, and storage facilities should focus on these types of crops rather than grain. If CCT decides to rebuild the rail spur, it could consider leaving some portion of adjacent land vacant so that it is available to host a rail-dependent use in the future.

OROVILLE

Among the border crossings into Canada located in Washington and Idaho, between 2016 and 2023 the top three crossings for truck freight (measured by Truck Containers Loaded) are Blaine and Sumas in Whatcom County and Eastport, Idaho.

Oroville, just north of Omak, is the fourth busiest, with 128,695 Truck Containers Loaded passing through the border between 2016 and 2023. Between May 2022 and April 2023, 544.6 million pounds of freight (worth $1.156 billion) moved through the Oroville port. This freight was moved predominantly by truck. The top commodities by the total value that moved through the port include:

- Wood & Articles (404.8 million lbs., $244 million)
- Vehicles other than Rail (10.1 million lbs., $187 million)
- Computer Machinery & Parts (9.6 million lbs., $163 million)
- Special Classification Provisions (19.5 million lbs., $118 million)

Over that same period, 19.7 million pounds of edible fruits and nuts (worth $59 million) passed through the Oroville border crossing.

		Oroville	Ferry	Lynden	Boundary	SeaTac	Washington
May-22	Value	$103,680,000	$200,700	$89,560,000	$79,360,000	$69,600,000	$71,019,000,000
	Pounds	52,673,951	0	3,029,213	114,514,603	742,405	76,218,988,496
Apr-23	Value	$84,820,000	$324,200	$80,370,000	$63,340,000	$133,900,000	$63,778,400,000
	Pounds	38,537,765	0	1,493,951	104,598,494	354,620	69,922,309,337
Change 2022-2023	Value	-18.2%	61.5%	-10.3%	-20.2%	92.4%	-10.2%
	Pounds	-26.8%	0.0%	-50.7%	-8.7%	-52.2%	-8.3%
Last 12 Months	Imports ($)	$588,170,000	$2,290,190	$63,900,000	$681,400,000	$302,900,000	
	Exports ($)	$567,370,000	$2,381,000	$850,600,000	$800,000	$993,500,000	
	Truck (lbs)	544,353,291	12,123,391	113,550,221	766,954	6,414,114	
	Rail (lbs)	219,448	0	0	1,135,792,051	0	
	Air (lbs)	1,049	0	0	0	600,837	
	Other (lbs)	0	0	0	0	66	

Figure 8. Truck Freight in Washington
Source: Bureau of Transportation Statistics

The ports included in the table on the previous slide are shown in the map to the right. While the amount and value of freight moving through ports decreased statewide between 2022 and 2023, Oroville still processed nearly as much freight by value as Lynden, which is just off the I-5 Corridor.

While some products, like prefabricated housing, are more likely to travel within the United States rather than cross-border, the proximity of the East Omak site to the Oroville crossing could be attractive to industrial users who import and export parts and products.

TRIBAL TRAILS TRUCK STOP

According to anonymized cell phone location data provided by Placer.ai, in the 12 months leading up to June 2023, approximately 26,200 visitors stopped at the Tribal Trails Truck Stop a total of 94,000 times. 13.4% of these visitors came from Omak, 8% from Okanogan, 5.8% from Tonasket, 4% from Brewster, and 3.8% from Oroville. (Note: Placer AI does not track data from outside the US).

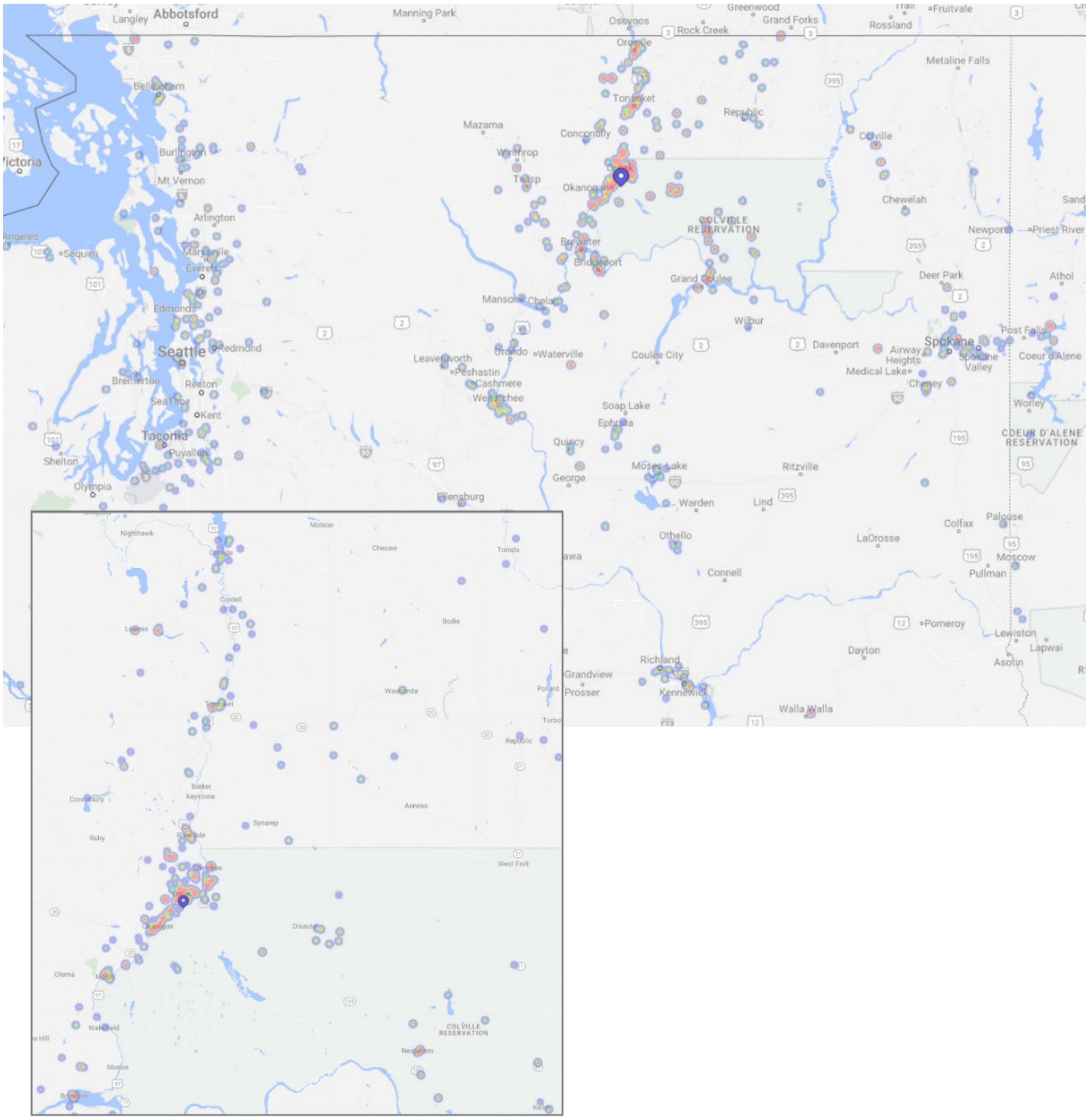


Figure 9. Visitor Data to Tribal Trails Truck Stop
Source: Placer.ai

While the truck stop's trade area extends to population centers in the Puget Sound and Spokane, the high percentage of visitors from the Tonasket and Oroville areas indicates substantial traffic flow from northern destinations. This, combined with border crossing data showing significant truck traffic through Oroville indicates that the industrial site is strategically located to take advantage of existing truck freight routes.

3.4 Targeted Industrial Uses

The following section analyzes specific industrial uses for consideration on the East Omak Industrial Site.

While “all the usual suspects” are present, like value-added food processing and warehousing, there are additional uses suggested based on compatibility with the site layout, as well as potential for local economic development and community resilience, both goals that have been stated by community stakeholders and Tribal Members.

Figure 10. East Omak Industrial Site in May 2023

Table 2 includes a summary of the pros and cons for each use based on market outlook, continuity with past plans, expected infrastructure needs, compatibility with the existing workforce, potential for job creation, environmental impact, and the potential to support Tribal sovereignty and community resilience.

Table 2. Targeted Industrial Uses - Summary Table

Use	Acres	Sq. Ft. RBA	Market Outlook	Infrastructure Needs	Existing Workforce Expertise	Tribal Sovereignty	New Job Creation	Environmental Impact	Continuity with Past Plans
Data Center	35	400,000	Medium-High	High	Construction only	Low	Low	Low-Medium	No
Craft Industrial	1+	8,000+?	Medium	Low	Yes	High	Medium	Low	No
Biofuel	7.5-45		Low-Med	High	Construction only	Low-Med	Medium	High	Yes
Flex Light Industrial	1.5+	12,000+	Medium	Low	Some	High	Medium	Low	Yes
Rail-Using Industrial	1.5-5	16,000-52,000	Low	High	Some	Low-Med	Medium-High	Medium	Yes
Wood Product Manufacturing	30-55	170,000-500,000	Low	Med	Yes	Low-Med	High	Medium-High	Yes
Value-Added Fruit Manufacturing	3-7	20,000-150,000	Medium	Med	Yes	Low	Medium-High	Medium	Yes
Solar Farm	1-100+	n/a	High	Low-Med	Some	High	Extremely Low	Low	No
Intermodal / Transloading Terminal	6-10	5,000-50,000	Low	Med-High	Some	High	Low-Medium	Medium	No
Warehousing	5-20	5,000-200,000	Medium-High	Med	Some	High	Low	Medium	No
Prefabricated Housing Cluster	4-7	70,000-122,000	Medium-High	Low	Some	High	Medium-High	Low-Medium	Yes

3.4.1 Data Center

Acreage / FAR	34.3 / 0.26
Transportation	Minimal road access is required after the initial build out
Infrastructure	Power needs of 60+ MW; Moderate water needs for cooling systems
Risk	Potential high-risk, high-reward due to infrastructure investment needs to attract long-term tenants.
Likelihood	Medium to High

MARKET OUTLOOK

More than 2 million sq. ft. of data center inventory has been built in Grant and Douglas counties since 2011 – mostly in Quincy and Wenatchee – with market rent per square foot as of Q2 2023 at an estimated $17.09-$20.89.

This growth represents steady demand for data center placement in North Central Washington. According to Datacenter Hawk's 2023 Data Center Market Recap, the US data center market is nearing full capacity, especially in major markets like Northern Virginia and Washington state, and "data center operators can't build facilities fast enough."

Lower cost of power within neighboring counties puts Omak at a competitive disadvantage in attracting data centers, however, these costs may be offset by special tax and business advantages available at the Omak site location.

In Central Washington, many communities are resisting future new facilities, as they are concerned about both the lack of significant jobs along with the related pollution with the current concentration.

Figure 11. Sabey Data Center - Quincy, WA, built in 2022

Pros	Cons
Compatible with neighboring uses	Fewer jobs than more traditional industrial uses

Potential to encourage other industry-adjacent users to the Omak area	Local workforce may not be compatible with employer needs; outside employment is a risk
Long-term outlook of data centers provides a sustainable source of revenue	Requires high investment in electrical capacity for site readiness
Fewer transportation needs compared to other potential uses	

3.4.2 Craft Industrial

Acreage / FAR	1+
Transportation	Road access is adequate, though would benefit from improved connectivity to the highway
Infrastructure	Low
Risk	Low-risk, high-reward due to low construction and infrastructure costs and potential to support local economic development and entrepreneurship; risk of failure without shared vision and management plan
Likelihood	Medium to High

MARKET OUTLOOK

Though difficult to account for market growth, thousands of craft industrial sites – often referred to as "makerspaces" – have emerged globally in recent decades, with a growing number every year, including the successful TwispWorks campus in nearby Twisp, WA.

Often community-based in nature, craft industrial sites have proven to be community assets that promote community resilience in times of crisis and help to grow a local entrepreneurial class.

Several other tribes elsewhere in the U.S. have organized maker spaces for tribal members, including new spaces opening soon at Nebraska Indian Community College campuses in Macy and Santee, Nebraska for experimentation and featuring traditional tools and modern engraving and 3-D printing equipment.

Figure 12. Whiteclay Makerspace – Whiteclay, NE

Pros	Cons
Compatible with neighboring uses - Meets a stated need by Omak area residents for creative space and fiber arts facilities	Smaller, incremental development – Not large-scale, employment-based
Strengthen community resilience through support for homegrown entrepreneurs and enterprise	Likely require initial investment by Tribes or another mission-driven investor – Not an outside investment vehicle
Market cultural identity through local business development	Ongoing management needs for sustained success

3.4.3 Bio-fuels Manufacturing

Acreage / FAR	7.7-45 acres
Transportation	Direct access to rail and improved highway access requirements
Infrastructure	High
Risk	High-risk, high reward due to high upfront investment costs and volatility of the biofuels industry
Likelihood	Low to Medium

MARKET OUTLOOK

Canola production in Central Washington, as well as forestry-related byproducts, provide a regional advantage in terms of access to some of the most common sources of biofuel production.

As of July 2020, Washington has only two major producers of commercially available biodiesel, with an annual production capacity of 117 million gallons per year; REG Grays Harbor, located in Hoquiam, WA, is the second leading producer of biodiesel in the United States.

Policy uncertainties and the volatility of oil prices have made biofuel a risky industry to invest in, with more than 9 biodiesel projects put on hold or canceled in Washington since 2008 alone.

Figure 13. SeQuential Biofuel Producer – Salem, OR

Pros	Cons
Complimentary to regional agricultural and forestry economy	Not compatible with neighboring residential uses
Potential to develop biofuel energy industry cluster around production facilities	Would require significant upgrades for access and re-opening of a rail spur
Single-user industrial development with a large number of jobs	Single user reduces the flexibility of future uses on site
Existing rail spur on site	

3.4.4 Flex Light Industrial

Acreage/FAR	1.5+ / 0.18
Transportation Needs	Does not need train access; Likely requires truck and car access to highway
Infrastructure Needs	Low

Market Risk	The ability to attract multiple tenants is market-dependent, but having a diversity of businesses can help protect against a major downturn. The quality of development will impact success. The Tribes' ownership model could help mitigate risks.
Likelihood	Medium to High

MARKET OUTLOOK

There are currently just 25 flex-industrial properties in the 5-county North Central Washington region.

Market rent per square foot as of Q2 2023 is $19.11, up 1.9% year over year. It is expected to reach $21.98 by Q2 2028.

There is currently a lack of flex space in Okanogan County, with the majority of flex space in the region concentrated near Wenatchee and Moses Lake.

Figure 14. Chelan Business Center built in 2018

Pros	Cons
Compatible with neighborhood uses	Incremental, leasing up over time
Provides space for small local businesses	Requires interest from multiple tenants rather than a single tenant
A mix of office and light industrial broadens the pool of potential users	Potentially higher tenant improvement costs than other typologies
Less resource-intensive than heavier industrial uses	

3.4.5 Rail-Using Industrial

Acreage / FAR	1.5-5 / 0.24
Transportation Needs	Direct adjacency to railroad spur; Truck access
Infrastructure Needs	Medium to High
Market Risk	Much of the existing freight in this region goes by truck rather than rail. Re-activating the rail spur could be costly and time-consuming, and there is a relatively small universe of industrial tenants reliant on rail access.
Likelihood	Low to Medium

MARKET OUTLOOK

According to CoStar, between Wenatchee and Riverside, there are 25 railroad-adjacent industrial properties. These include warehouses, manufacturing facilities, and cold storage facilities. No new railroad-adjacent industrial facilities have been built since 2019 along this rail corridor.

Just five of these railroad-adjacent industrial properties are located north of Wenatchee. The market rent per square foot as of Q2 2023 is $12.44, up 3.6% year over year. Rent is expected to reach $14.70 by Q2 2028.

There is an existing railroad-adjacent site on the Colville Reservation that formerly housed Colville Indian Power and Veneer. This site has remained unused since its closure in 2009.

Inexpensive goods like grains and other agricultural products as well as high-end goods like cars are the most amenable to rail freight.

Figure 15. Dolco Packaging Company – Wenatchee, WA, Built in 1964

Pros	Cons
Compatible with the local agricultural economy	Would require the reconstruction of the rail spur connection
There is an existing rail spur on site	Inflexibility regarding location on-site
The vacancy rate for rail-adjacent industrial properties is low and there is a lack of supply north of Wenatchee	The rail is privately owned – the owner has the ultimate decision-making authority regarding the rail spur
	Railroad rolling stock manufacturing is expected to see a 1.7% compound annual decline in wage and salary employment through 2031

3.4.6 Wood Product Manufacturing

Acreage / FAR	30-55 / 0.13-0.21
Transportation Needs	Truck access
Infrastructure Needs	Medium to high
Market Risk	While the wood product manufacturing industry is expected to see modest growth over the next few years, volatility in prices and increased wildfire risk in Washington are impacting the feasibility of new operations. Cross-laminated and mass timber products could be a growth area, but there are already nine of these facilities in the Northwest.
Likelihood	Low

MARKET OUTLOOK

The biggest opportunities in the timber industry currently are for mass timber products and other novel building materials. California-based Katerra announced the opening of a CLT factory in Spokane Valley in 2019, but it closed permanently in 2021 due to a combination of internal and logistics challenges.

Vaagen Timbers, based in Colville, WA, and Mercer Mass Timber, based in Spokane Valley, are now the only mass timber manufacturers in Eastern Washington. There are 7 additional CLT manufacturers based in OR, WA, ID, MT, and BC.

A 2018 report by the Beck Group for the State of Oregon estimated 8 to 12 typical-scale CLT manufacturing facilities to meet the expected demand from states in the Council of Western States Forester's region. Most of the CLT producers operate out of existing lumber manufacturing plants rather than building new ground-up facilities.

Figure 16. Vaagen Brothers Lumber – Colville, WA

Pros	Cons
The site is adjacent to the local logging industry	Omak lacks a direct highway or rail connection to existing forest product companies in the state
Existing workforce knowledge	Recent volatility in lumber pricing
A wood product manufacturing facility on this site could help reactivate the CIPV site in the future	Increase in fire season severity statewide pose a risk to timber-revenue forecasts
	Employment in the Wood Product Manufacturing industry is only expected to grow at a compound annual growth rate (CAGR) of 0.3% through 2031 in the US

3.4.7 Value-Added Fruit Manufacturing

Acreage / FAR	3-7 acres / 0.4-0.6 FAR
Transportation	Significant truck/traffic transportation is required. Could utilize rail but less likely due to cold storage needs.
Infrastructure	Existing fruit uses are reported to generate large amounts of wastewater. Some fruit manufacturing such as dehydration uses significant electricity. Refrigeration before processing would also require more power.
Risk	Moderate. Could be small or medium-sized, potentially adaptable to future alternative fruit uses, and existing potential workforce.

Likelihood	Medium (given existing agglomeration??)

MARKET OUTLOOK

Washington apple exports have decreased slightly in recent years due to weather and climate, but the state is still the #1 apple, blueberry, cherry, and pear producer in the U.S. Notably, the market for Canadian exports of apples has increased over the past several years according to the USDA.

Washington has seen an 11 percent increase in food manufacturing jobs and a 20 percent increase in food manufacturing firms between 2012-2021.

Most value-added fruit production takes place at relatively small-scale facilities, though there has been some consolidation and sales in the Washington market recently. For example, Chelan Fruit, itself a combination of four former cooperatives, is now owned by North Carolina-based International Farming Corporation.

Figure 17. Northwest Naturals Ross Manufacturing Facility, Selah, WA

Pros	Cons
Existing agglomeration of fruit manufacturing and packing in Omak	Climate change, natural disasters, and consumer preferences can shift the market for fruit products.
Production of fruit products near farming areas reduces transportation and storage costs.	Existing fruit packing and manufacturing is well established in Wenatchee and elsewhere.
Variety of options including packing, drying, snack bars, juice, etc. Some require refrigeration and others do not.	Potential issues with wastewater

3.4.8 Solar Farm

Acreage / FAR	"Community-Scale" 1-20 ac/<5mW "Utility-Scale" > 20 ac./ > 5mW Large farms in WA up to 1,800 ac.
Transportation	Very low impact after construction. Some are needed during construction.
Infrastructure	Would likely require additional power infrastructure to connect to the grid for transmission (depending on scale)
Risk	Potential for small or larger-scale solar on the site offers flexibility.
Likelihood	Relatively high given the flexibility of size, a strong market for recent projects in SE and SC Washington, and statewide renewable energy goals.

MARKET OUTLOOK

Solar energy is booming in Washington due to statewide goals of achieving carbon-neutral electricity production by 2030 and 100% clean power by 2045.

The Washington 2021 State Energy Strategy models suggest that electricity demand could grow 13-20% from 2020 levels by 2030 and 92% by 2050. By 2045, nearly half of Washington's energy use is expected to be from electricity, up from 21% today. Combined with the 100% clean power goal, this shows the expectation of continued demand for solar, wind, and other green energy sources over the next several decades.

Several large (80-100mW) projects are under construction near Yakima and even larger arrays have recently opened in Klickitat County, but there are not any large-scale active or proposed projects in North Central Washington. The area has a good outlook for solar production due to weather and location.

Figure 18. Adams Nielson Solar Farm, Lind, WA (28 mW / 200 ac / 4,000 homes)

Pros	Cons
Tribes could produce their energy for uses on the site and/or income by selling to the grid	Very few jobs are created after construction is complete (1-2 most likely)
A significant number of construction jobs and potential for revenue from land leasing.	Requires a significant amount of flat space which could be more profitable in other use
Solar siting here would not displace farmland or other habitat or environmentally constrained area	Other energy sources would still be required as a generation would fluctuate with weather, season, etc.

3.4.9 Intermodal/Transloading Terminal

Acreage / FAR	6-10 acres for a terminal. Can be combined with adjacent warehousing space (as shown above)
Transportation	High impact for road and rail, would require rebuilding rail spur and improving truck access to the site
Infrastructure	Relatively low for the terminal facility itself, some potential power considerations
Risk	May involve significant risk depending on the cost of rail improvements and interest from the railroad.
Likelihood	Low

MARKET OUTLOOK

Transloading from rail to truck is an integral part of the shipping business. There is a facility in Quincy but no such facility farther north in WA.

A current truck driver shortage is driving demand for these facilities, and rail transport in general at present, but may be a short-term trend.

Some facilities include large amounts of warehouse space for storage, including refrigerated storage. Could be combined with warehousing in some form.

Transportation and warehousing are a growing industry in Washington, with a 31% increase in jobs since 2012, and has increased significantly since the pandemic with the continued popularity of online retail.

Figure 19. Port of Quincy Intermodal Terminal, Quincy, WA

Pros	Cons
Capture some revenue from other industrial users in the area both on and off the site	Significant transportation needs for truck and/or rail, plus associated pollution
Capitalize on the existing rail spur and access to the railway, as well as the existing timber industry in the region.	Rail transportation is less cost-effective for fruit due to spoilage and refrigeration
	Location may be too remote to attract such a facility depending on the volume of freight/rail traffic

3.4.10 Warehousing

Acreage / FAR	5-20 acres, FAR 0.15 – 0.3
Transportation	High impact for road, would require new road and rail crossing to improve truck access to the site
Infrastructure	Potential moderate water and electricity usage, electricity could be higher if refrigerated.
Risk	Relatively low risk
Likelihood	Medium-High

MARKET OUTLOOK

Transportation and warehousing are a growing industry in Washington, with a 31% increase in jobs since 2012, and has increased significantly since the pandemic with the continued popularity of online retail.

The flexibility of warehousing uses provides opportunities for tribal use or leasing of space to other nearby industrial, agricultural, or transportation users.

Costar data indicates that the majority of warehousing space in the region, particularly non-refrigerated space, is relatively old.

Proximity to Canada could be beneficial if a FTZ is established on-site.

Figure 20. Gebbers Farms Cold Storage, Quincy, WA

Pros	Cons
Capture some revenue from other industrial users in the area both on and off the site	Significant truck traffic and the need for improved access to the site from the highway
Provide storage space for the community or other tribal businesses and improve the quality of warehouse space in the Omak area	Relatively few jobs were created compared to more intensive uses of the site.
One of the fastest-growing sectors regionally, refrigerated warehousing important for the regional fruit industry	Distance to major metros and interstate freeways may reduce demand.

3.4.11 Prefabricated Housing Manufacturing Cluster

Acreage/FAR	4-7 / 0.43
Transportation Needs	Truck access
Infrastructure Needs	Medium
Market Risk	Low to Medium. Competition with other prefab manufacturers closer to high-demand markets like Seattle, need for specialized labor that could be hard to find in North Central Washington.

Likelihood	Depends on whether CCT is interested in starting their own manufacturing business or whether they would try to attract an existing manufacturer.

MARKET OUTLOOK

Throughout Washington and neighboring states, there is a significant shortage of both housing and construction labor. Interest in prefabricated homes including manufactured homes, tiny homes, modular units, and other prefab housing has increased due to its ability to provide units quickly and at a much lower cost than traditional housing construction.

The prefabricated housing market is expected to grow at a CAGR of 4.8% through 2028, with North America expected to see the largest market growth over that period.

There are currently 7 prefabricated home manufacturers in Washington – four in the Seattle area, one north of Bellingham, one in Battle Ground, and one in Goldendale. There are no manufacturers in North Central or Western Washington.

Figure 21. Method Homes – Ferndale, WA, Built 2021

Pros	Cons
Using the knowledge and skills of the existing workforce, the Tribes could start their own prefab home manufacturing facility	The Tribes would likely need a loan or outside investment capital to build the facility and fund initial operations
Prefab housing could help meet local and regional housing needs while also providing jobs	Most existing prefab housing manufacturers in Washington are closer to high-demand markets
Modular homes can be built with wood fiber rather than old growth timber, making it more sustainable and eco-friendlier	Would likely require some highly specialized workers who would need to relocate to Omak

Given Okanogan County's existing share of the region's industrial market, as well as expected growth in both sectors, East Omak's "lowest hanging fruit" would be in food processing with accompanying refrigeration & cold storage space, along with more traditional transportation and warehousing facilities.

Bio-fuels manufacturing, once expected to be a major growth industry in the Pacific Northwest, has seen volatility in the market due to policy uncertainty and fluctuating oil prices. East Omak is competitively located to take advantage of the fuel sources needed to manufacture biofuels, however, there is not significant enough demand in the market to expect a bio-fuel business to locate on the industrial site without significant marketing and business development by the CCT.

All of the data center and colocation facilities in the region are located in Chelan and Grant Counties, with 12 facilities in Wenatchee and Quincy alone. However, this does not mean that Okanogan County will be unable to attract data centers in the future, but it will require active marketing and a substantial investment in power capacity to attract a user.

Growth in the solar energy sector is booming in Washington due to statewide goals of achieving carbon-neutral electricity production by 2030 and 100% clean power by 2045. If paired with a user that could take advantage of on-site power production, solar could be a beneficial use for the upper portions of the industrial site.

Finally, while not a large-scale use or major employer, there may be sufficient demand for utilizing a portion of the site through incremental investment into smaller flex-industrial spaces, or craft industrial/makerspace. This would help support local businesses and craftspeople and provide a pathway for Tribal-led enterprise development.

3.5 Uses Not Recommended in the Near Term

The following table outlines the reasons why specific uses are not being recommended in the following site program and strategic recommendations. While future market conditions may change, and therefore these uses should not be completely ignored as a potential future use, based on current market demand, infrastructure investment needs, and/or support for Tribal goals, these are not recommended in the near term.

Use	Market Reasons	Infrastructure Reasons	Tribal Reasons
Data Center	• Other counties nearby have better access to cheap power	• There is not sufficient electrical power currently on site • Constructing the infrastructure needed would be extremely costly and potentially politically difficult due to the Tribes' relationship with the utility	• Data centers do not generate enough jobs to justify the cost of necessary infrastructure
Biofuel	• The closure of the lumber mill and CTPV plant reduced the amount of byproduct available for biofuel production • Market volatility has reduced the likelihood of a new facility being constructed	• Significant Tribal resources would be required to prepare the site for biofuel production	• By-products of production could be hazardous to community health
Wood Product Manufacturing	• The market for wood products is weak, leading to the closure of lumber mills throughout the Pacific Northwest in recent years • Existing wood product facilities are sufficient to meet demand, with no new facilities constructed in recent decades.		

3.6 Site Program and Case Studies

Key findings from the above analysis were discussed with Tribal stakeholders, including the Tribal Business Council, which led to the development of a proposed site program. Proposed uses for the site include:

- Prefabricated housing manufacturing
- Craft/Flex Industrial
- Intermodal facility with adjoining warehousing
- Rail using industrial
- Retail

While all of these uses have been included on the following page, it must be stated that it is unlikely the entire program will be developed in the near-term. Rather, the program is a conceptual site plan representing a potential “full build-out” for the site. It is more likely the site will develop in a phased program, with the scale of new development dependent on active marketing and site preparation by the CCT.

Following the site program, the remainder of the report includes case studies for prefabricated housing and craft industries, as well as strategic recommendations to assist the CCT in their implementation of this site program.

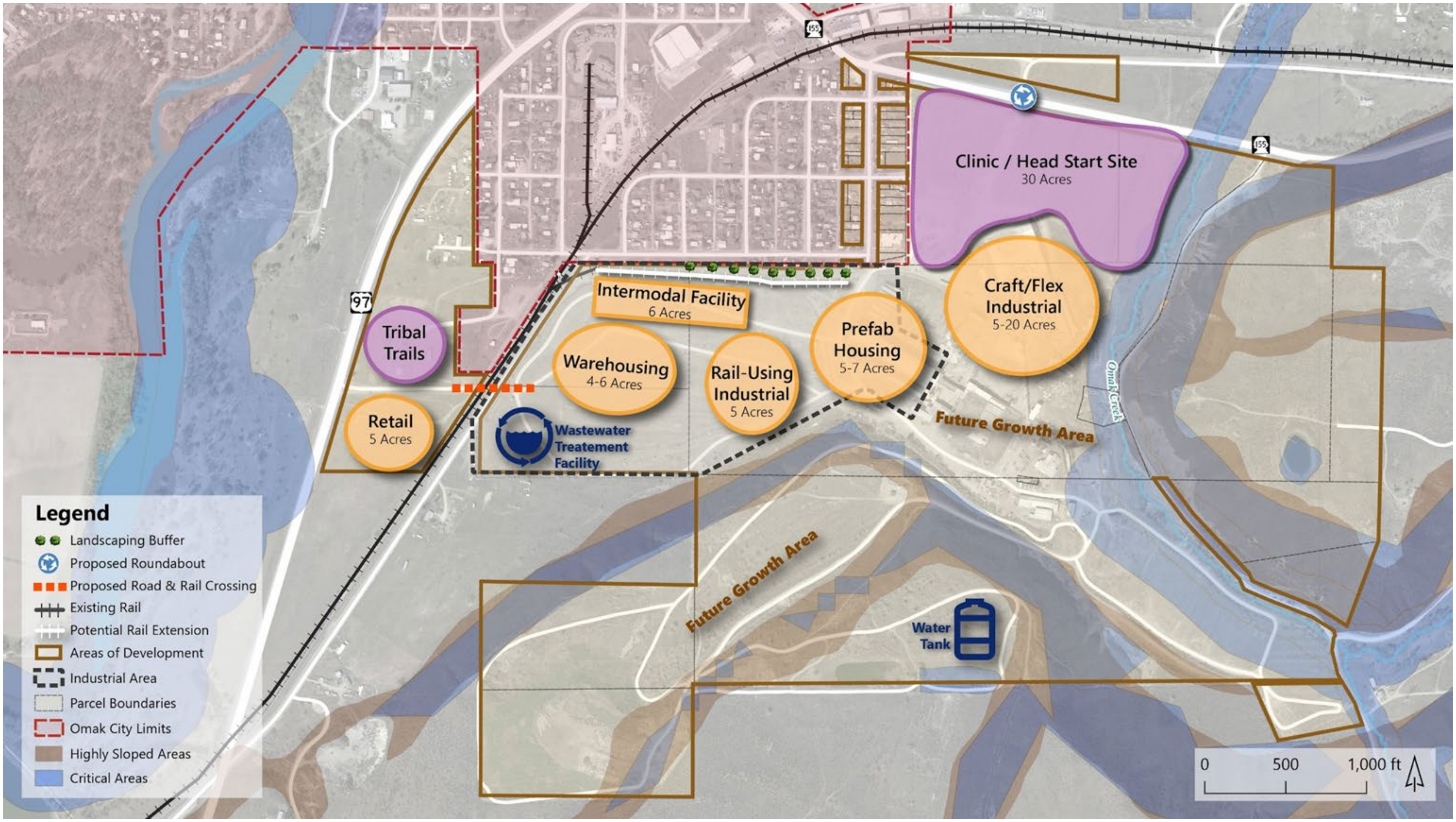


Figure 22. East Omak Industrial Site - Initial Market Proposed Site Program

4 Development Alternatives

This chapter applies the market findings in Chapter 3 to provide infrastructure development alternatives for the CCT to consider. Each alternative includes a no-build or no-improvement option as well as two to three development alternatives to provide options for the CCT. Planning level cost estimates are included as well to illustrate comparisons between each alternative in terms of up-front investment.

4.1 Land Use Assumptions

Based on the findings in Chapter 3, the consultant team estimated typical square footage, acreage, and build-out assumptions for the industrial site for each identified market use. The infrastructure alternatives assume the following parameters for land use development:

Table 3. East Omak Industrial Site Preferred Uses

PREFERRED USES	ACRES	LOW SF*	HIGH SF	SF ASSUMPTION	BUILDINGS ASSUMPTIONS FULL BUILD-OUT	TOTAL SF PER TYPE
PREFABRICATED HOUSING	4-7	70,000	122,000	122,000	1	122,000
INTERMODAL/TRANSLOADING	7-10	5,000	50,000	25,000	2	50,000
WAREHOUSING	5-20	5,000	200,000	100,000	2	200,000
FLEX LIGHT INDUSTRIAL	1.5+	12,000	25,000	25,000	25	25,000
CRAFT INDUSTRIAL (INFILL)	1+	8,000	35,000	35,000	1	35,000
RAIL-USING INDUSTRIAL	1.5-5	16,000	52,000	40,000	5	52,000
RETAIL	5	25,000	50,000	25,000	2	50,000

4.2 Transportation Alternatives

The transportation analysis was based on the preferred land use alternative presented in Chapter 3 and includes an assessment of three site-specific roadway alternatives. These alternatives included:

- *Alternative 1 - Minimum Transportation Alternative:* this alternative would be developed to support initial development on the site and would provide access only from the intersection of Jackson Street at 8th Avenue and from a new east/west road that would intersect Omak-Okanogan Road south of 8th Avenue.
- *Alternative 2 - 2011 Master Plan Transportation Alternative:* this alternative adds to the initial roadway development serving the site by connecting the two ends of the access roads constructed under Alternative 1. This full roadway connection through the East Omak Industrial site (Jackson Street Extension or Thoroughfare) can also serve other properties owned by the CCT which could be developed in the future.
- *Alternative 3 - Maximized Transportation Alternative*: this alternative would further build on Alternative 2 and incorporate additional connections to link the project area directly to SR 20/US97 across the railroad tracks.

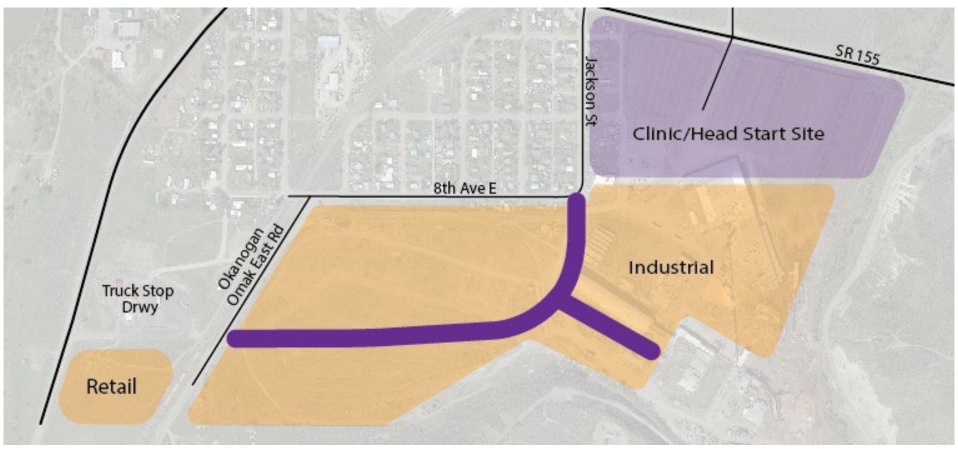
An illustration of these three alternatives is presented in Figure 23. Each of the transportation alternatives includes provision for active transportation with the provision of 12-foot wide shared-use paths along each side of the project's roadway 12-foot-addition, options were explored for the extension of freight rail service to and within the site to accommodate potential future land use that would benefit from the availability of this mode.

Analysis of transportation alternatives and improvement needs followed a four-step process that included:

- Trip Generation - estimation of future traffic volumes that would be attracted to the site.
- Future Year Forecasts – distribution of generated trips to the surrounding street network
- Evaluation of intersection operations with the three transportation alternatives
- Identification of impacts and deficiencies that would require improvements.

Figure 23. East Omak Industrial Site Access and Circulation Alternatives

Transportation Alternative #1



Transportation Alternative #2

Transportation Alternative #3

4.2.1 Trip Generation

Trip estimates were generated using ITE Land Use Codes for various industrial and/or retail commercial uses that could be expected to develop on the site. The trip generation rates that have been used are presented in Table 4.

Table 4. Trip Generation Rates

Land Uses	ITE Code	Unit	Daily Trip Rate	AM Peak Hour			PM Peak Hour		
				Trip Rate	% Enter	% Exit	Trip Rate	% Enter	% Exit
Prefabricated Housing	140	KSF	5.43	0.99	76%	24%	0.73	31%	69%
Intermodal Facility	30	Employees	6.90	0.84	47%	53%	0.69	52%	48%
Industrial Flex Space	110	KSF	7.97	1.00	88%	12%	0.73	14%	86%
Craft Industrial	110	KSF	5.20	0.79	88%	12%	0.54	14%	86%
Rail-using Industrial	140	KSF	8.82	0.85	76%	24%	0.43	31%	69%
Warehousing	150	KSF	1.96	0.36	77%	23%	0.38	28%	72%
Retail Commercial	822	KSF	54.45	2.36	60%	40%	5.97	50%	50%

Note: KSF means thousand square feet of development.

Table 5 applies the trip generation rates to the various land uses and assumed development potential to derive an estimate of total traffic that could be generated by the East Omak Industrial site during the long-term planning horizon year of 2045. Trip estimates were prepared for daily conditions and during the AM and PM peak of the adjacent street system.

Table 5. Preferred Land Use Alternative Trip Generation

Land Uses	Size	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
			Enter	Exit	Total	Enter	Exit	Total
Prefabricated Housing	122.0 KSF	629	89	28	117	26	58	84
Intermodal Facility	26 employees	171	10	11	21	9	8	17
Industrial Flex Space	12.0 KSF	91	10	1	11	1	8	9
Craft Industrial	35.0 KSF	173	24	3	27	3	15	18
Rail-using Industrial	40.0 KSF	336	24	8	32	5	12	17
Warehousing	100.0 KSF	186	27	8	35	10	26	36
Retail Commercial	25.0 KSF	760	17	12	29	42	42	84
TOTALS		**2,346**	**201**	**71**	**272**	**96**	**169**	**265**

As shown in the table, the preferred land use alternative is expected to generate approximately 2,350 daily trips with 272 occurring during the AM peak hour and 265 during the PM peak hour. For purposes of this report, the land use assumptions would remain constant for all transportation alternative scenarios.

4.2.2 Future Year Forecasts

To assess the effectiveness of the various transportation access alternatives, the trips generated by the Preferred Land Use Alternative were assigned to the surrounding street system. This assignment was then used to derive estimated AM and PM peak hour project-related traffic volumes at study area intersections which were evaluated to determine the need for transportation system improvements.

The trip distribution and assignment assumptions were based on engineering judgment and were developed in consultation with CCT. Site-related traffic distribution reflects the path each vehicle will take traveling to and from the site and is related to where customers would come from and where products would be shipped to. Vehicle directional trip distribution and assignment to and from the site will be influenced by:

- Current travel patterns on the area roadways as evidenced by existing intersection turning movement patterns;
- The locations of residential areas (for workers) and other commercial or industrial centers; and
- The proposed access system for the project

Table 6 presents a summary comparison of project-related traffic volumes along key segments of state highways in the vicinity of the East Omak Industrial Site and on streets internal to the site. This data will help facilitate a better understanding of the implications of project development along various transportation corridors and can be assessed for consistency with CCT aspirations for the site.

Table 6. Comparison of Project-Related Traffic

	2045 PM Peak Hour Volumes (2-Way)			
Roadway Segment	**Baseline**	**Alternative 1**	**Alternative 2**	**Alternative 3**
SR 155 east of Jackson Street	550	565	565	565
SR 155 west of Jackson Street	630	760	730	660
SR 155 west of Dayton Street	750	805	805	800
SR 20 south of Dayton Street	1,115	1,260	1,170	1,220
SR 20 north of Dayton Street	1,020	1,115	1,115	1,110
SR 20 south of Tribal Truck Stop	1,030	1,150	1,070	1,145
Jackson Street Extension east of Okanogan/Omak East Road	0	25	80	135
Jackson Street Extension south of SR 155	170	310	280	220
Jackson Street Extension east of SR 20	275	425	425	545

As noted in Table 7, 2045 PM peak hour traffic volumes on study area state highways would all increase with the addition of traffic generated by the preferred land use alternative. However, in all instances, the increase in traffic volumes would be less than 200 vehicles traveling in both directions. More significant increases would be expected in the internal roads within the project site. The most significant increase is expected on the internal truck stop road approaching SR 20 which could increase from about 275 two-way PM peak hour trips to nearly 550. However, it is anticipated that the existing channelization and traffic control could accommodate this increase. More detailed information about projected traffic volumes is included in the *Transportation Access Study*.

4.2.3 Analysis of Traffic Operations for Alternatives

Project-related traffic volumes for the three transportation alternatives were added to the future background projections associated with general community growth and intersection turning movement projections were developed for each of the three transportation access alternatives. As noted previously, the land use assumptions for the build-out of the East Omak Industrial site remain consistent with each of these alternatives. Analysis of traffic operational performance focuses on the 2045 AM and PM peak hours and expected deficiencies with each alternative have been identified.

Table 6 summarizes the results of operational analysis for both baseline (non-project or background) conditions and for the three alternatives during the 2045 AM peak hour, while Table 7 presents results for the 2045 PM peak hour.

As indicated in these tables, most study area intersections are expected to operate at acceptable levels of service during the 2045 AM peak hour. The exception would be at the intersection of SR 155 with Dayton Street where traffic turning left onto SR 155 (Omak Avenue E) from Dayton Street would experience unacceptable LOS E conditions with Transportation Alternative 1. This contrasts with results at the same intersection with Alternatives 2 and 3. Alternative 2 includes a direct connection across the project site allowing more traffic to avoid the SR 155/Dayton Street intersection by directing more traffic onto Okanogan/Omak East Road to reach destinations to the south rather than the circuitous route via SR 155. Alternative 3 provides a direct connection to SR 20 which distributes traffic even more effectively.

Table 7. 2045 AM Peak Hour Intersection Level of Service Results for Transportation Alternatives

		Baseline Alternative	Alternative 1	Alternative 2	Alternative 3
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Highway 280	TWSC[1]	B (13.6)	B (13.9)	B (13.8)	B (13.9)
	Roundabout	A (5.7)	A (5.7)	A (5.7)	A (5.7)
SR 155 at Jackson Street	TWSC[1]	B (11.9)	B (13.4)	B (13.1)	B (12.4)
SR 155 at Hanford Street	TWSC[1]	B (13.5)	C (16.5)	C (15.6)	B (14.1)
SR 155 at Garfield Street	TWSC[1]	C (17.2)	C (21.7)	C (20.2)	C (18.1)
SR 155 at Dayton Street	TWSC[1]	C (24.6)	E (41.8)	D (34.3)	D (26.5)
SR 20/US 97 at Dayton Street	Signal	B (12.5)	C (21.7)	B (13.5)	B (13.7)
SR 20/US 97 at Truck Stop	TWSC[1]	B (14.8)	C (16.6)	C (15.4)	C (19.0)
Okanogan/Omak East Road at 8th Avenue E	TWSC[1]	A (8.7)	A (8.7)	A (8.7)	--

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

Table 8 summarizes intersection operations analysis results during the 2045 PM peak hour. As shown, all study area intersections are expected to operate at LOS D or better except for the intersection of SR 155 with Dayton Street. During the 2045 PM peak hour, the northbound left turning movement is expected to operate at LOS F under baseline conditions and with each transportation access alternative. The magnitude of delay for conditions with the project is expected to be lowest with Alternative 3. This would occur due to both the through roadway on the site and the direct connection to SR 20.

Table 8. 2045 PM Peak Hour Intersection Level of Service Results for Transportation Alternatives

		Baseline Alternative	Alternative 1	Alternative 2	Alternative 3
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Highway 280	TWSC[1]	C (20.1)	C (20.8)	C (20.8)	C (20.8)
	Roundabout	A (6.6)	A (6.6)	A (6.6)	A (6.6)
SR 155 at Jackson Street	TWSC[1]	B (13.7)	C (18.5)	C (16.9)	B (14.9)
SR 155 at Hanford Street	TWSC[1]	B (12.1)	B (13.1)	B (12.8)	B (12.4)
SR 155 at Garfield Street	TWSC[1]	C (20.4)	D (25.0)	C (23.7)	C (21.2)
SR 155 at Dayton Street	TWSC[1]	**F (72.3)**	**F (281.6)**	**F (177.6)**	**F (94.8)**
SR 20/US 97 at Dayton Street	Signal	B (15.8)	C (32.0)	C (21.3)	B (17.7)
SR 20/US 97 at Truck Stop	TWSC[1]	C (18.5)	C (24.0)	C (22.2)	D (29.6)
Okanogan/Omak East Road at 8^{th} Avenue E	TWSC[1]	A (8.9)	A (8.9)	A (8.9)	--

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

4.2.4 Summary of Intersection Deficiencies and Improvement Needs

Based on the foregoing analysis, as well as an assessment of safety for pedestrians and bicyclists, the following deficiencies and improvements are needed to ensure high-quality and safe multimodal access and circulation for the industrial site. Improvement needs would include the following:

1. Monitor traffic at the intersection of SR 155 (Omak Avenue) with Dayton Street and implement mitigation when appropriate as the industrial site develops.
2. Provide or improve facilities to accommodate the multimodal needs of walkers and bicyclists including:
   - Develop a system of pathways along project site roadways that accommodate bicycles and pedestrians. For the purposes of this report, it is recommended that there be 12-foot shared-use paths along both sides of the street with a landscaped buffer area.
   - Consider adding sidewalks along Jackson Street between SR 155 and 8^{th} Avenue to provide safer pedestrian mobility, particularly with any increase in large truck activity along this street resulting from industrial development.

- Consider enhancements to improve safety for existing pedestrian crossings of SR 155 at the East Omak Elementary School such as proposed in the City's *Six Year Transportation Improvement Program* (TIP). These improvements could include the installation of more visible pedestrian crossing devices such as Rectangular Rapid Flashing Beacons (RRFBs) and/or school speed zoning when children are present. This may be particularly important as truck traffic to/from the industrial area increases. There is currently a project in the City of Omak's *Six Year Transportation Improvement Program* (2020-2025) that would install a high visibility crosswalk at the intersection of SR 155 with Garfield Street.

3. Monitor traffic at the intersection of SR 20 with the Tribal Truck Stop. As noted above, traffic operations with some level of cut-through traffic could approach LOS E and may require additional improvements such as the development of a roundabout or a traffic signal.

4.3 Water Service Alternatives

After evaluating the capacity of the existing City and CCT water systems, potential alternatives for water improvements were developed to meet the projected water system demand for the study area. This section illustrates and summarizes the alternatives. Due to time constraints, the level of detail and analysis was limited and should be considered preliminary.

The CCT expressed interest in combining the casino water system with the water system for the proposed industrial area. For the alternatives that combine the casino water system with the proposed industrial area water system, it was assumed that the existing pressures at the casino maintained.

The alternatives below assume that the proposed will not be required to have a fire suppression system. The CCT may require all buildings to have sprinkler systems meeting the fire flow requirements and therefore reduce the tank size considerably.

For fire storage requirements when connected to the city system, the required storage includes receiving 750 gpm from the city system for the duration of the fire. This is based on the fire flow analysis in the City's Water System Plan.

The tank sizing is approximate and should be analyzed during the final design for other volume requirements including operational storage and equalizing storage. Standby storage is assumed to be nested within the fire storage volume.

The opinions of probable construction costs are "rough order magnitude" costs based on very preliminary estimates of required capacity. The costs have not been adjusted for inflation. A 20% contingency was used. The costs assume design fees will be approximately 15% of construction costs.

4.3.1 Alternative A: City System – New Pressure Zone

This alternative extends the city system into the proposed development area and creates a new pressure zone within the city system. The new pressure zone is dedicated to the proposed development and does not change the pressures in the existing city system (lower pressure zone). The casino water system remains as is and without connection to the proposed industrial area.

The water system improvements needed for this alternative include:

- New connection to the city water system on 8th street: Assume connection to the new 12” water main being installed by the CCT.
- New booster pump station in connection to the city water system.
- A new 1.0-million-gallon water tank is located on the bench to the south of the industrial area.
- Distribution system: 12” water mains and 8” water service stubs.

See Figure 25 for a schematic of proposed improvements.

The booster pump station is necessary to provide the required pressures across the entire 386-acre development. It is anticipated the static pressure on the west end of the development is about 80 psi and the east end is about 40 psi. Higher pressures will be available with pump sizing and placing the storage tank slightly higher on the hill.

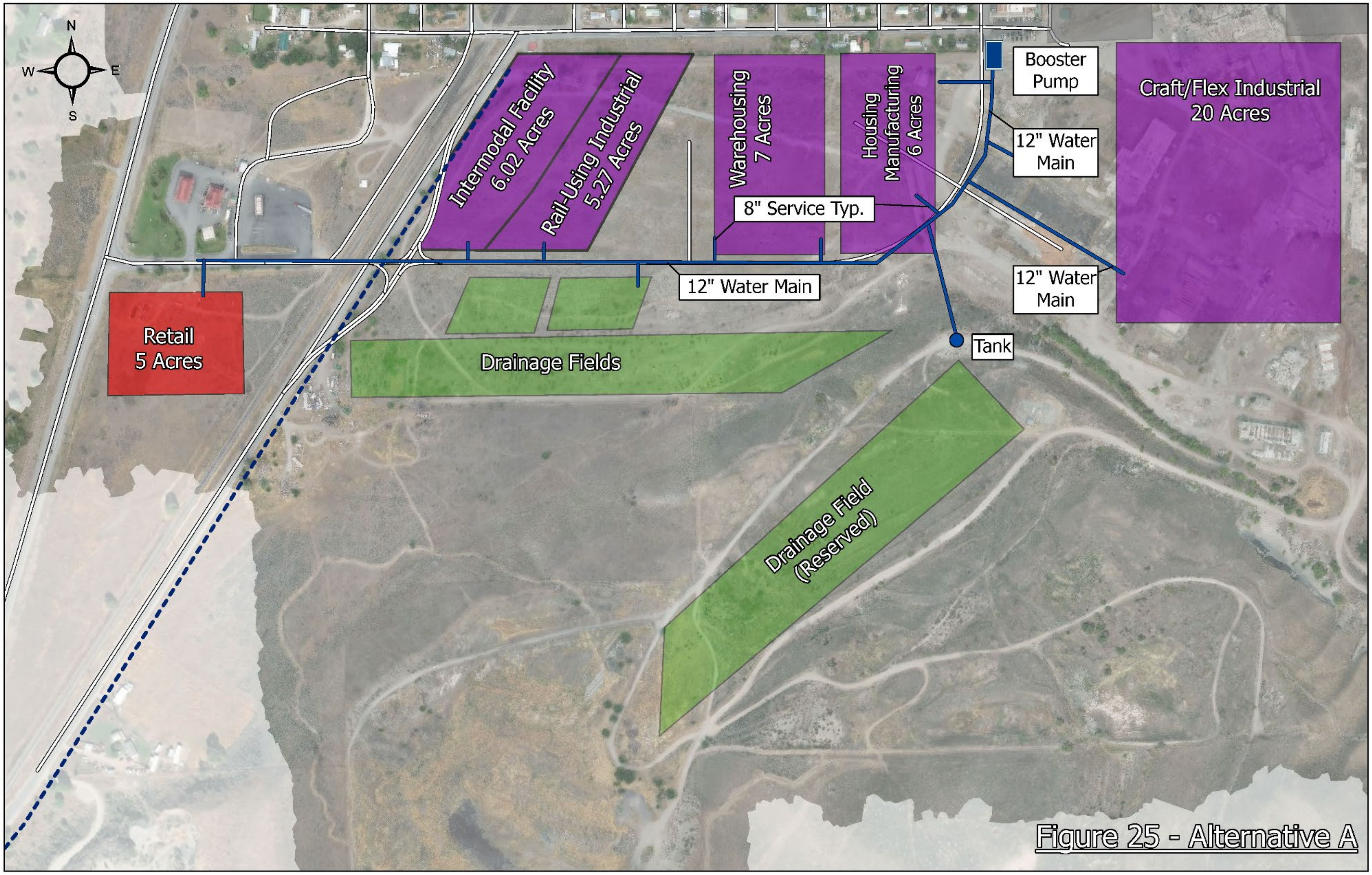
The new water tank will provide the required equalizing and fire storage for the industrial area. The storage volume is not available to the rest of the city water system.

ADVANTAGES

- Lower capital cost.
- The water system is maintained by the city.
- Design should reduce or eliminate the need for pressure-reducing stations.
- No new wells.

DISADVANTAGES

- The city may not accept the new pressure zone.
- Requires DOH approval of an amendment to the City Water System Plan.
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- A single connection to the city water system increases vulnerability should the booster pump or connection fail or require maintenance shutdown.
- Preliminary Opinion of Probable Construction Cost: $3 million.


N
W
E
S
Intermodal Facility
6.02 Acres
Rail-Using Industrial
5.27 Acres
Warehousing
7 Acres
Housing
Manufacturing
6 Acres
Booster
Pump
12" Water
Main
Craft/Flex Industrial
20 Acres
8" Service Typ.
12" Water Main
12" Water
Main
Retail
5 Acres
Drainage Fields
Tank
Drainage Field
(Reserved)
Figure 25 - Alternative A

4.3.2 Alternative B: City System – Extend City Lower Pressure Zone

This alternative extends the city system into the proposed development area by extending the existing lower-pressure zone. As has been noted earlier the water pressure and fire flows in the residential area just north of the proposed project area (8th & Jackson etc.) are low. The available fire flow of 750 gpm is not sufficient and the static pressures in the area are just below 40 psi. The required fire flow is not met in the new development area and the static pressures in the east end of the project area (380 acres) are likely close to zero psi (based on elevations from Google Earth). Although the new 12” water main being installed by the CCT on 8th Ave will improve available fire flow, it is anticipated that the static pressure will not substantially improve. The addition of a water storage tank in the project vicinity also addresses fire flow issues but does not address the pressure issue. As a result, this alternative is not recommended and was not developed further.

4.3.3 Alternative C: City System – Extend Casino Pressure Zone

This alternative extends the casino pressure zone into the proposed development area. Essentially upgrading the water service to the casino to provide water service to the proposed industrial area. The existing water service to the casino consists of a booster station near the connection to the water system on the 8th with a long water main south and slightly west of the casino. The water main is tapped south of the booster station and a new water main extended into the proposed industrial area.

Based on the existing information reviewed it appears the booster pump station is providing a discharge pressure of about 130 psi (96 psi discharge plus a static pressure in the city system). The existing drawings are interpreted as the total pressure on the discharge side of the pump is 96 psi. The booster station is located at an approximate elevation of 855 and the casino is at an approximate elevation of 975. Based on these elevations the casino has an existing water pressure of approximately 57 psi to 82 psi (depending on the interpretation of the pump discharge in the existing drawings). However, the pressures in the lower industrial zone are well above 80 psi (possibly over 100 psi) and therefore require pressure-reducing valves on each water service or a single large pressure-reducing valve where the new water main connects to the existing water main to the casino. If a pressure-reducing station was provided at the connection to the existing water main the storage tank would be located at the casino site to provide storage to both the casino and the proposed industrial area.

The water system improvements needed for this alternative include:

- Booster station upgrades: Replace domestic and fire pumps for increased demand, upgrade plumbing as needed.
- A new 1.0-million-gallon water tank is located at the top of the hill to the south of the industrial area or southeast of the casino.
- Distribution system: 12” water mains and 8” water service stubs
- Pressure reducing station(s)

See Figure 26 for a schematic of proposed improvements.

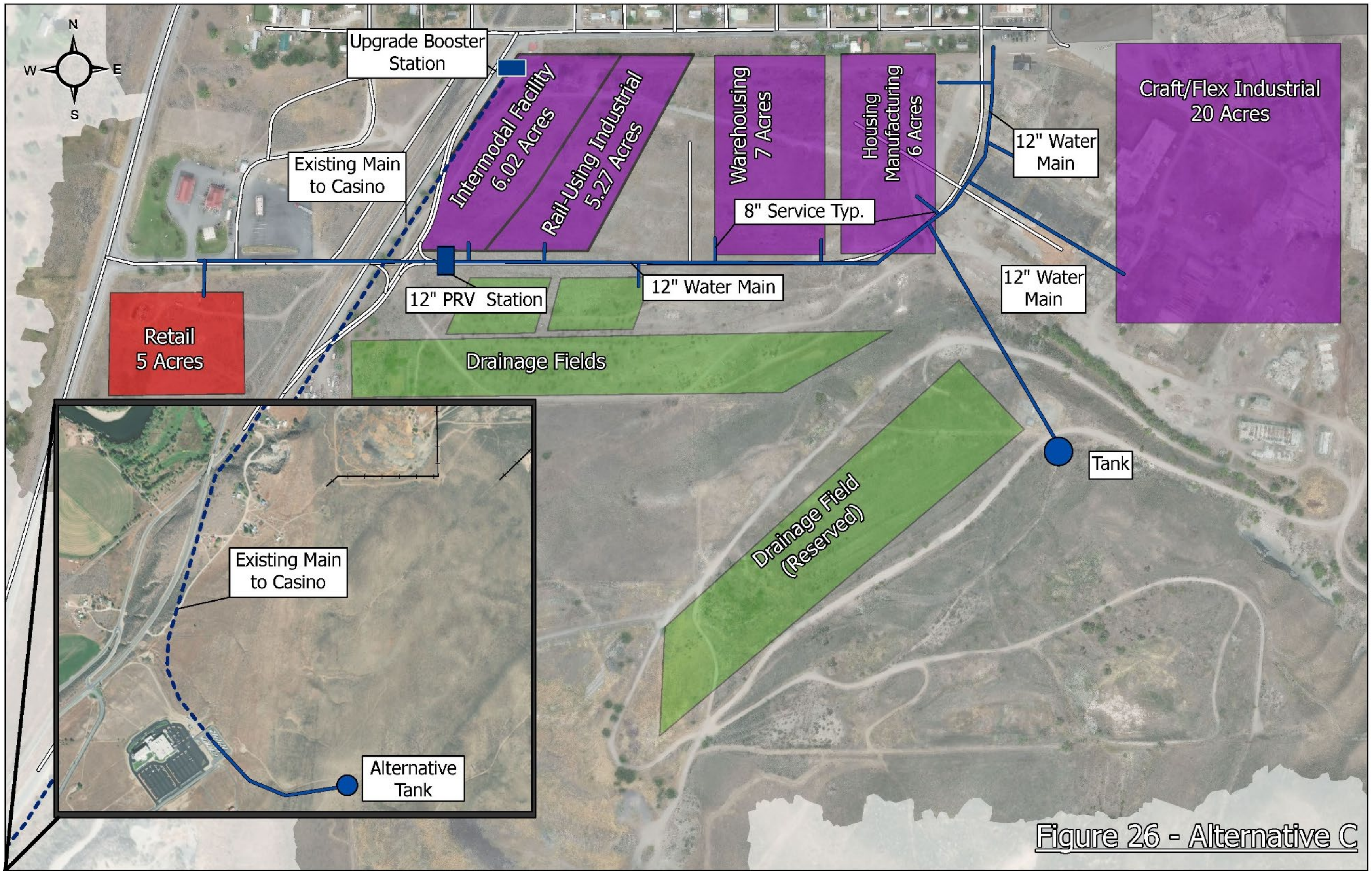
The new water tank will provide the required equalizing and fire storage for both the industrial area and the casino. The storage volume will not be available to the rest of the city water system.

ADVANTAGES

- No new wells.
- Provides water storage for both casino and proposed development.
- Provides for the upgrade of aging equipment in the existing booster pump station.
- Potential reuse of existing booster pump building.

DISADVANTAGES

- Requires DOH approval of an amendment to the City Water System Plan.
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- May require a larger booster pump station building.
- The need for pressure-reducing valves in the proposed industrial area increases cost, maintenance, and potential problems if service is installed without the pressure-reducing valve.
- A single connection to the city water system increases vulnerability should the booster pump or connection fail or require maintenance shutdown.
- An opinion of probable cost was not prepared for this alternative because of the increased cost and potential problems with having pressure-reducing stations in the industrial area.


N
W
E
S
Upgrade Booster Station
Internodal Facility 6.02 Acres
Rail-Using Industrial 5.27 Acres
Warehousing 7 Acres
Housing Manufacturing 6 Acres
Craft/Flex Industrial 20 Acres
12" Water Main
Existing Main to Casino
8" Service Typ.
12" PRV Station
12" Water Main
12" Water Main
Retail 5 Acres
Drainage Fields
Tank
Drainage Field (Reserved)
Existing Main to Casino
Alternative Tank
Figure 26 - Alternative C

4.3.4 Alternative D: CCT System – Industrial Area Water System

This alternative creates a new tribal water system to exclusively serve the proposed industrial area. The new water system includes two new wells (for redundancy) in the proposed industrial area. A new storage tank provides the required storage for the proposed development. The CCT may consider installing an emergency intertie to the city system (typically a valve vault). However, it should be noted that the city water system does not provide adequate pressure or fire flow for the entire system. The casino water system remains a separate water system.

The water system improvements needed for this alternative include:

- Two new wells: Assume a capacity of 250 gpm (500 gpm total) at each well to accommodate future growth.
- A new 1.2-million-gallon water tank is located on the bench to the south of the industrial area.
- Distribution system: 12" water mains and 8" water service stubs

See Figure 27 for a schematic of proposed improvements.

The new wells will need to be located at least 100' (preferably more) away from the proposed wastewater treatment system and drain field. The availability of adequate groundwater should be studied by a hydrogeologist to reduce (but not eliminate) the risk of drilling wells that do not produce the required flow rate.

The new water tank will provide the required equalizing and fire storage for the industrial area.

Although the water system design is not reviewed by DOH, it is recommended that the system be designed and maintained following DOH requirements.

ADVANTAGES

- Self-contained water system under tribal control that can operate independently of the city and casino.
- The system does not rely on aging or outdated infrastructure.
- Does <u>not</u> require DOH approval of an amendment to the City Water System Plan
- Design should reduce or eliminate the need for pressure-reducing stations.

DISADVANTAGES

- Inherent risk with drilling new wells (depth to water, sustainable flow rate, etc.)
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- CCT is responsible for developing and maintaining water sources.
- Although CCT appears to hold adequate water rights, it is understood that the water rights might be in use by the City.
- Preliminary Opinion of Probable Construction Cost: $5.7 million.

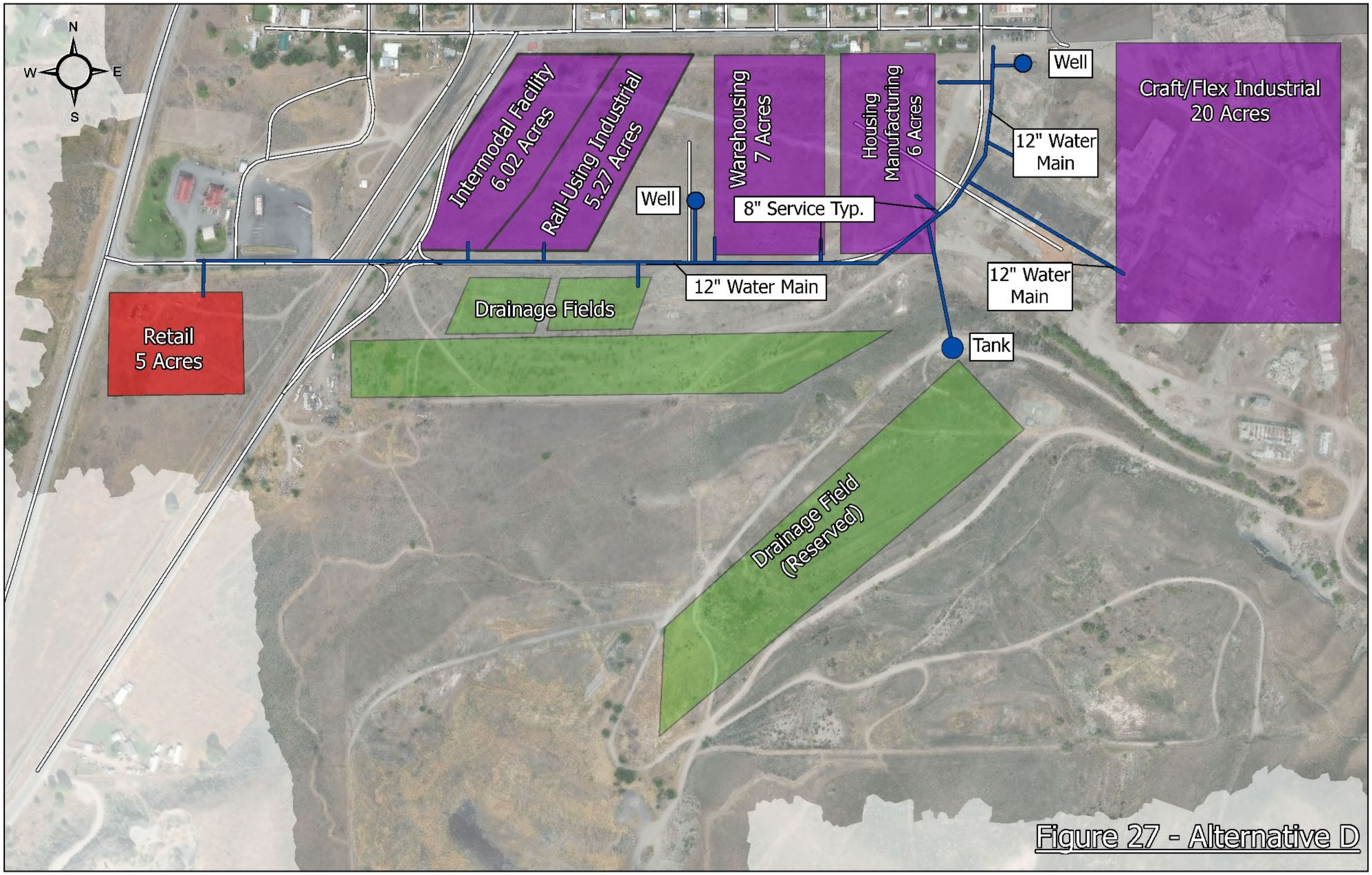


Figure 27 - Alternative D

4.3.5 Alternative E: CCT System - Industrial Area Casino Combined Water System

This alternative creates a new tribal water system to serve both the casino and the proposed industrial area. This scenario is similar to Alternative C except that the CCT will provide the water sources (wells). The new water system includes two new wells (for redundancy) in the proposed industrial area. A new storage tank provides the required storage for the proposed development and casino. The existing booster pump station for the casino serves as an emergency intertie with the city water system. This report assumes no upgrades to the booster pump station. As discussed in the Alternative C section all or portions of the proposed industrial area require pressure-reducing valves.

The water system improvements needed for this alternative include:

- Two new wells: Assume a capacity of 250 gpm at each well to accommodate future growth.
- A new 1.2-million-gallon water tank at the top of the hill to the south of the industrial area or southeast of the casino.
- Distribution system: 12" water mains and 8" water service stubs
- Pressure reducing station(s)

See Figure 28 for a schematic of proposed improvements.

The new wells will need to be located at least 100' (preferably more) away from the proposed wastewater treatment system and drain field. The availability of adequate groundwater should be studied by a hydrogeologist to reduce (but not eliminate) the risk of drilling wells that do not produce the required flow rate.

The new water tank will provide the required equalizing and fire storage for both the casino and the proposed industrial area.

Although the water system design will not be reviewed by DOH, it is recommended that the system be designed and maintained following DOH requirements.

ADVANTAGES

- Self-contained water system under tribal control that can operate independently of the city and casino.
- The system does not rely on aging or outdated infrastructure.
- Does <u>not</u> require DOH approval of an amendment to the City Water System Plan

DISADVANTAGES

- Inherent risk with drilling new wells (depth to water, sustainable flow rate, etc.)
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- CCT is responsible for developing and maintaining water sources.
- Although CCT appears to hold adequate water rights, it is understood that the water rights might be in use by the City.
- The need for pressure-reducing valves in the proposed industrial area increases cost, maintenance, and potential problems if service is installed without the pressure-reducing valve.
- It is understood that the adjacent property to the southeast of the casino may not be cooperative in the installation of the tank on their property.

- An opinion of probable cost was not prepared for this alternative because of the increased cost and potential problems with having pressure-reducing stations in the industrial area.

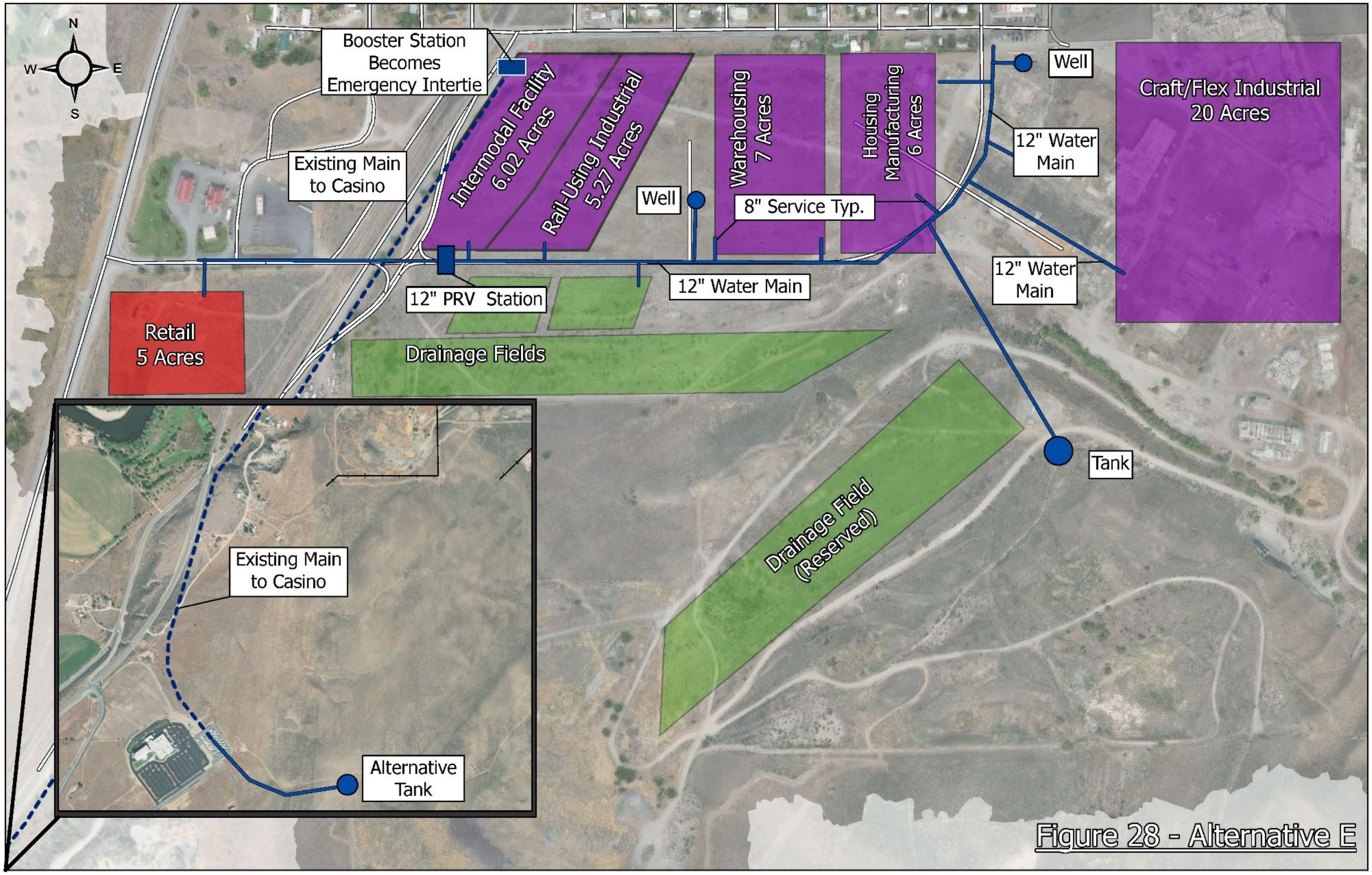


Figure 28 - Alternative E

4.4 Electrical Build Options

The proposed Build Option for the East Omak Industrial Site is comprised of a Prefabricated Home Manufacturing Facility, an Intermodal Terminal, Warehousing, Light Industrial, Craft Industrial, Rail-Using Industrial, and Retail spaces. The construction/build of any preferred usage options over 1MW of power will require adherence to the above-mentioned Okanogan PUD #1 New Large Load Agreement and the BPA TSR Study.

Table 9. Estimated Connected Load Density – Watts/SF

PREFERRED USES	LIGHTING	MECHANICAL	RECEPTACLE	MISC. EQUIPMENT	TOTAL W/SF
PREFABRICATED HOUSING CLUSTER	1	2.4	5	2	10.4
INTERMODAL/TRANSLOADING	1	3	2	15	21
WAREHOUSING	1	2.4	2	5	10.4
FLEX LIGHT INDUSTRIAL (INFILL)	1	3	2	8	14
CRAFT INDUSTRIAL (INFILL)	1	3	2	8	14
RAIL-USING INDUSTRIAL	1	3	4	4	12
RETAIL	1	4	5	2	12

Data sourced from U.S. EIA[1]

Table 10. East Omak Industrial Site Preferred Use Estimated Electrical Load - MW

PREFERRED USES	ACRES	BUILDINGS ASSUMPTIONS FULL BUILD-OUT	TOTAL SF PER TYPE	ESTIMATED CONNECTED LOAD W/SF	TOTAL ESTIMATED CONNECTED LOAD MW*
PREFABRICATED HOUSING CLUSTER	4-7	1	122,000	10	1.27
INTERMODAL/TRANSLOADING	7-10	2	50,000	18	0.90
WAREHOUSING	5-20	2	200,000	10	2.00
FLEX LIGHT INDUSTRIAL (INFILL)	1.5+	25	25,000	14	0.35
CRAFT INDUSTRIAL (INFILL)	1+	1	35,000	14	0.49
RAIL-USING INDUSTRIAL	1.5-5	5	52,000	12	0.48
RETAIL	5	2	50,000	12	0.60

*MW: Megawatts

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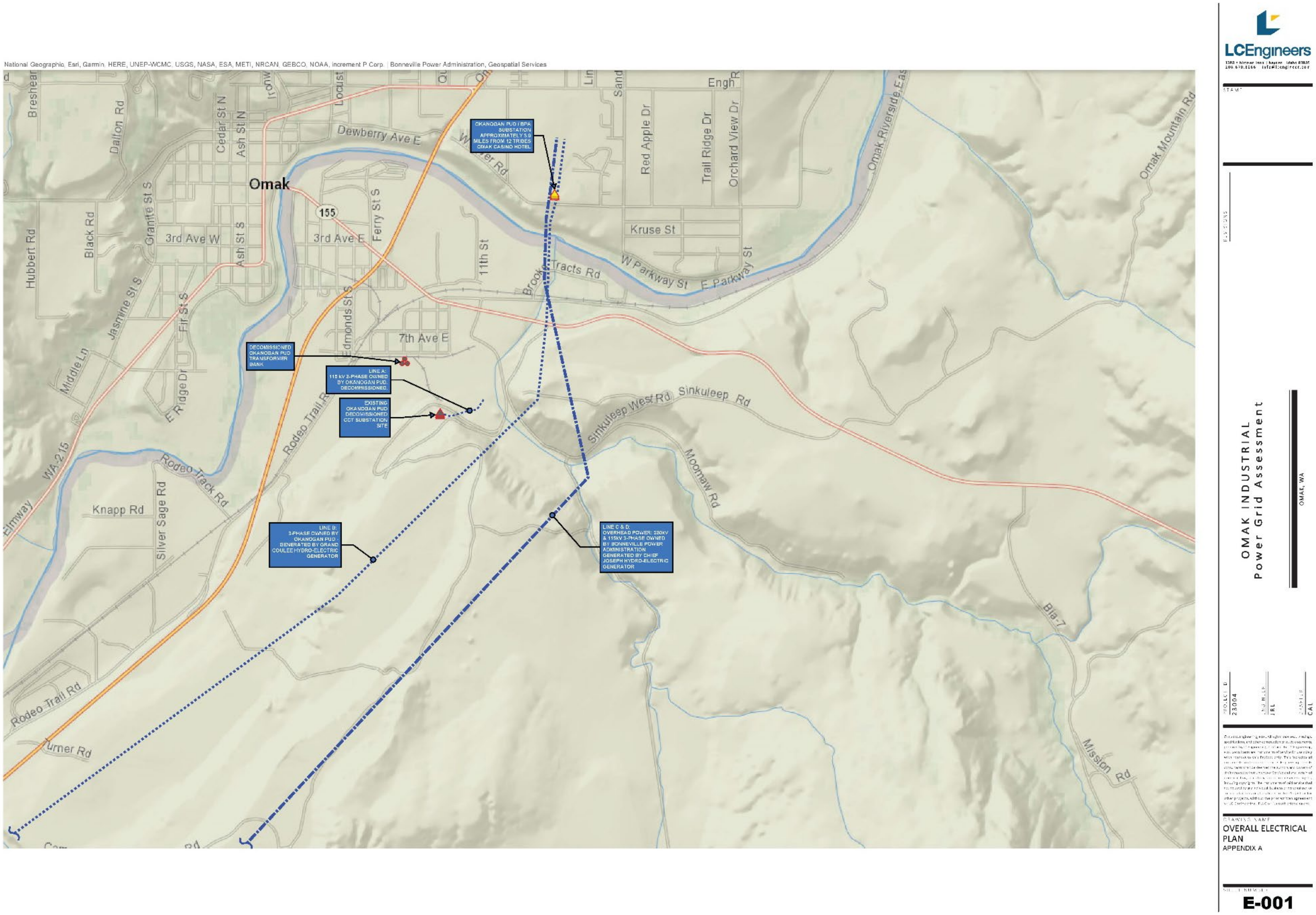
[1] Electrical estimations calculated from historical data collected by the U.S. Energy Information Administration https://www.eia.gov/electricity/


National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp. | Bonneville Power Administration, Geospatial Services
Omak
OKANOGAN PUD / BPA SUBSTATION APPROXIMATELY 3.9 MILES FROM 12 TRIBES OMAK CASINO HOTEL
DECOMISSIONED OKANOGAN PUD TRANSFORMER BANK
LINE A: 115 kV 2-PHASE OWNED BY OKANOGAN PUD. DECOMMISSIONED.
EXISTING OKANOGAN PUD DECOMISSIONED CCT SUBSTATION SITE
LINE B: 3-PHASE OWNED BY OKANOGAN PUD - GENERATED BY GRAND COULEE HYDRO-ELECTRIC GENERATOR
LINE C & D: OVERHEAD POWER: 230kV & 115kV 3-PHASE OWNED BY BONNEVILLE POWER ADMINISTRATION GENERATED BY CHIEF JOSEPH HYDRO-ELECTRIC GENERATOR
LCEngineers
OMAK INDUSTRIAL
Power Grid Assessment
OMAK, WA
OVERALL ELECTRICAL PLAN
APPENDIX A
E-001

4.4.1 No Build

As a result of the 2021 Cold Springs Canyon Fire and the theft of the CCT Substation equipment, there is currently no standing available power to the CCT Substation. Okanogan PUD #1 confirms that they do have a transmission interconnection line feeding the now-destroyed mill substation. Okanogan PUD #1 can feed <1MW, of the available 2-6MW, to the East Omak Industrial Site without infrastructure improvements. The available power to the East Omak Industrial Site overall system is based on their current capacity to secure their substation redundancies. Substation redundancies are implemented to secure power to utility customers should a substation suffer damage or need maintenance and/or improvements.

Before the theft, there was 240V, 3-Phase, and 120/208V, 3-Phase power available to the site. However, the pneumatic trip breakers had a standing history of faulty operation as a result of rust buildup. In turn, the breakers were inefficient at building up pressure and would trip due to low pressure, causing power interruptions. Current availability to re-build the substation on site requires the purchase of needed breakers estimated at $90,000.00 and if required a new transformer at the current market rate starting at $15,000.00. Also due to market demand, transformers can be backordered for up to 18 months depending on the model and should be considered in time estimates for future development.

4.4.2 Electrical Build Option A. Less than One Megawatt

Preferred Build Uses must not exceed a total estimate load of 1MW. Okanogan PUD will assess East Omak Industrial Site as an entire system given its current infrastructure limitations. The estimated electrical improvement construction start time is 12-24 months. Improvements will include extending the power from Line C.

The proposed Build Option estimated total connected load of any (1) preferred use, or a combination thereof would require a load <1MW given the currently available power to the East Omak Industrial Site. If the Colville Confederated Tribes chose to build or allow the build of any preferred use(s) >1MW it would require one of the following options:

4.4.3 Electrical Build Option B. Substation Rebuild

Tribal Sovereignty by rebuilding the CCT substation via a BPA Contractor Agreement adhering to the BPA Transmission Study & Expansion Process – TSEP. Estimated construction start time of 24 months – 5 years.

4.4.4 Electrical Build Option C. Pursue PUD Increase

Tribal pursuit of East Omak Industrial Site power exceeding 1 MW via Okanogan PUD #1 adhering to the BPA Transmission Study & Expansion Process – TSEP. Estimated construction start time of 24 months – 5 years.

4.5 Wastewater Treatment Alternatives

4.5.1 Surface Water Discharge

Surface water discharge requires the least amount of land area and the least amount of O&M costs when compared to other alternatives. The Okanogan River is a waterway of the United States of America and therefore, discharging WWTP effluent to the river would require a National Pollutant Discharge Elimination System (NPDES) permit. The permit would require continuous water quality monitoring of the effluent to ensure that discharge limitations are being met.

Surface water discharge limits are much stricter than other types of discharges, due to their direct interface with freshwater flora and fauna and with the public through recreational and domestic uses of the water source. It has been expressed by the CCT that this is the least favorable option due to the challenging permitting process and increased treatment requirements. SCJ has therefore not reviewed surface water discharge as a viable option based on this direction given by the CCT.

4.5.2 Land Treatment

The land treatment utilizes treated wastewater effluent to irrigate agricultural land. Treated effluent is applied at agronomic rates such that the crop uptake of nutrients is considered part of the treatment process. According to the Onsite Wastewater Treatment Systems Manual published by the EPA, agricultural applications require significant disinfection and pretreatment before application. Some examples of agricultural applications could be irrigating diverse types of crops like those listed below with irrigation estimates in gallons per day (gpd) per acre (ac). In Washington State, non-food crops such as alfalfa can be irrigated with treated effluent. However, food crops must be irrigated with Class A reclaimed water.

- Apples – 5,300 gpd/ac = 57 ac @ 0.3 MGD
- Dry Beans – 2,900 gpd/ac = 103 ac @ 0.3 MGD
- Lentils – 2,300 gpd/ac = 130 ac @ 0.3 MGD
- Peas – 3,100 gpd/ac = 97 ac @ 0.3 MGD
- Alfalfa – 3,500 gpd/ac = 86 ac @ 0.3 MGD

4.5.3 Class A Reclaimed Water

The Criteria for Sewage Works Design published by the Department of Ecology for the State of Washington in 2008 defines reclaimed water as water derived in any part from wastewater that is adequately treated for a specific purpose other than human consumption. Discharge limits for class A reclaimed water are more stringent than those for agricultural irrigation (land treatment) of non-edible crops. Reclaimed water can be used for irrigation of landscaping, irrigation of food crops, and industrial processes such as cooling.

4.5.4 Groundwater Discharge

WWTP effluent can also be discharged to groundwater. This can be accomplished by mechanically pumping effluent into the ground via an injection well or it can be gravity fed via an infiltration basin or drain field. The size of a groundwater discharge facility is highly dependent on the porosity of the soils that it is constructed on and surrounded by. This method of discharge is best suited for well-drained porous soils. A geotechnical investigation should be conducted to confirm soil types and infiltration rates before sizing the system.

4.5.5 Pump to Omak

A final option that's important to note is for existing and future wastewater from East Omak (all 3 contributors) to continue being pumped to the City of Omak WWTP for treatment. The 2011 Master Plan for Omak Business and Industrial Park states that there was adequate capacity in the sewage treatment plant to accommodate additional domestic discharge generated by the Industrial Park Development. However, it was also indicated by City staff that there was no capacity to accommodate any process waste that may be generated by an industry that relies on heavy water use, such as food processing. Currently, no food processing industries are considered in the potential development preferences for the areas of development.

4.5.6 Biosolids Disposal Alternatives

Biosolids are concentrated during the wastewater treatment process as solids are allowed to settle out of the solution and, once the liquid is decanted, the result is sludge. Sludge is then physically and chemically treated to further condense and dry to produce a semisolid, nutrient-rich substance, which can be disposed of or repurposed. Biosolids can have many applications and disposal options such as beneficial reuse as a fertilizer, incineration, or landfill disposal.

Biosolids are categorized into two categories: Class A or Class B. Class A biosolids are effectively pathogenically inert, meaning that all pathogens, including viruses, have been removed. Class B biosolids are 99.9% pathogen free but require additional processing to remove all pathogens. Most biosolids are stored in some capacity before being removed and disposed of or repurposed. The drying of biosolids, required to produce Class A or Class B, can have very high capital costs and O&M costs. Lagoon systems will typically not include a drying process and instead will be sized appropriately to allow long-term accumulation of sludge (approx. 5-10 years). Once the operational sludge storage is at its maximum limit it must either be pumped and hauled off as liquid sludge or dried on-site and hauled off. The cost of this long-term sludge removal can be very expensive and must therefore be properly budgeted as an O&M item.

4.5.6.1 Organic Loading

Organic loading is dependent on two parameters, Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). The concentration of these constituents will determine the level of treatment required as well as the rate at which biosolids accumulate. We were unable to get sufficient operational data from the Omak WWTP to estimate the organic loading more accurately at the proposed WWTP. We have therefore assumed typical BOD and TSS concentrations for residential-strength wastewater of 250 mg/L (each).

4.5.7 Treatment Alternatives Key Component Sizing

It is important to consider the footprint requirements for the various treatment and discharge alternatives being considered as they vary greatly. For instance, a mechanical plant would have a smaller footprint compared to a lagoon treatment system. When considering the footprint of the different discharge options, land treatment would have the greatest acreage requirement while surface water discharging the lowest. A lagoon treatment option with a drainage field combines the cost-saving benefit of a lagoon treatment system and the medium land use requirement of a drainage field. Sections 5.5.1 and 5.5.2 elaborate on the methodology used to calculate the sizing requirements needed for a lagoon treatment and drainage field discharge system to meet the demands of the area.

4.5.7.1 Groundwater Discharge Drain Field

The soil type plays a crucial role in drain field sizing due to the different hydraulic loading rate factors shown in Table 11 from WAC 246-272(b). It also influences the positioning of collection system piping and the feasibility and location of lagoons.

Table 11. Soil Type Hydraulic Loading Factors

Soil Type	Soil Textural Classification	Maximum Hydraulic Loading Rate, for residential strength effluent, gpd/sf
1	Gravelly and very gravelly coarse sands, all extremely gravelly soils.	1.0
2	Coarse sands.	1.0
3	Medium sands, loamy coarse sands, loamy medium sands.	0.8
4	Fine sands, loamy fine sands, sandy loams, loams.	0.6
5	Very fine sands, very fine loamy sand, very fine sandy loams; or silt loams and sandy clay loams with a moderate or strong structure (excluding platy structure).	0.4
6	Other silt loams, sandy clay loams, clay loams, silty clay loams.	Not suitable
7	Sandy clay, clay, silty clay, strongly cemented or firm soils, soil with a moderate or strong platy structure, any soil with a massive structure, any soil with appreciable amounts of expanding clays. Soils greater than 90% rock.	Not suitable

According to the soil information obtained from the USDA Web Soil Survey, the chosen drain field site exhibits well-drained characteristics with fine sandy loam soils and slopes ranging from 0 to 5 percent.

Figure 24. USDA Soil Web Soil Survey

After determining the projected effluent flow rate, we can consider the noted soil type to determine the sizing of the drain field. By using an application rate of 0.6 gals/sf/day for soil type 4 (fine sands), we can calculate the appropriate size for the proposed and reserve drain field. The drain field sizing calculation is provided below in Figure 4. It's important to note that the 468,875 square footage (10.8 acres) size mentioned is solely for the primary drain field depicted in Figure 5, and an equally sized dedicated reserve area must also be considered.

$$Primary\ Drainfield\ Size = \frac{Gallons\ Per\ Day}{Application\ Rate\ From\ Soil\ Type} = \frac{281{,}325\,\frac{gal}{day}}{\frac{0.6\,\frac{gal.}{sq.ft.}}{day}} = 468{,}875\ sq.ft.$$

Figure 25. Drain Field Sizing Calculation

A "reserve area" is also needed in the vicinity. A “reserve area” is an area of land approved for the installation of a Large Onsite Septic System (LOSS) and is dedicated to the replacement of the LOSS in the event of a system failure. Due to limited space in the Industrial Park area for placement of the reserve area, it may be located on the plateau to the southeast of the WTTP as seen in Figure 25 in an area of similar soil type and slope. In the event of a system failure at the main drainage field location, the reserve field will need to be accessed via a lift station.

4.5.7.2 Lagoons

When sizing lagoons, factors for consideration are wastewater strength, discharge limits, and storage need for sludge and/or treated liquid effluent, when agricultural irrigation discharge is seasonally limited. A system of this size would require an aerated treatment lagoon with a volume of 3-4 million gallons and an approximate footprint of 1-2 acres. If discharged to a land treatment site, there would also need to be 2-3 storage lagoons with a combined volume of approximately 60-70 million gallons and an approximate footprint of 22 acres (in addition to the agricultural acreage discussed in the land treatment section 5.3.2). If discharged solely to groundwater via a drain field, the size of the storage lagoons can be significantly reduced but the drain field would still be required and would have a minimum footprint of approximately 11 ac (as discussed in 5.5.1) (Figure 15). In either discharge scenario, the CCT is looking at a very large land area, approximately 20-40 acres.

Figure 26. Rendition of Treatment Lagoon & Drainage Fields

5 Improvements and Recommendations

This chapter includes overall strategic recommendations for the CCT to implement to ensure success in drawing markets to the site as well as infrastructure improvements and costs.

5.1 Overall Strategic Recommendations

5.1.1 Neighborhood Revitalization

Revitalization and reinvestment into the adjacent neighborhood and area will be crucial to attracting employers to the site. Building off the momentum of the nearby clinic, wellness center, and Head Start facility development, CCT should consider:

- Coordinated reinvestment in the existing housing stock to remove health or safety hazards, and/or modernize the homes.

- Assisting eligible residents with applications for USDA Single Family Housing Repair Loans and Grants or other rural housing assistance programs.
- The potential of prefabricated housing manufacturing on-site to provide relatively affordable housing options to replace existing, aging housing stock.
- Use of the site for local job fairs, workforce training, and business development/entrepreneurship support programs.
- Revitalization of Jackson Street commercial node that includes a storefront showcasing local artisan products or other Tribal-led businesses.

Figure 27. USDA Single Family Housing Repair Loans & Grants eligible area
Source: USDA

5.1.2 Housing as Economic Development

The lack of housing options in the area may be a barrier to attracting new and large employers, which in turn is a barrier to attracting and expanding the workforce, particularly for younger workers. CCT should consider:

- Preserving a portion of the site for workforce housing as an added incentive for prospective businesses and employees. A site with both housing and employment leads to 24/7 activation of the site, which may also increase safety and security and improve the attractiveness of the site to potential employers.

- Positioning the site as a location for prefabricated housing manufacturing and forging a partnership with the manufacturer to allocate a portion of production for local and regional housing needs.
- Working with employers and local partners to develop a Reservation-wide housing strategy that accounts for workforce housing needs and housing development.

5.1.3 New Access Points

Existing site access is a limiting factor for any potential industrial user. Providing new access, and improving existing access points, will improve site readiness and attractiveness. CCT should consider:

Developing the proposed new rail crossing on the west end of the site at the Tribal Trails Truck Stop. This will improve access from Hwy 97 and help prevent disruption by freight traffic accessing the site through the existing neighborhood off of Jackson Street.

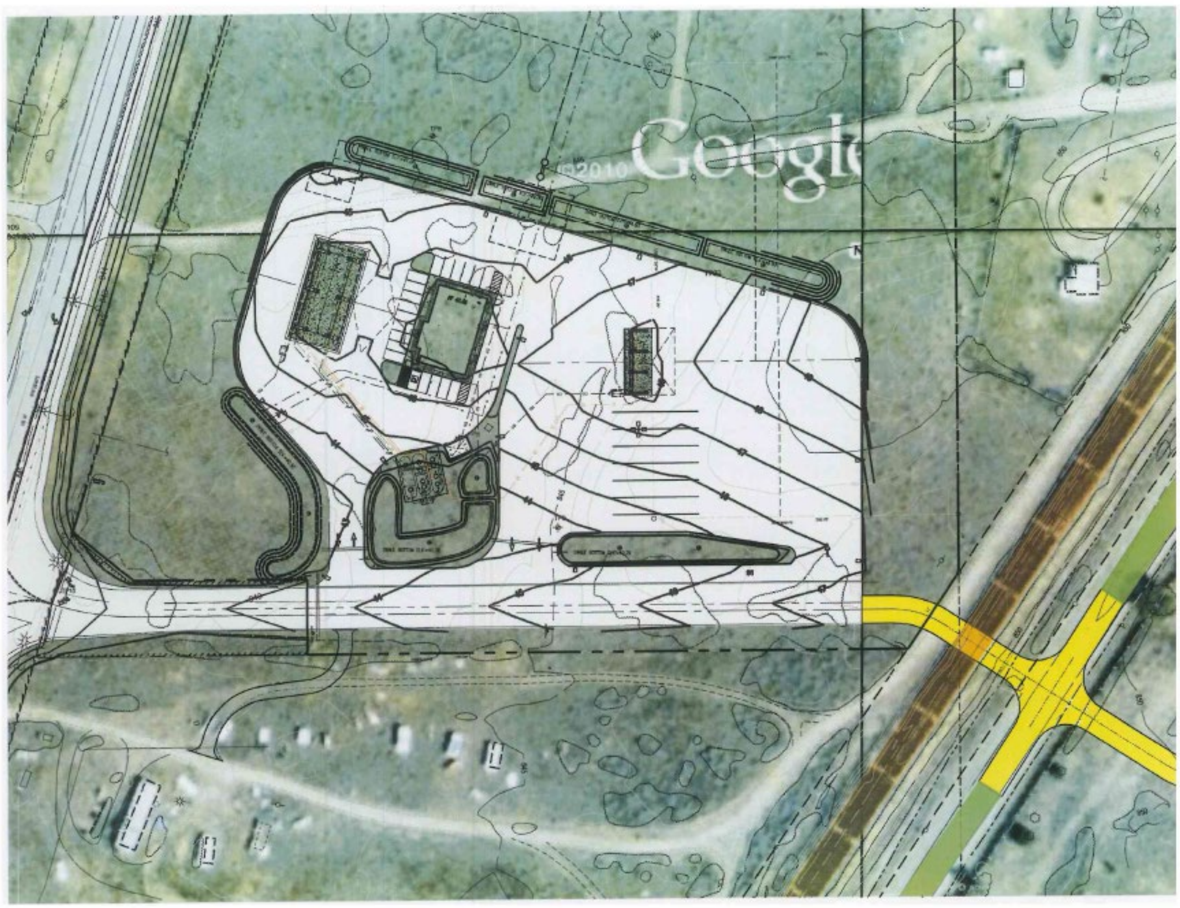


Figure 28. Original Proposed Rail Crossing at Tribal Trails Truck Stop, 2011

Integrating new industrial development with the access and circulation plan of the new clinic and Head Start facility to ensure freight traffic accesses through the west of the site and community traffic through Jackson Street and/or new Hwy 155 access.

5.1.4 Gateways and Signage

Current access to the site off Jackson Street limits the visibility and attractiveness of the site to prospective users. As new access points are developed to the site, there is an opportunity to make the property a "gateway" into East Omak, both via access from Hwy 97 and Hwy 155 and build site identity that can help drive further development and interest on the site. CCT should consider:

- Creating attractive and modern signage at the new access points at the Tribal Trails Truck Stop off of Hwy 97, and the new clinic off of Hwy 155.

- Creating branded signage and wayfinding, and a “gateway” moment onto the site, to develop site identity around a local craft industrial/Tribal arts business cluster.

Figure 29. TwispWorks Gateway Sign

5.1.5 Agricultural Partnerships

Agriculture is by far the largest economic driver of Okanogan County and the North Central Washington region, and the industrial site has a locational advantage due to its proximity to fruit producers and value-added fruit manufacturers. To capitalize on this regional advantage, CCT should consider:

- Being proactive in developing partnerships with regional farms and orchards to assess interest for additional food processing and storage, or potential demand for an intermodal terminal facility, which could be located on the site.
- Developing partnerships with local fruit producers to develop Tribal-led businesses like cider making, winemaking, a distillery, a brewery, or other value-added food products.

5.1.6 Workforce Training

The existing local workforce is an asset for agricultural and adjacent industries, like food processing & manufacturing, and CCT should try to capitalize on this strength. However, the level of education of the existing labor force is not well suited for attracting employers in advanced manufacturing or other highly specialized industries. Job training in partnership with a new employer that focuses on increasing the skills of the local workforce may be an important consideration in attracting further industrial development. CCT should consider:

- Attracting a business to the site in the fruit processing & manufacturing industry to capitalize on the existing regional workforce

- Proactively engage with local institutions, like Wenatchee Valley College in Omak and the Okanogan County WorkSource Center, to develop local workforce training/apprenticeship programs in partnership with regional employers to encourage local hiring and skill development for more highly specialized industries like prefabricated housing, biofuels production, solar panel manufacturing, and woody biomass products.

5.1.7 Tribal Enterprise Development

Though capacity constraints may be a limiting factor, there are good reasons to utilize a portion of the site for Tribal-led enterprises, particularly if the goal is to initiate change in the near-term. Doing so will help show others the Tribes are actively pursuing improvements on the site, which may help encourage additional businesses to locate nearby. CCT should consider:

- Developing a craft industrial “makerspace” on-site in partnership with the local craft community, with a focus on local fiber arts and other Tribal crafts, or showcasing local produce and agricultural products, with an adjoining “trading post” storefront to showcase local artists and products.
- Developing business & entrepreneurial support programs as a part of the craft industrial space.
- Initiating the development of high-quality warehousing, or flex/light industrial space, to meet the demand of local producers.

5.1.8 Quality

A large portion of the existing industrial properties in the region are old, and show a general lack of “quality”, especially warehousing and food processing & storage facilities. There is a high likelihood that both existing and new businesses would be attracted to any new, high-quality industrial space, providing an opportunity to meet this demand on the East Omak industrial site. In addition, improving the quality of surrounding uses and the neighborhood will help with the marketability of the site to prospective users. CCT should consider:

- Initiating the development of modern, quality warehousing space to meet demand within existing industries.
- Modern warehouse design includes:
- Easily adaptable spaces
- Higher bays to accommodate efficient and safe material handling, and improved circulation
- Green design, including solar panels, LED lighting, cool-roof systems, skylights, green building materials
- Separate receiving and shipping areas
- Improved fire protection capacity

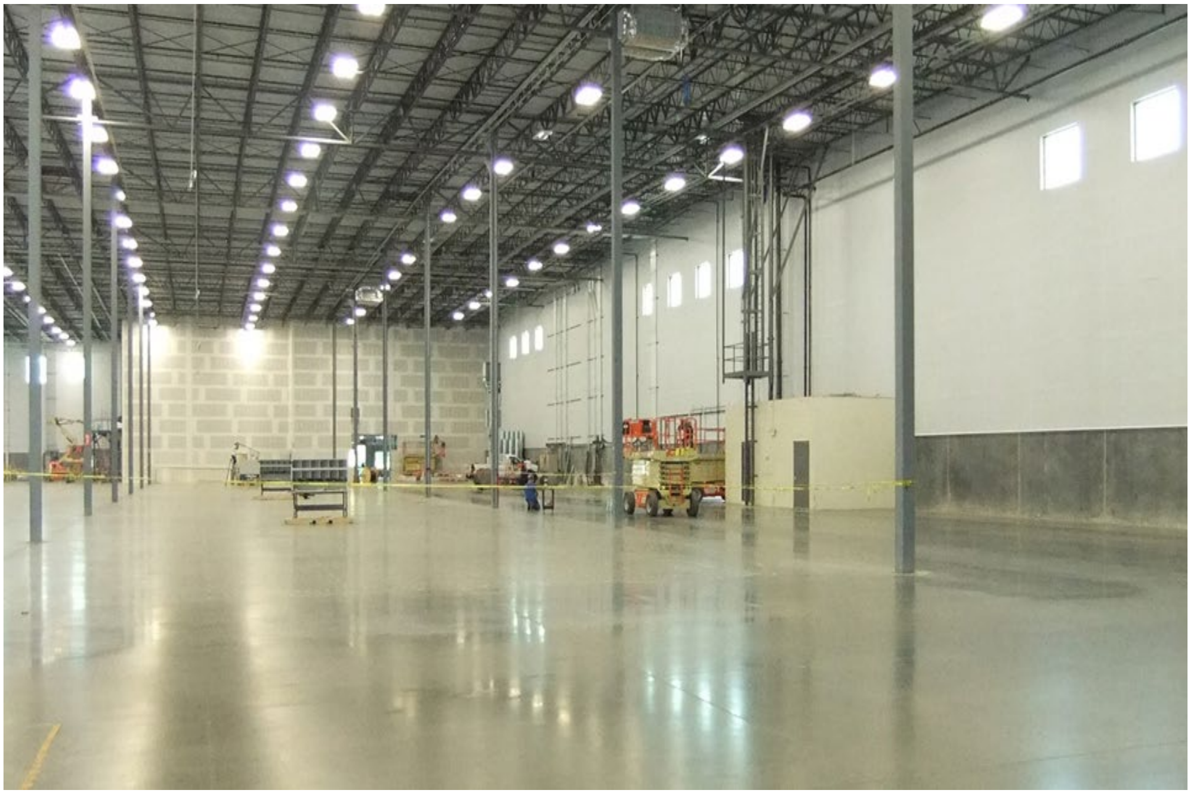


Figure 30. Warehouse | WBDG - Whole Building Design Guide

5.1.9 Marketing

To maximize the potential for the site, CCT will need to make a concerted effort to actively market the site towards targeted industries and businesses. Because the site is not located in a "hot" market, inquiries into site readiness and development may be sporadic and unexpected, making it all the more important to have unified messaging on how to market the property. CCT should consider:

- Bringing together all relevant Tribal entities and outside partners to share the results of this site readiness report and create a shared understanding of current opportunities and goals for the site to ensure coordinated messaging and continuity in the inquiry response.
- Develop a site prospectus showcasing the site readiness and the Tribes' willingness to partner or provide incentives in business development.
- Proactively market the site towards targeted industries like prefabricated housing manufacturers – like those included on page 77 – fruit producers & value-added manufacturers, and developers of light industrial and warehousing facilities.
- Dedicating a full staff member for site management and marketing

5.1.10 Get a "Quick Win"

Due to prolonged site inactivity, and the lack of perceived momentum towards new investment, the Tribes should aim to get a "quick win" that shows initiative and spurs renewed interest in the site. CCT should consider:

- Working with the railroad to develop the new rail-crossing at the Tribal Trails Truck Stop.

- Incremental development of flex/light industrial that has a low-cost original buildout with room to scale.
- Developing site marketing materials.
- Initiating a steering committee with Tribal artisans to develop a plan for craft industrial enterprise development – Partner with NCWEDD, Economic Alliance, and other regional partners to develop small business development programs.
- Facilitating discussions amongst fruit processing and other agricultural businesses to assess interest in rail spur expansion and intermodal terminal.

5.2 Transportation

Based on the analysis described in Chapter 4, the following improvements would be needed for each of the Transportation Alternatives within the long-term planning horizon year of 2045. It should be noted that adverse traffic impacts and improvement needs are unlikely in the near-term, but traffic volumes at key intersections should be monitored over time as development expands to identify when future improvements are needed. Analysis details are included in the *Transportation Access Study*.

5.2.1 Transportation Alternative 1

5.2.1.1 Intersection Improvement Needs

Table 12 presents a summary of 2045 AM and PM peak hour traffic operations for various improvement options at the intersection of SR 155 with Dayton Street. As noted in Chapter 4, this intersection would be adversely impacted by the development of industrial and/or commercial retail uses on the East Omak Industrial site.

Table 12. Intersection Improvement Needs for Transportation Alternative 1

		2045 Baseline		2045 Alternative 1	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Dayton Street	Existing TWSC[1]	C (24.6)	F (72.3)	E (41.8)	F (281.6)
	Signal	A (9.1)	A (9.8)	B (12.2)	B (11.6)
	Roundabout	A (6.0)	A (6.6)	A (6.3)	A (7.3)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

As shown in the table, the anticipated future operational problem at the intersection of SR 155 with Dayton Street can be resolved successfully through either installation of a traffic signal or a roundabout.

5.2.1.2 Signal Warrant Analysis

To support the installation of a traffic signal at the intersection of SR 155 with Dayton Street, an assessment of peak hour warrants was conducted. This analysis shows that a signal would be warranted based on projected 2045 PM peak hour volumes.

5.2.1.3 Safety Considerations

As part of the analysis of the existing transportation system documented in Chapter 2, an analysis was conducted of existing crash experiences at study area intersections. No significant traffic safety problems were identified and no safety improvements to address existing problems are needed. Consideration of transportation safety as part of the East Omak Industrial site development focused on enhancing the multimodal network as described below.

5.2.1.4 Recommended Roadway Improvements

As described earlier in this report and illustrated in Figure 23, the internal site roadway improvements would be limited to the provision of access into the site from both the 8th Avenue/Jackson Street intersection on the north and from a new intersection on Okanogan/Omak East Road on the west. These roadways would include a 28-foot curb-to-curb width, and 12-foot shared-use pathways along both sides with a 4-foot buffer. This buffer could be fully landscaped including street trees to enhance the overall appearance of the industrial site and, when fully mature, could provide needed shade and reduction in the heat load associated with roadway pavement. A total of 1,400 linear feet of roadway would be developed with this alternative.

A planning-level cost estimate has been prepared for this alternative, which is documented in greater detail in the *Transportation Access Study*. The cost of these roadway segments is estimated to be $2,995,700 with street trees and landscaping and $2,989,300 without street trees.

5.2.2 Transportation Alternative 2

5.2.2.1 Intersection Improvement Needs

Table 13 presents a summary of 2045 AM and PM peak hour traffic operations for various improvement options at the intersection of SR 155 with Dayton Street. As noted in Chapter 4, this intersection would be adversely impacted by the development of industrial and/or commercial retail uses on the East Omak Industrial site.

Table 13. Intersection Improvements for Transportation Alternative 2

		2045 Baseline		2045 Alternative 2	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Dayton Street	Existing TWSC[1]	C (24.6)	**F (72.3)**	D (34.3)	**F (177.6)**
	Signal	A (9.1)	A (9.8)	B (11.0)	B (10.8)
	Roundabout	A (6.0)	A (6.6)	A (6.2)	A (7.0)

1. Two-Way Stop-Control

2. Worst movement at unsignalized intersections.

As shown in the table, the anticipated future operational problem at the intersection of SR 155 with Dayton Street can be resolved successfully through either installation of a traffic signal or a roundabout.

5.2.2.2 Signal Warrant Analysis

To support the installation of a traffic signal at the intersection of SR 155 with Dayton Street, an assessment of peak hour warrants was conducted. This analysis shows that a signal would be warranted based on projected 2045 PM peak hour volumes.

5.2.2.3 Safety Considerations

As noted under the discussion of Alternative 1, no significant safety problems were identified at study area intersections and no safety improvements to address existing problems are needed. Consideration of transportation safety related to the project focused on the multimodal network.

5.2.2.4 Recommended Roadway Improvements

As described earlier in this report and illustrated in Figure 23, the internal site roadway improvements would provide a complete connection through the site from the 8th Avenue/Jackson Street intersection on the north to a new intersection on Okanogan/Omak East Road on the west. As described under Alternative #1, these roadways would include a 28-foot curb-to-curb width, and 12-foot shared-use pathways along both sides with a 4-foot buffer. A total of 2,840 additional linear feet of roadway would be developed with this alternative.

A planning level cost estimate was prepared for the additional roadway segments between the two dead-end roads provided in Alternative 1 and is estimated to be $6,222,100 with street trees and landscaping and $6,100,500 without the street trees. The total cost of improvements with both Alternative #1 and #2 would be $9,217,800 with street trees and $9,089,800 without.

5.2.3 Transportation Alternative 3

5.2.3.1 Intersection Improvements

Table 14 presents a summary of 2045 AM and PM peak hour traffic operations for various improvement options at the intersection of SR 155 with Dayton Street. As noted in Chapter 4, this intersection would be adversely impacted by the development of industrial and/or commercial retail uses on the East Omak Industrial site.

As shown in the table, the anticipated future operational problem at the intersection of SR 155 with Dayton Street can be resolved successfully through either installation of a traffic signal or a roundabout.

Table 14. Intersection Improvements for Transportation Alternative 3

		2045 Baseline		2045 Alternative 3	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	**Control Type**	**LOS (Delay)²**	**LOS (Delay)²**	**LOS (Delay)²**	**LOS (Delay)²**
SR 155 at Dayton Street	Existing TWSC¹	C (24.6)	**F (72.3)**	D (26.5)	**F (94.8)**
	Signal	A (9.1)	A (9.8)	A (9.5)	B (10.0)
	Roundabout	A (6.0)	A (6.6)	A (6.0)	A (6.7)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

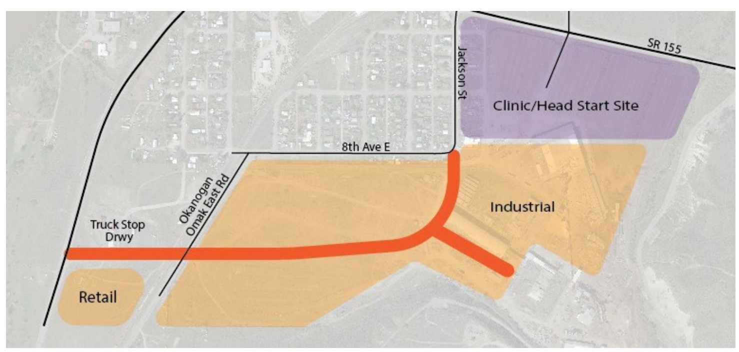
5.2.3.2 Signal Warrant Analysis

To support installation of a traffic signal at the intersection of SR 155 with Dayton Street, an assessment of peak hour warrants was conducted. This analysis shows that a signal would be warranted based on projected 2045 PM peak hour volumes.

5.2.3.3 Safety Considerations

As noted under the discussion of Alternative 1, no significant safety problems were identified at study area intersections and no safety improvements to address existing problems are needed. Consideration of transportation safety related to the project focused on the multimodal network.

5.2.3.4 Recommended Roadway Improvements



As described earlier in this report and illustrated in Figure 23, the internal site roadway improvements would provide a complete connection across the site from the 8th Avenue/Jackson Street intersection on the north to a new intersection on Okanogan/Omak East Road on the west and would continue west across the existing railroad tracks to connect directly with SR 20. These roadways would include a 28-foot curb-to-curb width, and 12-foot shared-use pathways along both sides with a 4-foot buffer. A total of 1,625 additional linear feet of roadway would be developed with this alternative. This improvement would also include an at-grade crossing of the railroad with appropriate gates and signals and a 66-foot level area at the crossing to accommodate large trucks.

A planning level cost estimate was prepared for this alternative. The added cost of these roadway segments is estimated to be $2,362,700 without street trees and landscaping. The total cost of improvements with Alternative #1, #2, and #3 would be $11,580,500 with street trees and $11,452,500 without.

5.2.4 Off-Site Transportation Improvements

5.2.4.1 Intersections

As noted above, the project would add traffic to and adversely affect the intersection of SR 155 (Omak Avenue) with Dayton Street. Cost estimates prepared for improvement options at this location include:

- Installation of a traffic signal - $1,000,000
- Installation of a roundabout - $2,100,000 (this improvement may require additional right of way acquisition which would be determined based on greater engineering design detail. See graphic in Appendix G for draft illustration)

It should be noted that this intersection is expected to drop to LOS F operations for side street traffic without the development of the East Omak Industrial site, so the project should not be fully responsible for improving this location. It should also be noted that these improvements would include pedestrian enhancements that would improve non-motorized safety for travel between the community south of SR 155 and the park to the north. The need for and timing of this improvement should be reconfirmed over time as the project site develops through project-specific traffic impact analyses.

5.2.4.2 Multimodal Improvements

To enhance multimodal access and circulation for the East Omak Industrial site, the following improvements are recommended:

- Installation of improved pedestrian crossings on SR 155 at Garfield and Hanford Streets to serve the East Omak Elementary School. Improvements would include RRFBs at both crossings and high reflective striping for the crossings. The planning level cost of these improvements is estimated to be $146,100 This improvement is currently included for Garfield Street in the City's Six Year TIP. Consideration could also be given to speed zoning with appropriate signage.
- Installation of 5-foot sidewalks on both sides on both sides of Jackson Street where they presently do not exist between SR 155 and 8th Avenue. The estimated planning level cost for this improvement would be $1,576,600

5.2.5 Rail System Improvements

Chapter 2 describes the existing rail system serving Omak and the East Omak Industrial site and notes that the former mill track industrial spur connection to the Cascade and Columbia River (CSCD) mainline has largely been removed. Along with the total proposed street system for the project site, a proposed rail concept to serve new industrial land uses on the site is illustrated in Figure 31.

The concept would place two rail-served industries (an intermodal yard and a rail-industrial use) on the west side of the site to the north of the proposed east/west site access road (Jackson Street Extension). On-site rail would be located between these two uses and would generally follow existing north/south-oriented site contours. This location requires the least track elevation raise from the main line and aligns the tracks with the contours to allow for minimal site grading. The two industrial uses would be located adjacent to each other with the rail configured such that the track crossings are merged into a single double-track road crossing of the internal site road. A turnout was placed off the CSCD main south of the new access road (Jackson Street Extension) that intersects the Okanogan/Omak East Road in the far southwest corner of the property. The rail alignment would then parallel Okanogan/Omak East Road as

Figure 31. East Omak Industrial Site and Transportation Network

it curves up to the two industrial uses. This reduces the impact on the usable footprint of the overall site. The existing spur worked well as a lead-up to the old mill, but it would be difficult to place spurs and facilities on the 1.6% grade that exists along that old alignment. Additionally, it would vastly increase the amount of site grading to replace a rail track along the former track alignment to serve an intermodal facility and/or rail industrial use.

As the two industrial uses would be located close together, this would allow for a single lead for the majority of the distance. In addition, the ability to extend a future lead could be provided to the east for future development if rail access is required. The mainline crossing and turnout would be constructed by a contractor selected by the CSCD and involve a separate design contract from the facility that would include the crossing signal design. This would need both a Preliminary Engineering Agreement and a Construction and Maintenance Agreement to fund the CSCD efforts.

The first rail-dependent land use on the western side of the property would place two tracks at 15-foot spacing for an intermodal facility. The property provides about 250 feet of storage space and access roads west of the tracks. The track capacity is 740 feet of clear distance on both tracks which provides for 28 53-foot container cars. The concept would utilize reach stackers to access both tracks. It's also possible to use gantry cranes, although it may be easier to store and stack on a small footprint with the reach stackers. The site grading is minimized by the tracks running parallel to the contours.

The second rail-dependent use would be just east of the intermodal facility and would be served by a single spur along the west side of the property. The intent is to place the spur along the back side of an industrial facility such that either box cars can be unloaded from a raised dock or bulk materials can be removed by piping or pits. This spur could also serve multiple buildings by providing additional spurs parallel to the primary.

As CSCD switches cars to and from the intermodal facility and industrial site the move would most likely block the internal site access road for 15-20 minutes once or twice a week in each direction. With alternate access to the industrial park via Jackson Street, this shouldn't be a significant issue.

The CSCD mainline would have a new 28-foot wide at-grade road crossing with multi-use paths on both sides of the road. The crossing would be protected through the use of automated gates with flashing lights. The multi-use paths would utilize tactile strips warning of the upcoming crossing and signage involving a MUTCD reduced size crossbucks, yield, and look signs. The on-site lead track and internal spur crossings would have passive crossings utilizing concrete panels and crossbucks and yield signs. This is because the train length is short, will be operating at a slow speed, and will involve CSCD personnel to flag the train across the roadway. All crossings would provide Advance Warning Signs and Advance Warning Pavement Markers on the road approaches.

The CSCD would be interested in additional shipping in the Omak area, and permitting would be fairly straightforward. The process would involve the preparation of a concept master plan that would be reviewed with the regional Manager of Maintenance and the national Director of Engineering. Following this review, the specific design would be developed for each industry and each plan submitted to the CSCD and their parent railroad Genesee & Wyoming Railroad (GWRR). The project would follow GWRR industrial track guidelines and be adjusted per the review comments from the GWRR. The crossings would need Washington State PUD approvals.

5.2.6 Summary of Transportation Improvement Program

This section presents an overview and summary of the transportation infrastructure needs associated with the East Omak Industrial site. Included in the discussion are both on-site improvements that can be constructed in stages as funding is available, and off-site investments to address potential future mitigation.

Table 15 presents each proposed project including the project location (or name), project limits, a description of the activities to be undertaken, the relationship of the project to the timing of site development, and estimated costs. Details related to cost estimation are included in the *Transportation Access Study***.** Key assumptions in the development of the cost estimates include:

- All costs are presented in 2023 dollars.
- Contingency is estimated at 30 percent to reflect the extent of unknowns at the planning level. This contingency could cover any changes in stormwater design or other project elements such as additional signage, roadway delineation, driveways, etc.
- Stormwater piping is based on the length of the roadway. Catch basin type 1 is assumed every 150 feet and catch basin type 2 every 500 feet.
- Bioretention would occur in the planter strip
- Rail cost estimates assume prevailing wages for the construction of the CSCD track elements while the industrial trackage does not include this.

As shown in the table, the total cost of needed on-site transportation infrastructure would be about $17,393,400 in 2023 dollars. This breaks down into discrete projects including three potential phases of internal site roadways and internal site rail (including a spur track from the existing north/south Cascade and Columbia River railroad and trackage associated with a proposed intermodal terminal). The total cost of on-site internal roads is $11,580,500 and $5,812,900 for internal rail.

The table also includes costs for various off-site transportation improvements to address potential congestion or safety issues associated with project development. These include improvements to address congestion at the intersection of SR 155 (Omak Avenue) with Dayton Street, and safety projects on SR 155 at Garfield and Hanford Streets, and along Jackson Avenue. The total cost of the off-site improvements could range from a low of $2,723,000 to a high of $3,823,000, depending on whether a traffic signal or a roundabout is installed at the intersection of SR 155 with Dayton Street. It should be noted that the project does not bear sole responsibility for the expected future congestion at this intersection as it would see poor levels of service even without the project. Additionally, it should be noted that the City of Omak is currently planning to make school safety improvements at the intersection of SR 155 at Garfield Street. The project could further enhance school safety by making similar improvements at the Hanford Street intersection.

Table 15. Transportation Infrastructure Improvements

Location	Limits	Description	Timing	Estimated Cost
Internal Street System				
Jackson Street Extension	East of Okanogan/ Omak East Road, and south of 8th Avenue	Construct a total of 1,400 LF of the new industrial road with shared-use paths, but no street trees	To serve initial development activity on the west and east ends of the project site	$ 2,995,700
		Without street trees		$ 2,989,300
Jackson Street Thoroughfare	Between two segments of the Jackson Street Extension	Construct an additional 2,840 LF of the new industrial road with shared-use paths to connect initial roadway extension access to east and west portions of the site, no street trees	To serve later development stages more central to the site, or to provide a complete connection for the entire site	$ 6,222,100
		Without street trees		$ 6,100,500
SR 20 Connection	SR 20 to Okanogan/Omak East Road	Construct an additional 1,625 LF of new industrial roadway with shared-use paths to connect the project site with SR 20. Includes at-grade railroad crossing but no street trees	To serve later stages as the project site develops to enhance access to/from the regional transportation network	$ 2,362,700
			ON-SITE TOTALS (with street trees)	**$11,580,500**
Off-Site Improvements				
SR 155 at Dayton Street	Intersection	Install traffic signals and enhance pedestrian crossings	To address traffic operational impacts	$ 1,000,000
		Install a roundabout and enhance pedestrian crossings	To address traffic operational impacts	$ 2,100,000
Jackson Street	SR 155 to the project site	Install 2,125 LF of 5-foot-wide sidewalks to enhance pedestrian safety on this site truck access route	To serve the initial development stage as truck traffic increases	$ 1,576,600
SR 155 at Garfield and Hanford Streets	Intersections serving East Omak Elementary School	RRFBs at the crossings with Garfield and restriping the crosswalks	To serve the initial development stage as truck traffic increases. Coordinate with City TIP project.	$ 146,100
			RANGE FOR OFF-SITE TOTALS	**$2,723,000 to $3,823,000**
Railroad Spur	Mainline to the project site	Install 3,600 LF of new rail trackage to serve the proposed intermodal facility and rail-industrial site including crossing protection	Develop as opportunities arise for intermodal transfers and the need for rail access occurs	$ 5,812,900

RANGE FOR GRAND TOTALS	**$20,116,000 to $21,216,000**

5.3 Water Supply Next Steps

The work summarized in this report was limited by time and available information. Depending on the CCT's preferred alternative(s), further investigation in the following areas may be warranted. This list is not intended to be exhaustive.

- Fire flow test after new 12" installed.
- Verify existing CCT booster pump discharge pressure.
- Hydrogeologic study for potential new wells.
- Verify the location and potential reuse of the existing well from the CIPV site.
- Verify proposed land use within the project area relative to water demand.
- Water system modeling of existing City water system with estimated future water demands.
- Investigate the potential for incorporating a portion of the City's lower pressure zone into a new pressure zone that includes the proposed industrial area (extension of Alternative A).
- Investigate the potential for the retail site to receive water from the same system supplying the existing fueling station. This avoids railroad crossings. An opinion of probable cost was not prepared for this alternative because of the increased cost and potential problems with having pressure-reducing stations in the industrial area.

Table 16. Water Improvements Opinion of Probable Cost

OPINION OF PROBABLE COST				**6/26/2023**
PROJECT: Omak Industrial Site				
WATER				
8" Services	EA	$70.00	830	$58,100
12" Pipe, fittings, and valves	LF	$90.00	3055	$274,950
Water Line Railroad Crossing	LS	$50,000.00	1	$50,000
Booster Pump with Enclosure & Fire Pump	EA	$480,000.00	1	$480,000
1.2 million Gallon Water Tank	EA	$1,400,000.00	1	$1,400,000
Fire Hydrant Assembly	EA	$4,500.00	7	$31,500
Incidentals (fence, access road, etc.)	LS	$60,000.00	1	$60,000
Engineering & Design	LS	$299,199.00	1	$299,199
		SUBTOTAL		$2,294,550
		TAX (10%)		$229,455.00
		CONTINGENCY (20%)		$458,910.00
		TOTAL		**$2,982,915**

5.4 Wastewater Recommendations

Based on the expressed interests of the CCT, including cost, practicality, operational requirements, and permitting requirements, we recommend that the CCT proceed with the design of a lagoon treatment facility, hydraulically sized to serve East Omak, the 12 Tribes Omak Casino Hotel, and the proposed industrial park development. If plans for the industrial park development change in the future and a greater level of treatment is required to treat higher-strength industrial wastewater, the CCT can at that time design and construct a pretreatment facility for the industrial discharges rather than modifying the process of the entire WWTP.

We further recommend that the CCT proceed with a groundwater discharge as well as a potential future irrigation discharge, to supplement the groundwater discharge once agriculture and/or irrigated landscaping has been established. During spring runoff months, the water table is high, and the ground is saturated, therefore groundwater discharge capacity is reduced. Similarly, crops can only be irrigated during the spring and summer months. The WWTP will therefore benefit from the added flexibility of having multiple discharge options. The WWTP will require storage lagoons in addition to aerated treatment lagoons, to store treated effluent until it can be discharged to groundwater and/or be used to irrigate. These storage lagoons would also be used to store biosolids (sludge) long-term until the lagoons have reached capacity and must be removed.

Before proceeding with the design of the selected WWTP alternative, we recommend that the CCT collects additional information to aid in the design process and ensure that the system is properly sized. This information would include geotechnical investigations of the area; operational data from the City of Omak WWTP; review of land availability and potential land acquisition in the area of the proposed WWTP; further review of the proposed industries to refine treatment sizing; site survey data, including as-builts of existing water and sewer infrastructure; and review of anticipated EPA discharge limits for the proposed facility.

5.4.1 Wastewater Cost Considerations

At this point, there are still many unknowns, and therefore accurate cost estimates are not possible; however, we have provided some preliminary cost ranges (see below), which demonstrate the general cost magnitude required to design and construct these various alternatives. This cost review does not consider the acquisition of land, if applicable, which should be considered separately. This cost review also does not include the construction of sewer main extensions throughout the proposed industrial park development, because the site layout and specific building locations are unknown at this time.

A rough estimate of $2M - $5M should be budgeted separately for such future collection system improvements. Lastly, treatment alternatives that include a surface water discharge have not been considered in this cost review due to the direction provided by the CCT. It's important to note that a surface water discharge would likely have significant cost savings for both capital improvements as well as ongoing O&M when compared to the other discharge options.

Estimated Design & Construction Costs for WWTP Alternatives:

- *Mechanical Plant w/ Agricultural Irrigation Discharge ~ $30M - $40M*
- *Mechanical Plant w/ Groundwater Discharge ~ $25M - $35M*
- *Lagoon System w/ Agricultural Irrigation Discharge ~ $15M - $20M*
- *Lagoon System w/ Groundwater Discharge ~ $10M - $15M*
- *Continue discharging to the City of Omak WWTP ~ $2M*

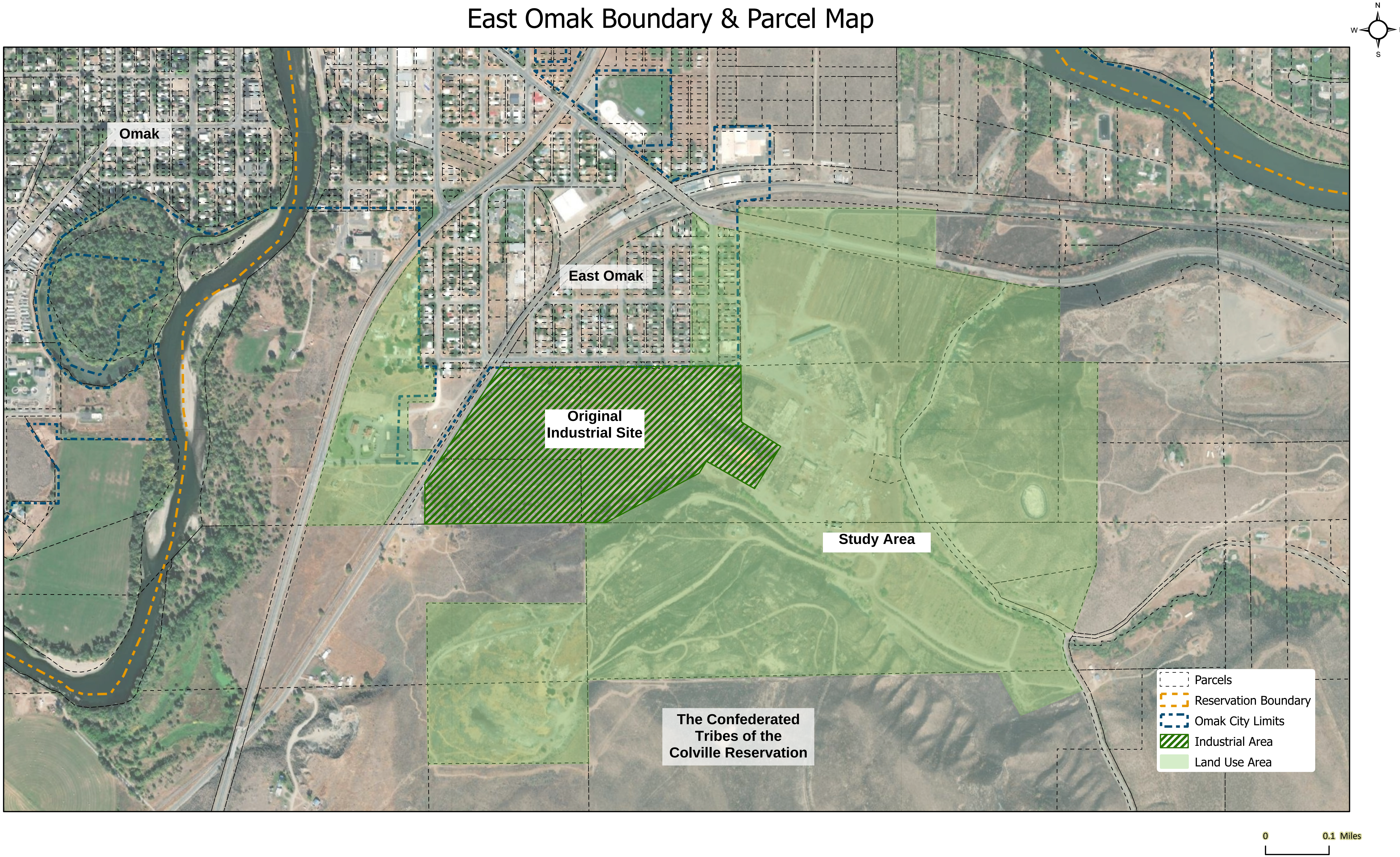
In conclusion, there are multiple improvements for the CCT to pursue moving forward for the industrial site. There are funding opportunities available as well for economic development-oriented infrastructure and even more available for revitalization dedicated to the surrounding East Omak neighborhood. None of the no-build alternatives provide suitable infrastructure conditions for an industry to be sited at the East Omak Industrial and Business Park, however, there are improvement recommendations that can be scaled depending upon a potential industrial user. The likelihood of attracting users to the site increases tremendously with improvements and infrastructure already in place, showing dedication to the area. As recommended in the Market and Industry Report, getting a “quick-win” is a surefire way to demonstrate the CCT’s seriousness in developing the site.

Minimal improvements can be made to set the path for the first users and as revenue is obtained larger improvements can be funded and made in the future. There are many opportunities here to diversify and expand the CCT’s economic revenue as well as benefit the tribal community through jobs, neighborhood revitalization, and workforce training.

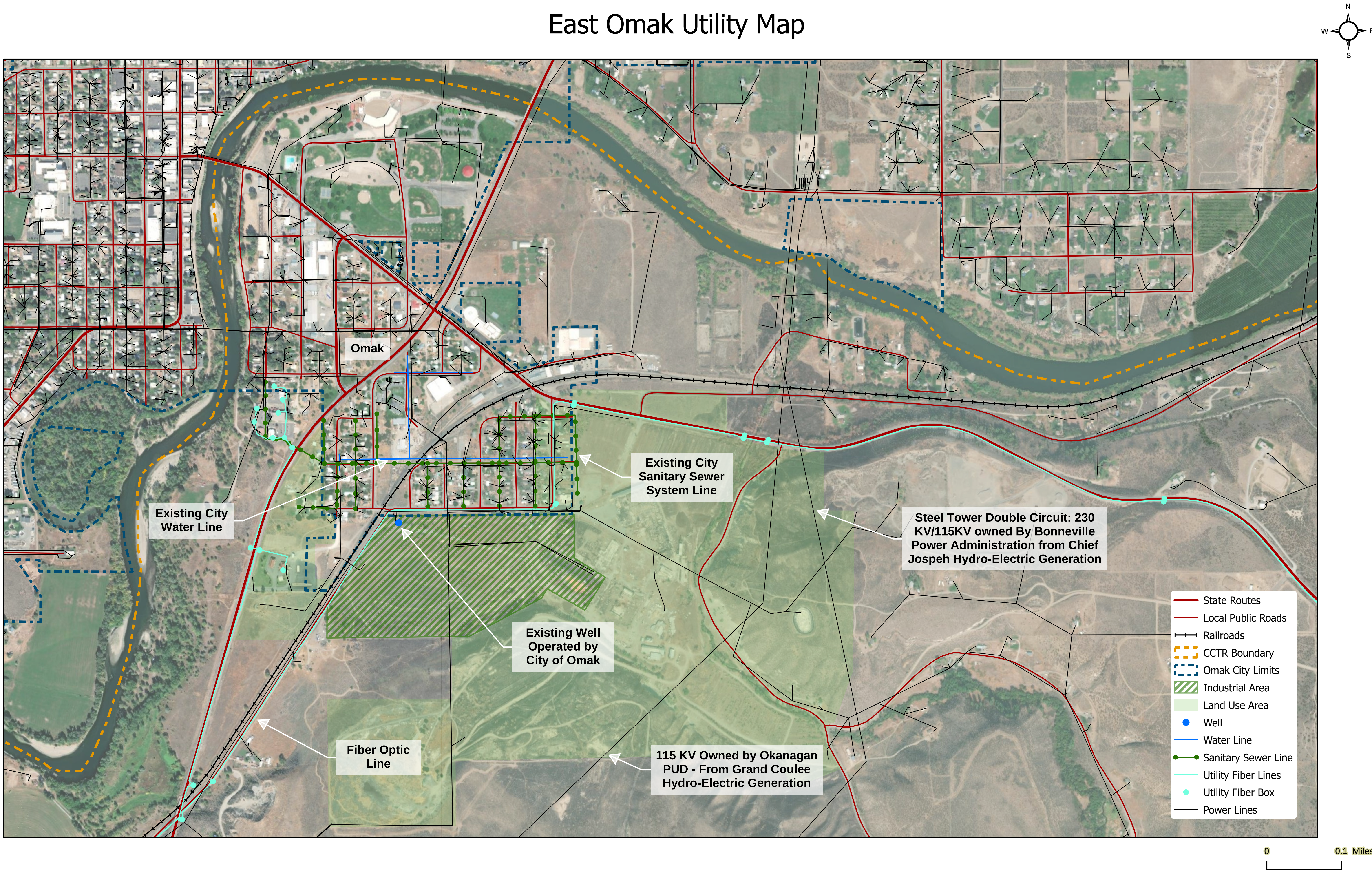
Appendix A
Map Portfolio

East Omak Overall Map

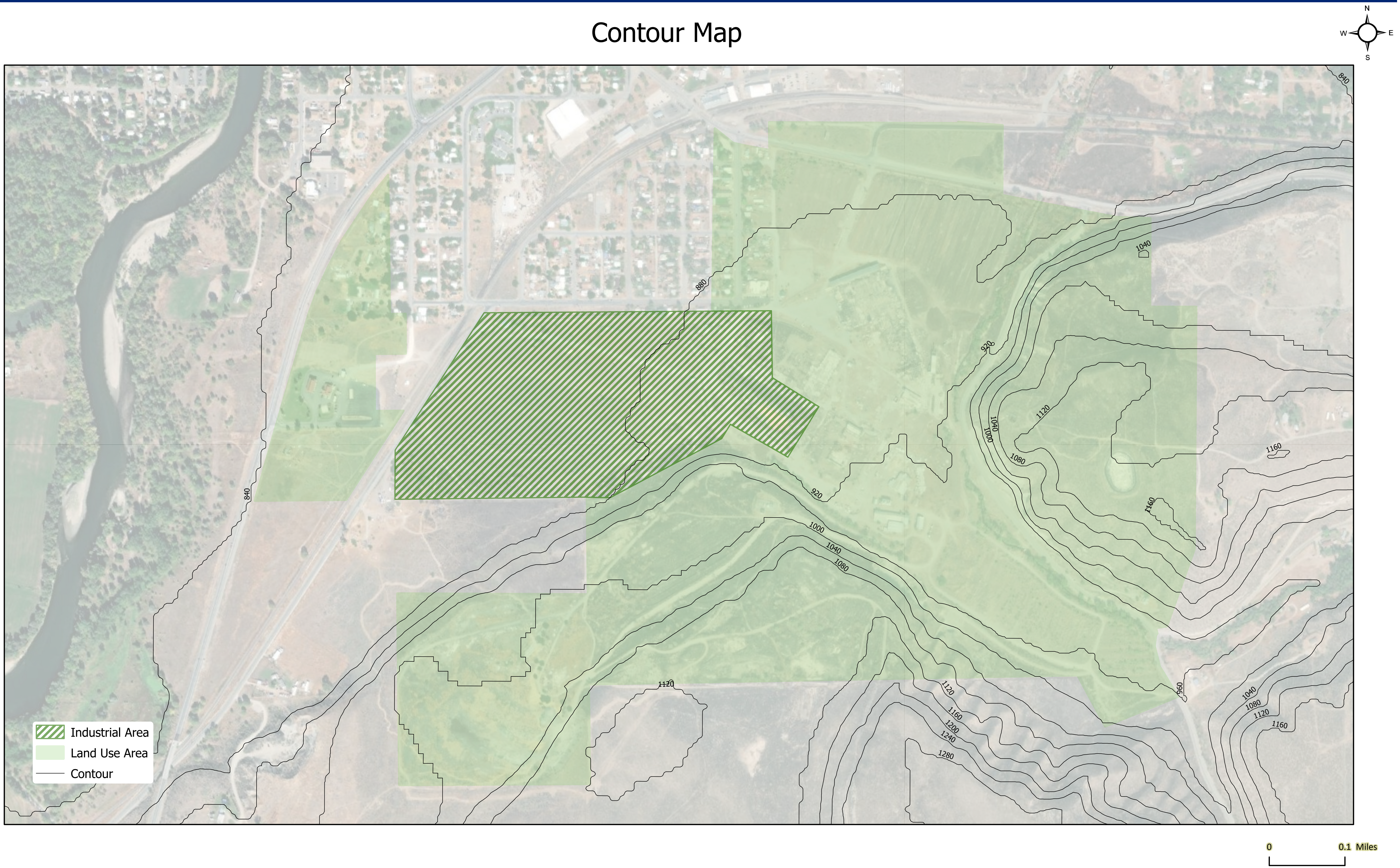
East Omak Boundary & Parcel Map



East Omak Utility Map



Contour Map


N
W
E
S
Industrial Area
Land Use Area
Contour
840
880
920
960
1000
1040
1080
1120
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1200
1240
1280
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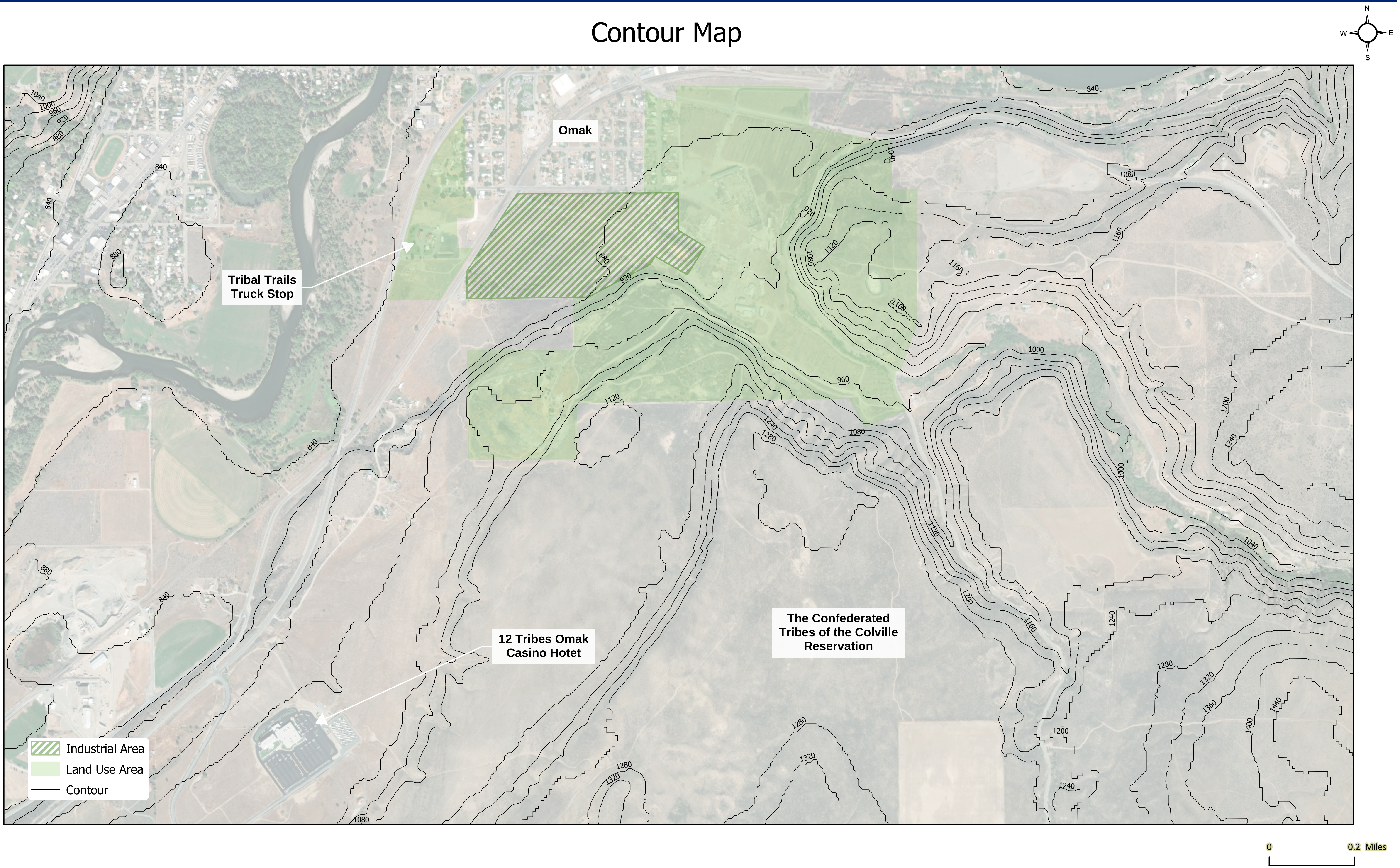
0.1 Miles

Contour Map


N
S
E
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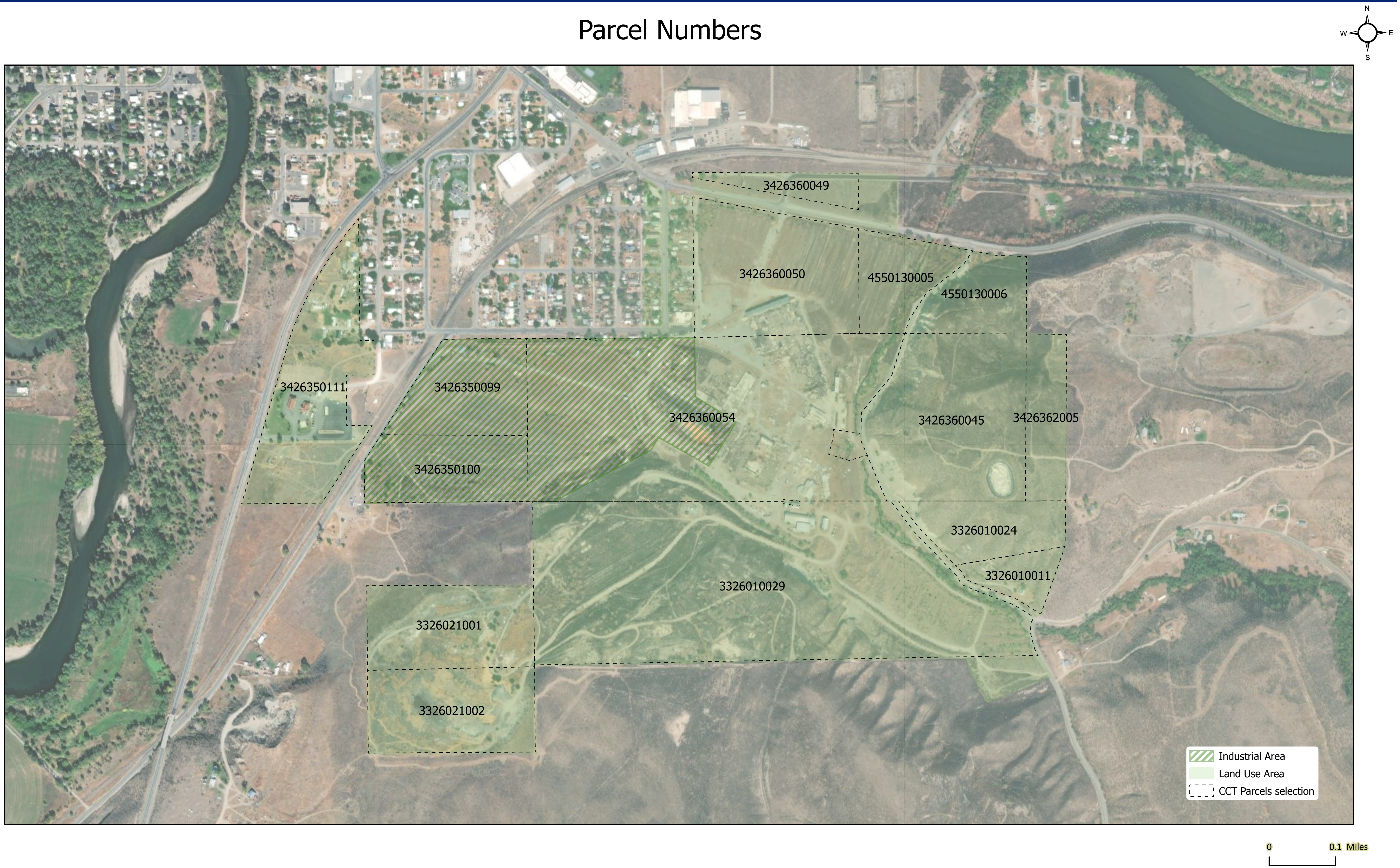
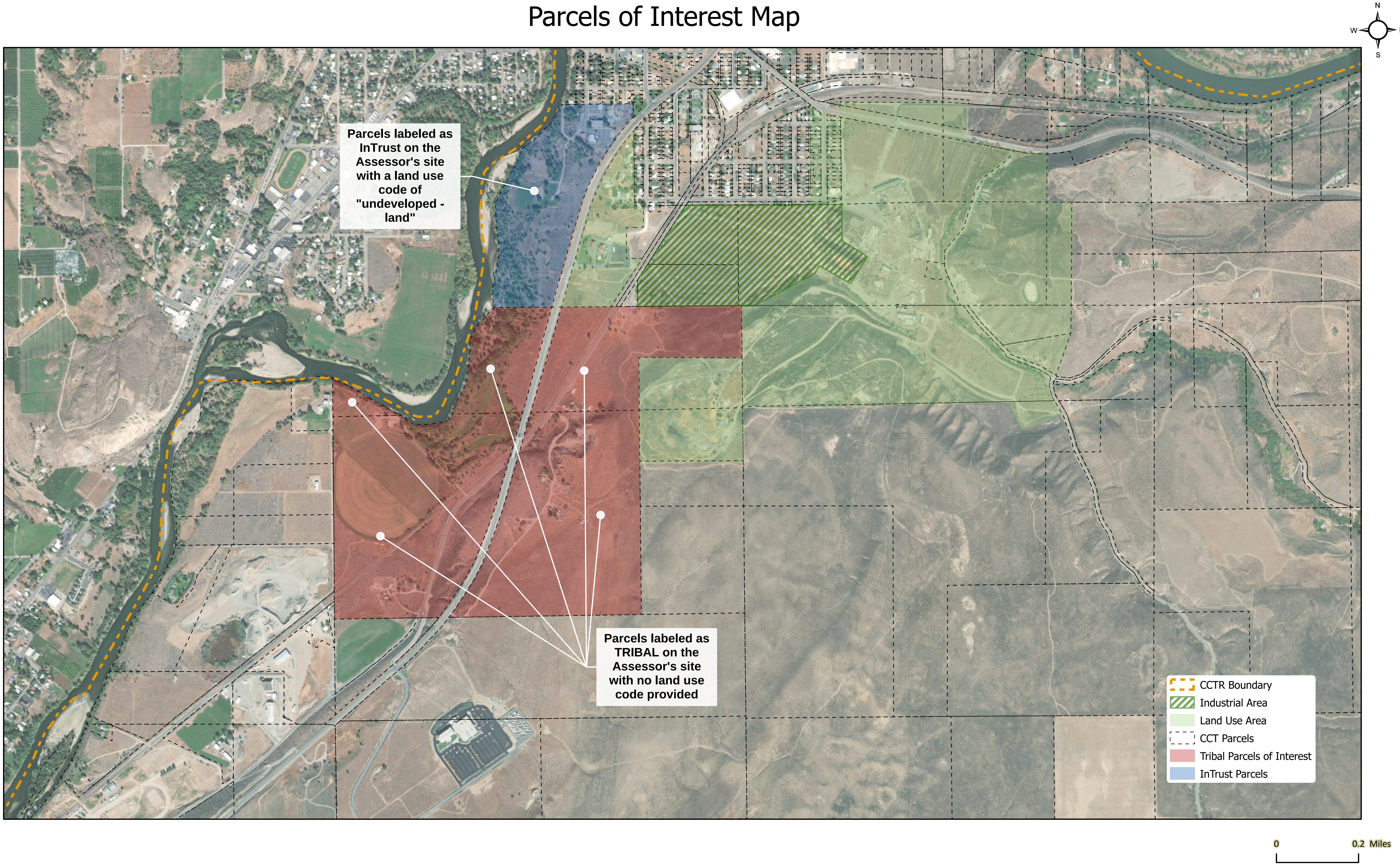
Omak
Tribal Trails Truck Stop
12 Tribes Omak Casino Hotet
The Confederated Tribes of the Colville Reservation
Industrial Area
Land Use Area
Contour
0
0.2 Miles

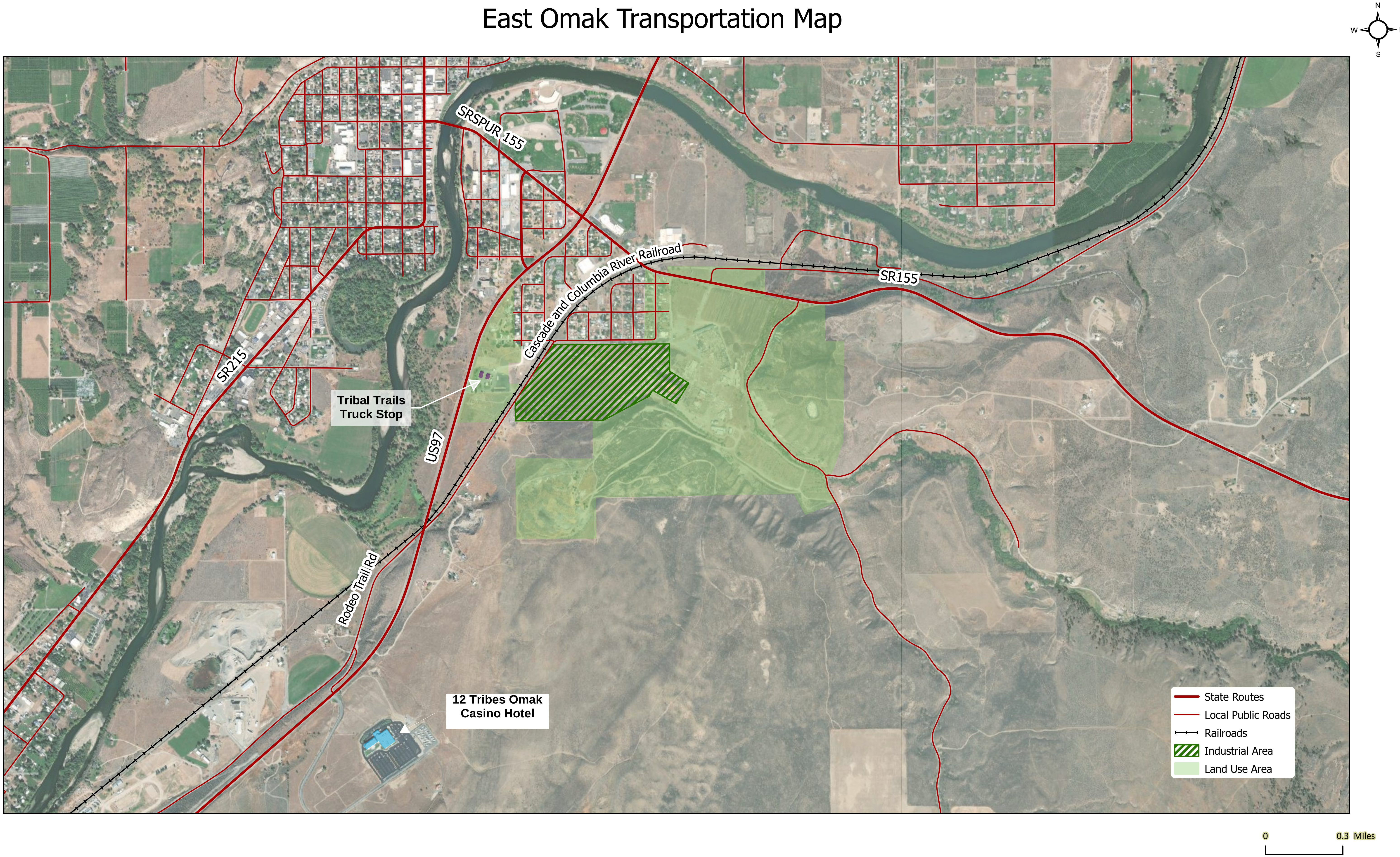
Parcel Numbers



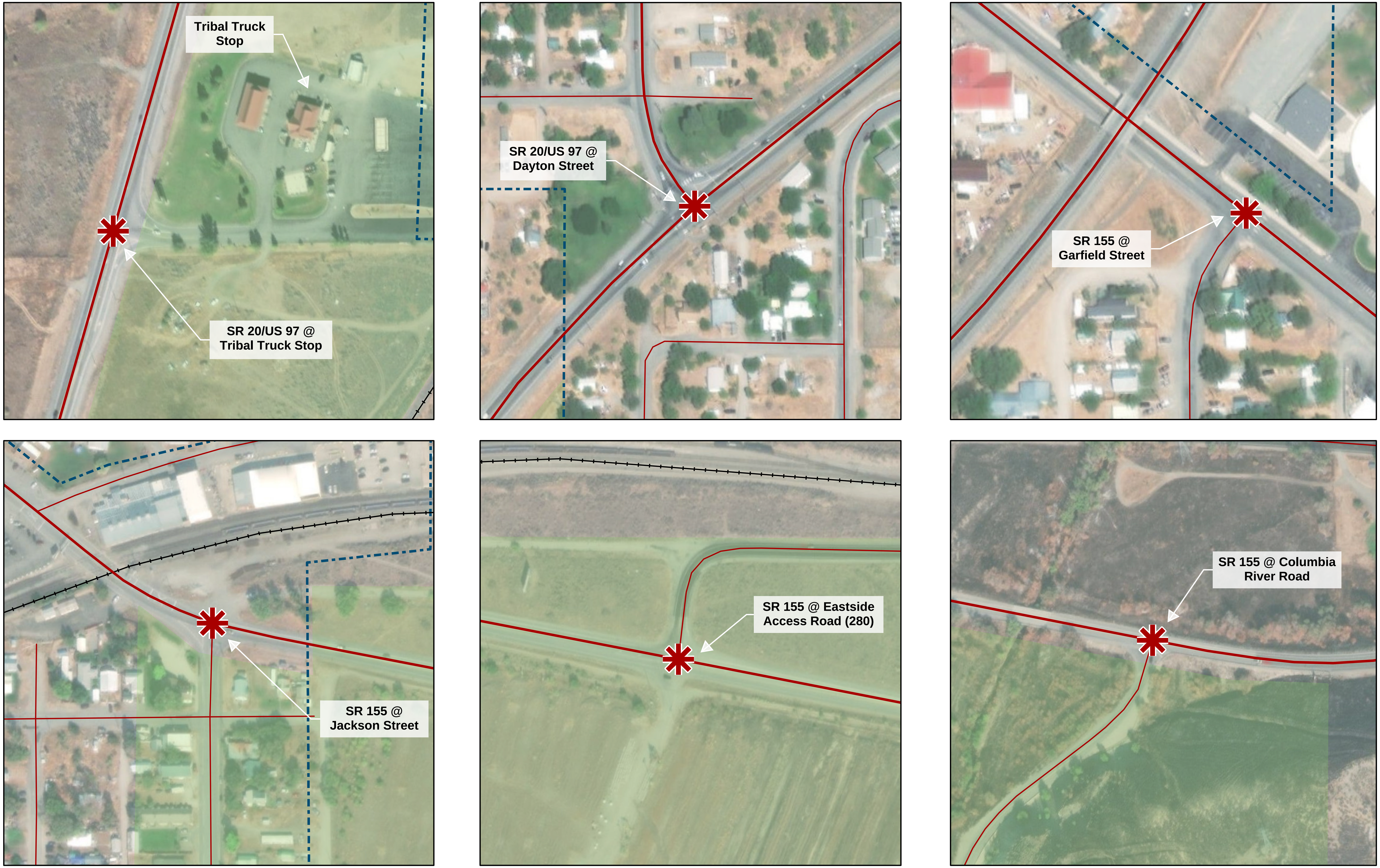
Parcels of Interest Map



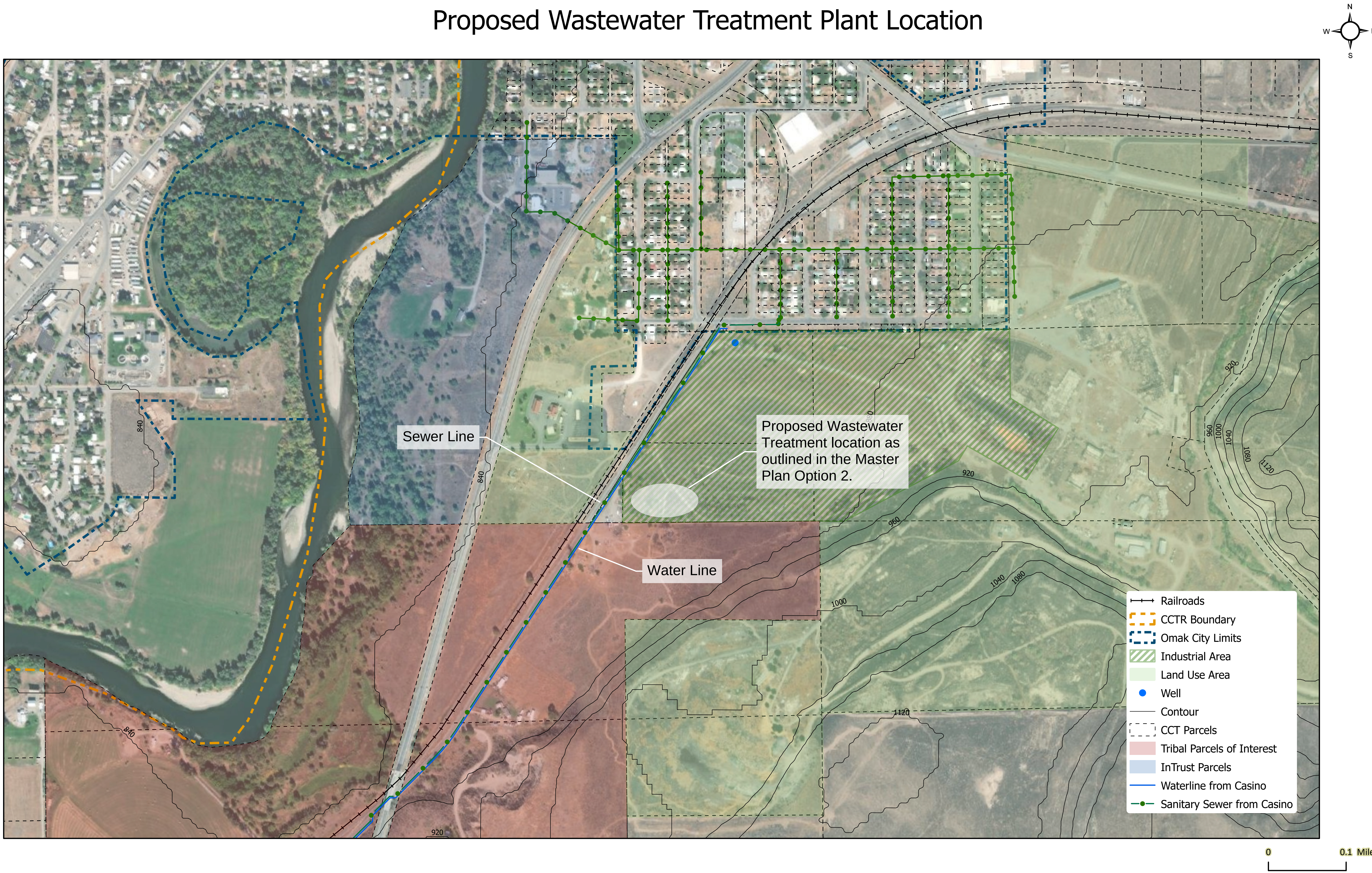
East Omak Transportation Map



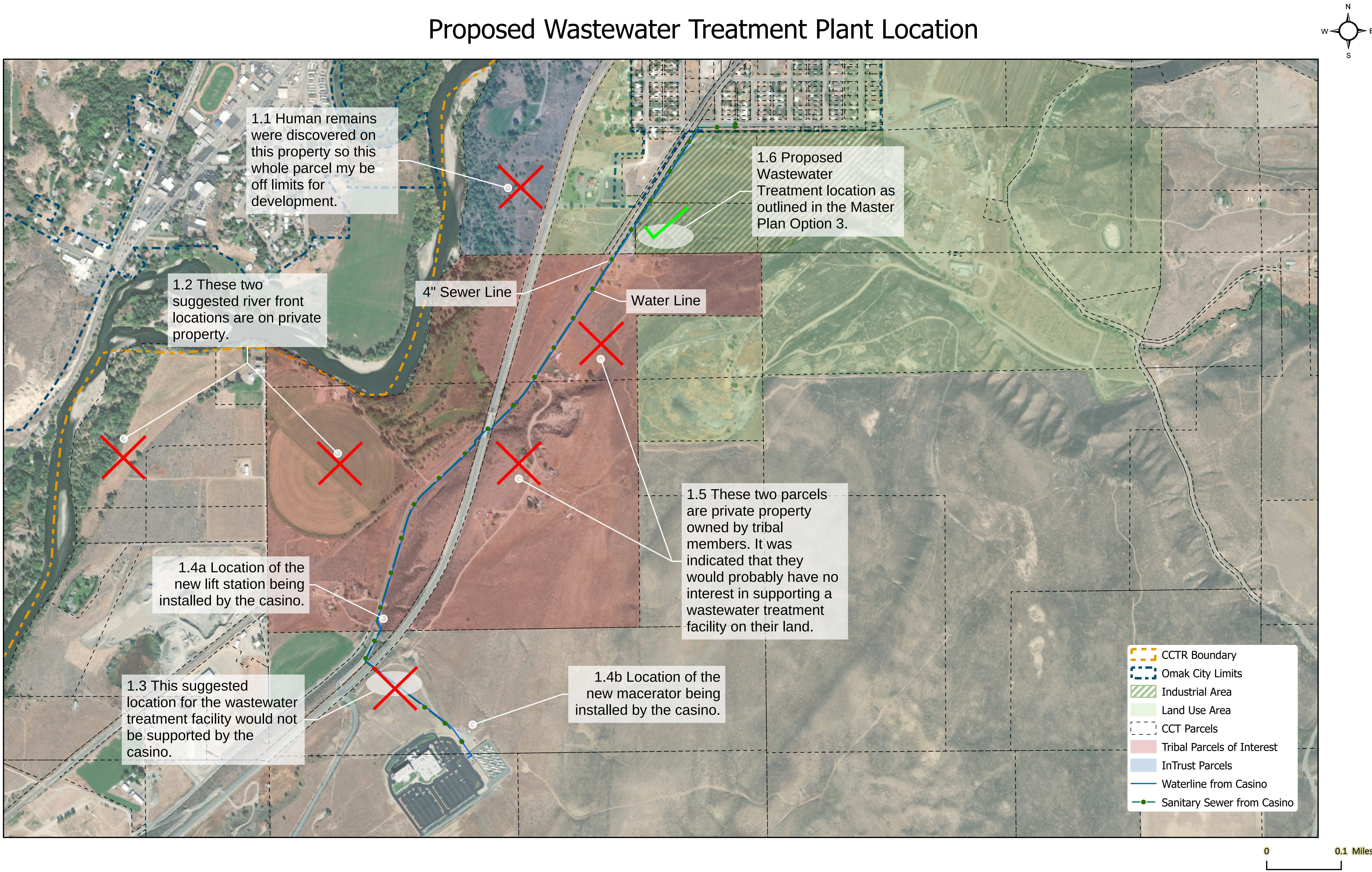
Proposed Intersection Locations for Traffic Counts



Proposed Wastewater Treatment Plant Location



Proposed Wastewater Treatment Plant Location




N
S
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Clinic / Head Start Site
Intermodal Facility
6.02 Acres
Rail-Using Industrial
5.27 Acres
Warehousing
7 Acres
Housing Manufacturing
6 Acres
Craft/Flex Industrial
20 Acres
Retail
5 Acres
Lagoons
Drainage Fields
Drainage Fields
(Reserved)

Appendix B
Market and Industry Study

East Omak Industrial Site Readiness

Market Analysis and Industry Study

PREPARED FOR

THE CONFEDERATED TRIBES OF THE COLVILLE RESERVATION

PREPARED BY

LELAND CONSULTING GROUP

JUNE 2023

Introduction and Background

Purpose and Goals

The purpose of this report is to provide the Confederated Tribes of the Colville Reservation (CCT) an updated market analysis and target industry study for CCT's East Omak Industrial Site and Business Park.

Prior to this study, CCT completed a 2011 Master Plan which included a detailed market study and industry analysis for the site. This previous work included a baseline demographic and employment analysis, as well as recommendations for targeted industries based on regional real estate conditions and the site's competitive advantages or opportunities for future investment and development.

Despite the Master Plan having been completed nearly 12 years ago, many of its recommendations are still relevant today. However, **the permanent loss of the Colville Indian Plywood and Veneer Plant (CIPV)** in 2017 has certainly altered the market for the site, and in the wake of COVID-19, it is important to understand how **the broader regional market conditions have changed**.

With the goal of providing CCT with a better understanding of current market conditions, and assisting them in marketing the site to potential customers interested in locating their business in East Omak, this report includes:

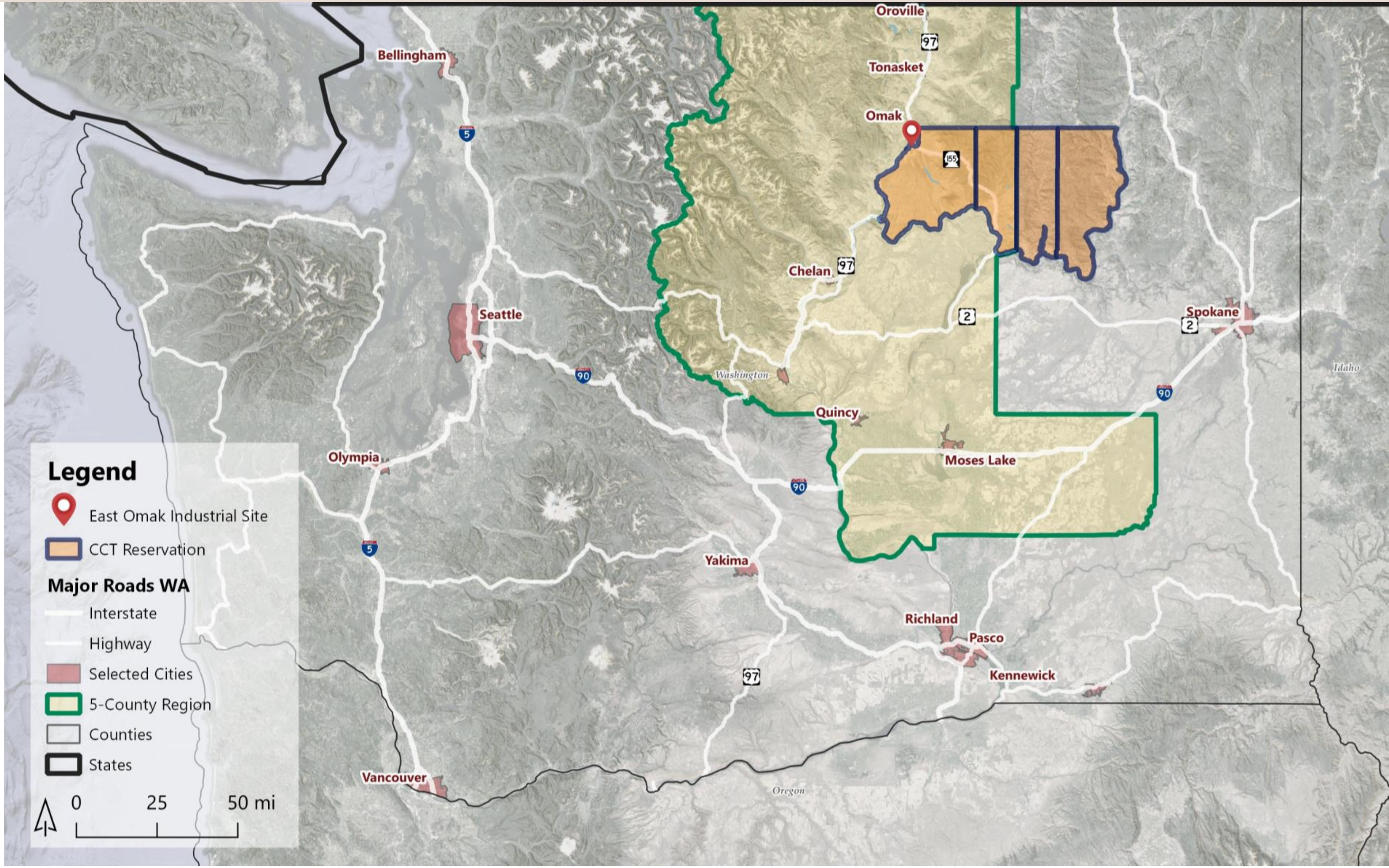
1. Updated Demographic & Economic Profile
2. Regional Industrial Market Analysis
3. Site Program, Case Studies & Strategic Recommendations

Site Context

The East Omak Industrial Site is located within the CCT Reservation in Okanogan County (shown in orange). It is east of US-97 and south of WA-155.

US-97 stretches from Weed, California to Canada, while WA-155 connects Omak to Grand Coulee and the Coulee Dam.

The site is adjacent to the Tribal Trails Truck Stop and about 2 miles north of the 12 Tribes Omak Casino Hotel.



Past Planning Efforts

The East Omak Industrial Site has been the subject of recent planning efforts, including the 2011 Master Plan discussed previously, conducted before the loss of the former mill. The conclusions of that plan have informed the current process, updated to reflect the new realities of the site and regional economy post-fire and post-pandemic.

Several other regional and tribal plans relating to economic development in the area were reviewed in developing recommendations for the site, including:

- CCT Comprehensive Plan 2020-2040
- CCT Comprehensive Economic Development Strategy (CEDS) 2017-2021
- North Central Washington Economic Development District (NCWEDD) Comprehensive Economic Development Strategy (CEDS) 2022 Annual Update
- 2020-2024 North Central Regional Workforce Plan
- 2017 Okanogan Economic Recovery Plan
- 2019 Greater Omak Area Comprehensive Plan Update
- 2021 Okanogan County Comprehensive Plan

Key themes from 2011 Site Master Plan

The **previous market and industry analysis** for the site identified the following recommended industries:

- Wood products *(construction materials cluster)*
- Food products *(processed food cluster)*
- Recreational and travel vehicles *(prefabricated enclosures cluster)*
- Power generation and transmission cluster *(including renewable energy)*
- Metal manufacturing cluster
- Plastics cluster

Some of these recommendations are still relevant, such as food products, which reflects the agglomeration of value-added fruit manufacturing in the area, as well as prefabricated enclosures manufacturing. However, **wood products and power generation are less relevant industry recommendations today** since the closure of the Power & Veneer plant and the loss of the existing mill on the site.

The study also identified a number of advantages and disadvantages of the site which can provide useful perspective and informed the SWOT Analysis found later in this report:

- Lack of specialized local **labor force**
- Absence of commercial **air services**
- Potential capital from the **Economic Alliance** and **North Central Washington Business Loan Fund**
- Opportunity for **business-friendly environment** through tax advantages of operating on reservation lands
- Potential for **several uses** on the site due to its size.

As stated in the **2019 Omak Industrial & Technology Park White Paper**, the industrial site remains located within a federal Opportunity Zone, providing incentives that include capital gains tax deferral and forgiveness, and numerous other financial incentives to encourage investment and economic development projects in economically distressed areas and on tribal lands specifically, including:

- Native American Wage and Insurance Tax Credits at 20% of wages and health insurance
- Equipment and Building Accelerated Depreciation at 2X the normal rate
- New Market Tax Credits
- Federal Contracting Preference for Tribal Companies
- HUB Zone preference
- Tax Exempt Bonds issued by Tribal Governments to Investors
- Dept of Energy loan guarantees for Tribal Energy projects

Key goals from other plans relevant to the site

CCT's Comprehensive Economic Development Strategy (CEDS) contains several strategic goals related to the development and marketing of the East Omak Industrial Site:

- Increase financial diversity and stability
- Encourage and support economic development and improvement
- Re-capitalize tribal enterprises
- Recoup lost revenues
- Increase energy (green) programs

In addition, the **2019 Greater Omak Area Comprehensive Plan**'s Land Use Element contains policies around Industrial Development in the area:

- Policy 2: Cooperatively work to enhance and expand existing industries through value added or new products and strive to attract new industrial businesses that complement existing industries, promote diversification and create a sustainable economic base.
- Policy 4: Cooperatively upgrade services and utilities and promote industrial expansion and use in existing and planned industrial areas where industrial uses may locate with consideration of changing transportation modes, proper access, and the availability of public services and utilities.
- Policy 7: Agree to develop and enforce standards for industrial development so that adjacent land uses are not negatively impacted and can develop in a compatible atmosphere.

Finally, the **2017 Okanogan Economic Recovery Plan** contains a number of goals around industrial development and resiliency in the area, particularly related to wildfire damage in recent decades:

- Developing redundancy in critical infrastructure and improving basic infrastructure capacity;
- Developing space and marketing to support growth in industry and tourism throughout the County;
- Targeting manufacturing industries to mitigate commodity-based industry vulnerabilities; and
- Diversifying the agriculture, timber, and mining industries and exploring further opportunities for processing, manufacturing, and sale at local markets.

Key takeaways from past community engagement efforts

CCT's CEDS and the 2011 site master plan both contain summaries of community engagement efforts conducted as part of the planning processes. These engagement efforts revealed important **community preferences and views about potential economic development projects on the site**. These themes and preferences are reflected in the recommendations found under "Targeted Industrial Uses" later in this report.

Community members rated the most important factors to consider for projects on the site as follows:

1. **Tribal Sovereignty**
2. **New Job Creation**
3. **Sustainability**
4. **Total Investment**
5. **Probability of Success**
6. **Environmental Impact**
7. **Cultural Impact**
8. **Community Support**

Other **important themes** which emerged during engagement efforts included:

- Emphasis on using the **rail line**
- Importance of **tribal-owned businesses**
- Importance of improving **road service** to the site to avoid trucks moving through neighborhoods
- Emphasis on **specialized products** rather than raw materials
- Desire for **technical/trade schools** & training
- Market the **"Native Experience"**

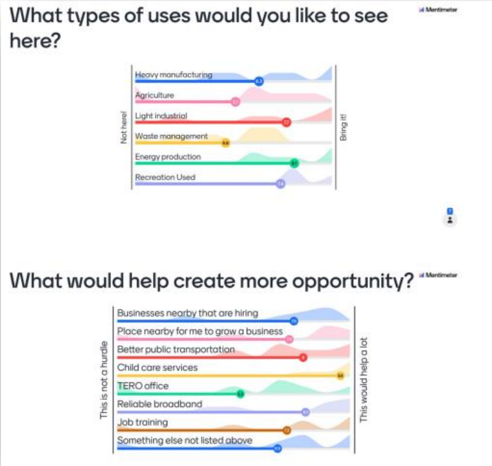


Photo from CCT Comprehensive Plan, Survey Results from Akana 2022 Workshop Summary

Key Findings

The East Omak site has been the subject of several previous planning efforts and is identified as an important site in other regional planning efforts as well. Although the realities of industrial development on the site have changed significantly over the past decade, many key elements and goals of past plans remain relevant.

Past community engagement efforts by CCT and external consultants have found community support for site improvements, new job creation, job training, and industrial uses that further tribal sovereignty.

The following slide presents a SWOT analysis based on the project team's review of background information on the site as well as interviews conducted by Leland Consulting Group and SCJ Alliance with Tribal staff and regional stakeholders in May 2023. A SWOT analysis presents four categories of considerations which can help inform and clarify decision-making processes about CCT's next steps in economic development investments: Strengths, Weaknesses, Opportunities, and Threats. Strengths and weaknesses are internal attributes to be considered or addressed, whereas opportunities and threats are external factors which can be leveraged or mitigated.

SWOT Analysis

Strengths

- Labor force, if use is agricultural, food processing, wood manufacturing
- Transportation access at a regional scale a strength – Hwy 97 provides access to both regional and national freight, as well as southeastern British Columbia - though site access needs to be improved
- Existing broadband and fiber optic available on site
- Access to capital for small businesses - Small Business Administration (SBA) funding available with Economic Alliance assistance; NCW Business Loan Fund
- Post-high school education and work force training programs at local universities
- Quality of life for those that enjoy a rural lifestyle

Weaknesses

- Lack of specialized labor force for more technical industries
- Lack of commercial air services, existing road access a challenge for freight
- Utilities: Power and waste heat no longer available due to closure of CTPV, water and wastewater capacity may not meet needs of some business sectors
- Business services sector – rural location not ideal for some companies
- Lack of functional rail spur at the site location

Opportunities

- Local and regional housing shortages combined with a labor force with experience in construction and wood manufacturing
- Potential to sell and showcase products made by local artists, artisans, and craftspeople, generating revenue and supporting the community
- Proximity to an active international border crossing
- Access to local agricultural products including fruits, legumes, grains, and timber
- Sustained demand for data centers located in NCW region
- Lack of quality, modern industrial properties in the region, particularly warehousing and food processing & storage facilities

Threats

- Closure of CIPV reduces advantage for locating wood products or bio-mass-to-fuel production facilities
- Cost of power in neighboring counties puts site at competitive disadvantage
- Disagreements of access to the existing well and servicing the site from adjacent PUD
- Poor coordination within and between CCT stakeholder groups has led to ineffective marketing of the site

Demographic and Economic Profile

Introduction

The following section highlights the most prominent demographic and economic trends for CCT and Okanogan County in relation to neighboring counties and the State of Washington, as a whole. This context is important in understanding the competitive advantages or disadvantages of the East Omak Industrial Site and establishing market potential both now and into the future.

While the data shown below will further detail how this context has changed since the 2011 Master Plan was completed, below are some key takeaways from the past decade:

- Overall **population has declined within the CCT Reservation**, and growth has slowed countywide, since 2010.
- Median Household **Incomes have increased by 90%,** though rates of poverty in both the Reservation and Okanogan County have remained steady.
- Both the county and Reservation have **aging populations**. Together with the impacts of COVID-19, the overall **labor force has declined** over the past decade.
- While agriculture, forestry, fishing and hunting have maintained the highest rates of employment in the County**, industrial jobs overall have declined since 2016**, which is likely tied in part to the closure of the Colville Indian Plywood and Veneer Plant (CIPV).
- Growth in **transportation and warehousing jobs** between 2017 and 2020 in Okanogan County **outpaced statewide growth**.
- **Housing growth has not kept up with the needs of the size of the workforce**, further constraining workforce development opportunities.

North Central WA is a slowly growing region

The Colville Reservation is located within both Okanogan and Ferry Counties. As a result, there is overlap in some of the population data for the Reservation and Okanogan County.

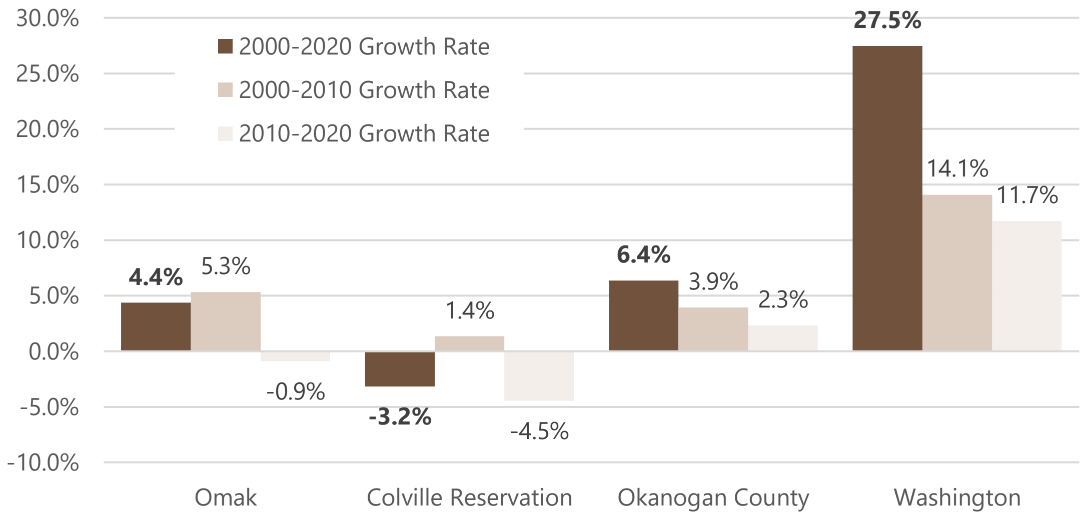
Okanogan County grew by 4.4% between 2000 and 2020, but between 2010 and 2020 the County saw negative population growth. The population living on the Colville Reservation **shrank by 3.2%** between 2000 and 2020, but **between 2020 and 2022 its population has started growing again**.

The County is much bigger than the Reservation, with a population of approximately 42,700 as of 2022 according to the WA Office of Financial Management. **The Reservation's population is 7,830 as of 2022**.

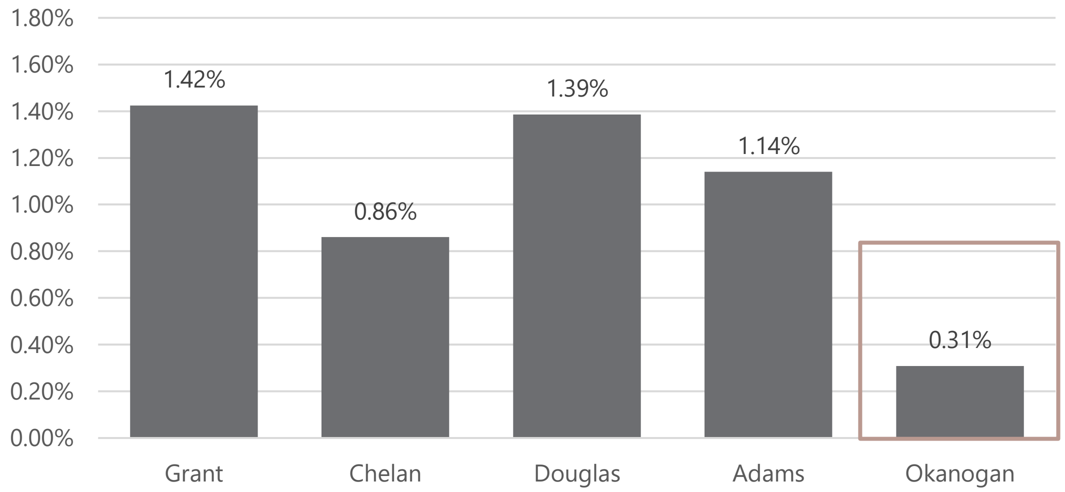
According to the US Census, between 2000 and 2020, the population of all five North Central Washington counties increased. Grant, Douglas, Okanogan, and Chelan Counties all saw positive international and domestic in-migration, while Adams County lost 118 residents through out-migration. Grant experienced the highest number of births and the highest number of deaths, with a net natural increase of 1,183.

Of the five North Central Washington counties, **Okanogan saw the slowest growth over the past two decades**, with an average annual population growth rate of 0.31%.

Population Growth Rates, 2000-2010 and 2010-2020



Annual Population Growth Rates, North Central Washington, 2000-2020



Source: US Census Bureau, LCG.

Colville Reservation and Okanogan County are lower-income communities

Okanogan County residents have higher incomes on average than Colville Reservation residents. **The median household income in Colville Reservation as of 2022 is $65,987 compared with $73,366 in Okanogan County**. Both are below the median household income in Washington ($77,006).

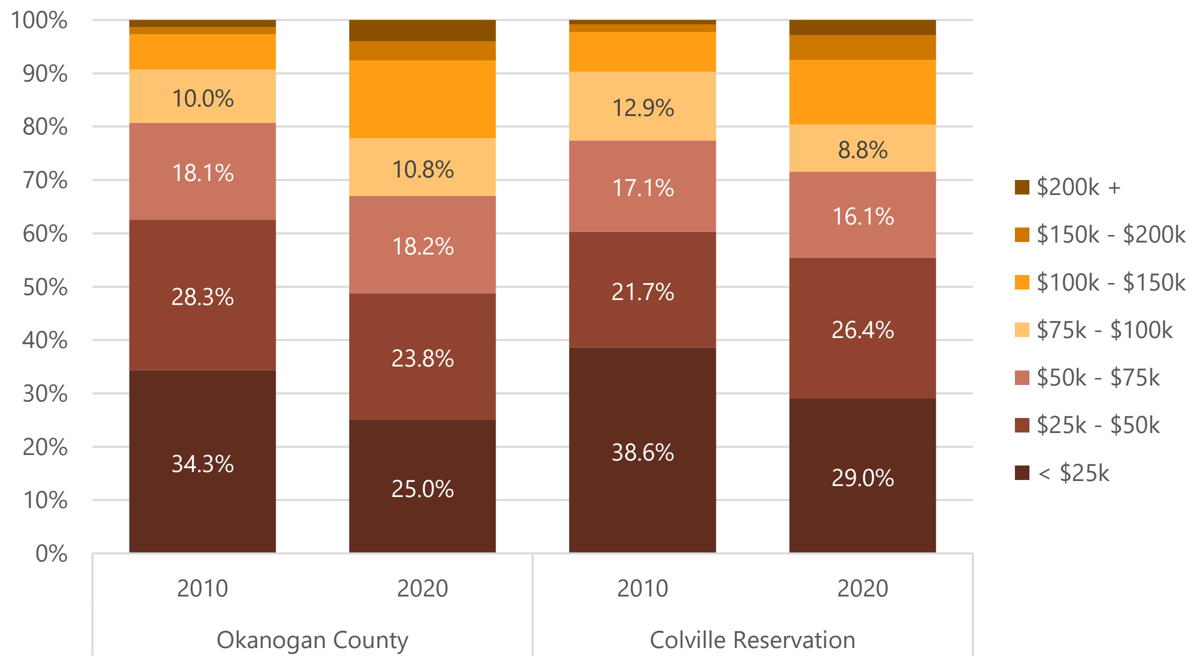
Incomes have increased over the past decade. In 2010, **the median household income for Okanogan County was $38,551**. The median income for the Colville Reservation was $34,239 for the portion in Ferry County and $35,962 for the portion in Okanogan County.

19.6% of households living in the Colville Reservation make less than $15,000 per year (14.5% in all of Okanogan County)

Nearly half (48.8%) of Okanogan County households make less than $50,000 per year, while 22.2% make at least $100,000 per year.

Between 2010 and 2020, **the poverty rate in Okanogan County remained just under 15%**. The poverty rate on the reservation is higher, particularly in Okanogan County.

Income Distribution, Colville Reservation & Okanogan County, 2010 and 2022



Percent of Families below the Poverty Level

Year	Okanogan County	Colville Reservation (Ferry County)	Colville Reservation (Okanogan County)
2010	14.7%	15.8%	26.1%
2020	14.9%	14.8%	26.3%

Source: Esri, US Census Bureau, LCG.

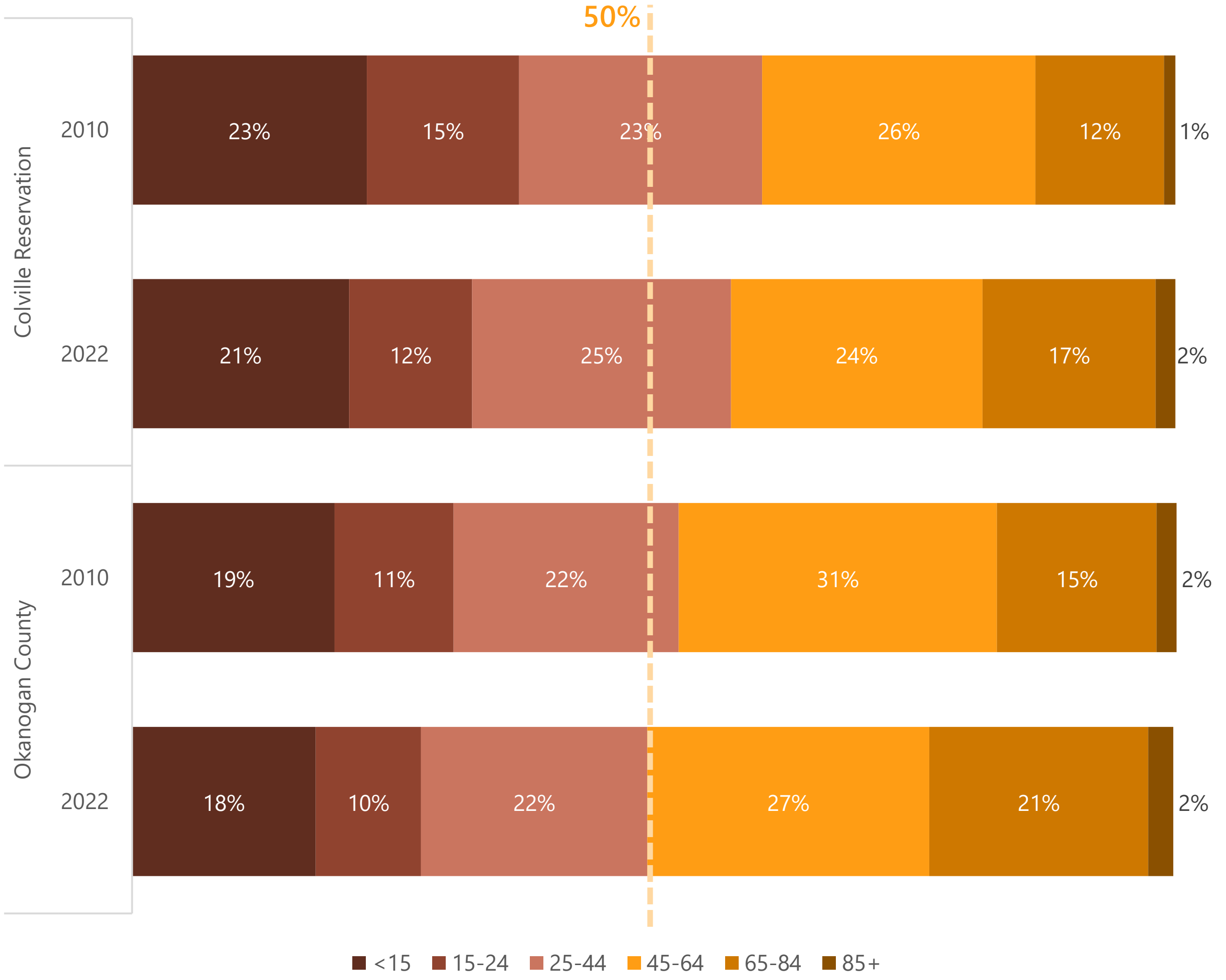
An aging population in need of a younger workforce

Okanogan County's population skews slightly **older** than the Colville Reservation's, with a median age of 45.5 compared with 38.5 in the Reservation. In both areas, median age increased between 2010 and 2022.

The percent of residents under the age of 15 decreased in both the County and the Reservation between 2010 and 2022, while the percent over 65 grew. In Okanogan County, **over a fifth of the population is over typical retirement age.**

Deaths currently outnumber births in Okanogan County – a common phenomenon in aging areas. While the County makes up for this natural loss in population with in-migration (mainly domestic), **more employment opportunities will be needed to attract younger workers.**

Age Distribution, Colville Reservation & Okanogan County, 2010 and 2022



Source: Esri, US Census Bureau, LCG.

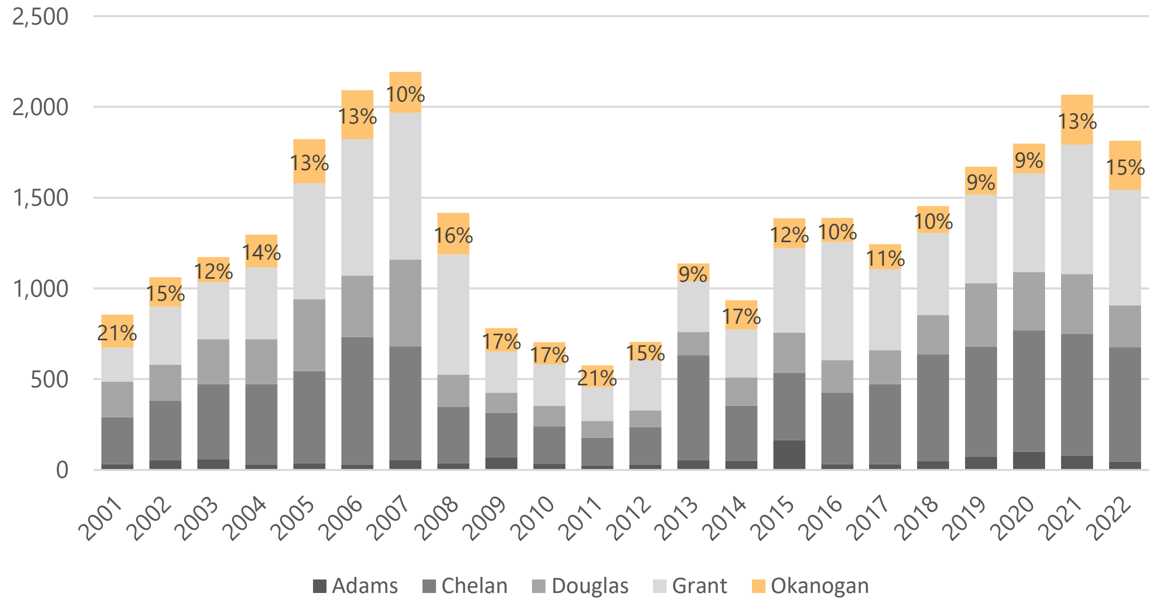
Okanogan County isn't building enough housing to serve its workforce

Since 2001, the number of units permitted in Okanogan County have made up a small share of units permitted across the five-county area. Although in 2022, 15% of units permitted in North Central Washington were in Okanogan County, **between 2019 and 2020, the County had only a 9% share of new units**.

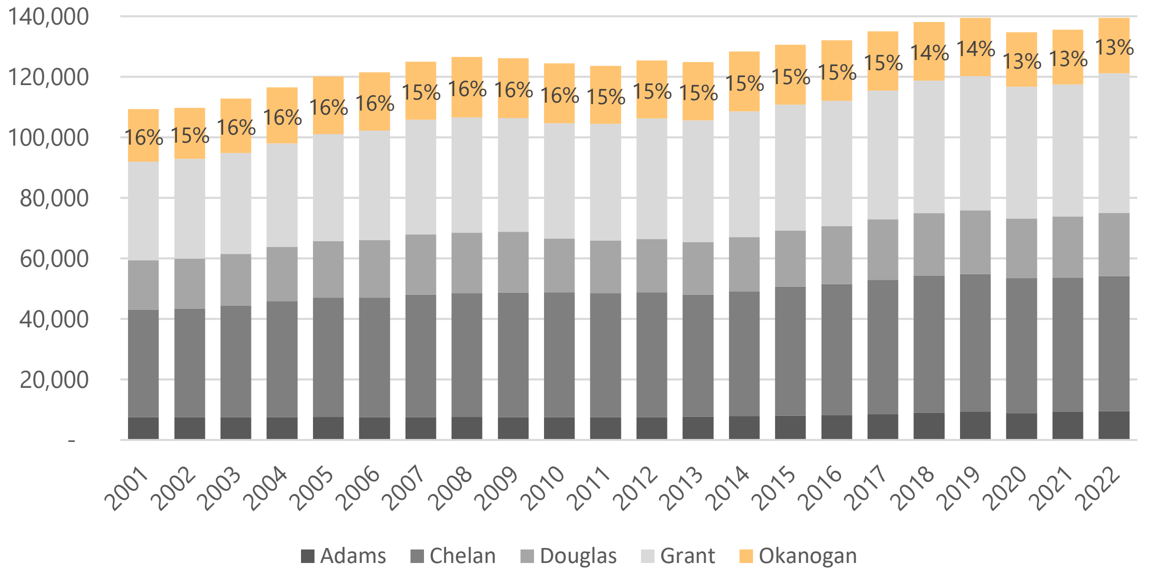
At the same time, **Okanogan County's workforce consistently makes up roughly 13% to 16% of the regional workforce**. The existing housing stock is not enough to meet current needs, and this is preventing labor force growth.

A major challenge to attracting a new large employer will be to ensure there is adequate infrastructure in place. This includes the availability of labor – if there are not enough workers in the community, companies will need to attract them. **If there is not enough housing for workers, companies will not want to locate in Okanogan County.**

New Housing Units Permitted, 2001-2022 (HUD SOCDS)



Annual Employed Persons, Not Seasonally Adjusted, 2001-2022 (St. Louis Fed)



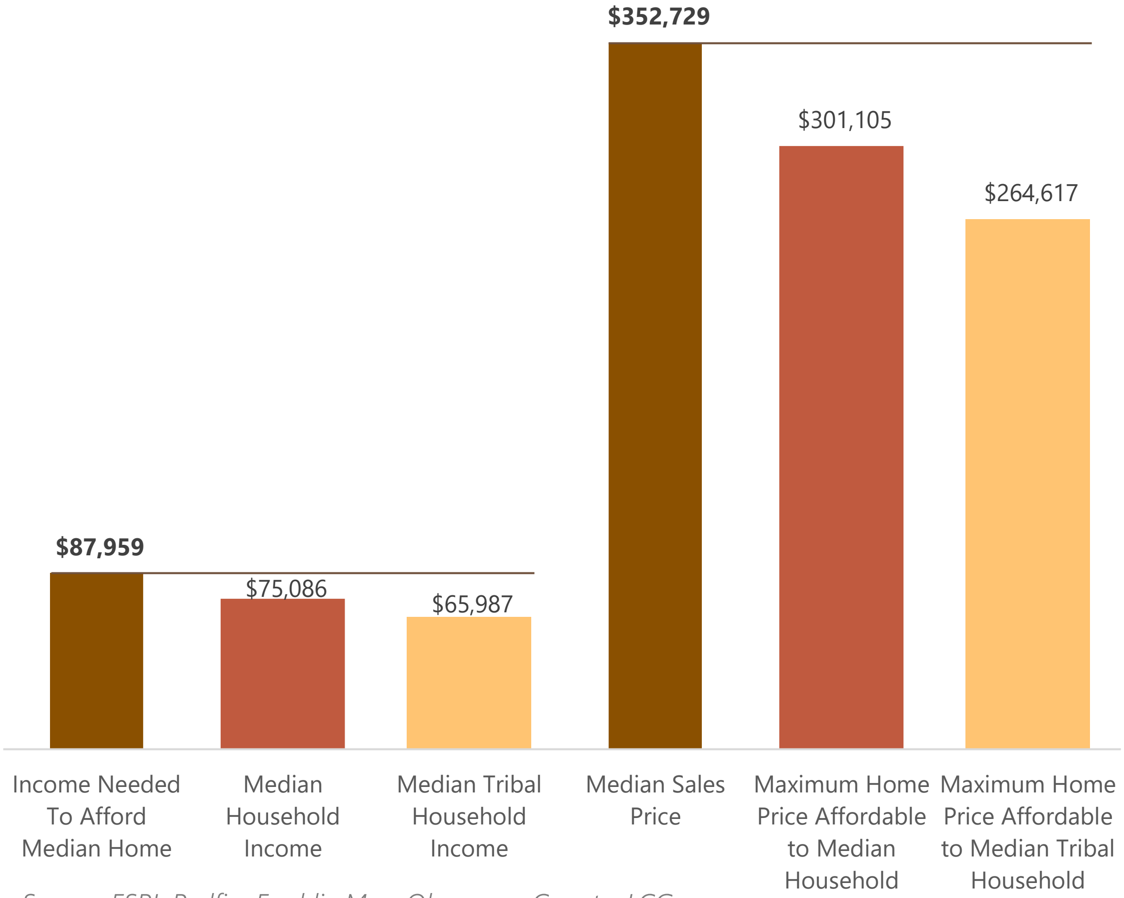
Housing affordability is a challenge in Okanogan County and on the Colville Reservation

The chart at right shows the gap between the price of housing and average incomes across Okanogan County and on the Colville Reservation. The 2022 median sales price for a home in the county was $352,729, **but the median household only earned enough to afford a house worth about $50,000 less**, based on current interest rates, Okanogan County tax rates, and a 20% down payment.

The median income of households on the Colville Reservation is lower than overall countywide median incomes as discussed previously. **The median household on the reservation could only afford a house worth $264,617, nearly $100,000 less than the median price in the County**. Although data on housing sales on the reservation are not tracked particularly accurately in this dataset, the overall picture shows a gap between the types of home prices seen across the region and incomes of Okanogan County residents.

Rental prices are also difficult to track in rural locations, but self-reported incomes on the 2021 American Community Survey showed that the average Okanogan County renter household was paying around $776 in rent and earning around $36,000. This would mean these households are paying only slightly less than 30% of their income in rent, a common measure of housing "cost burden."

Housing Affordability in Okanogan County, 2022



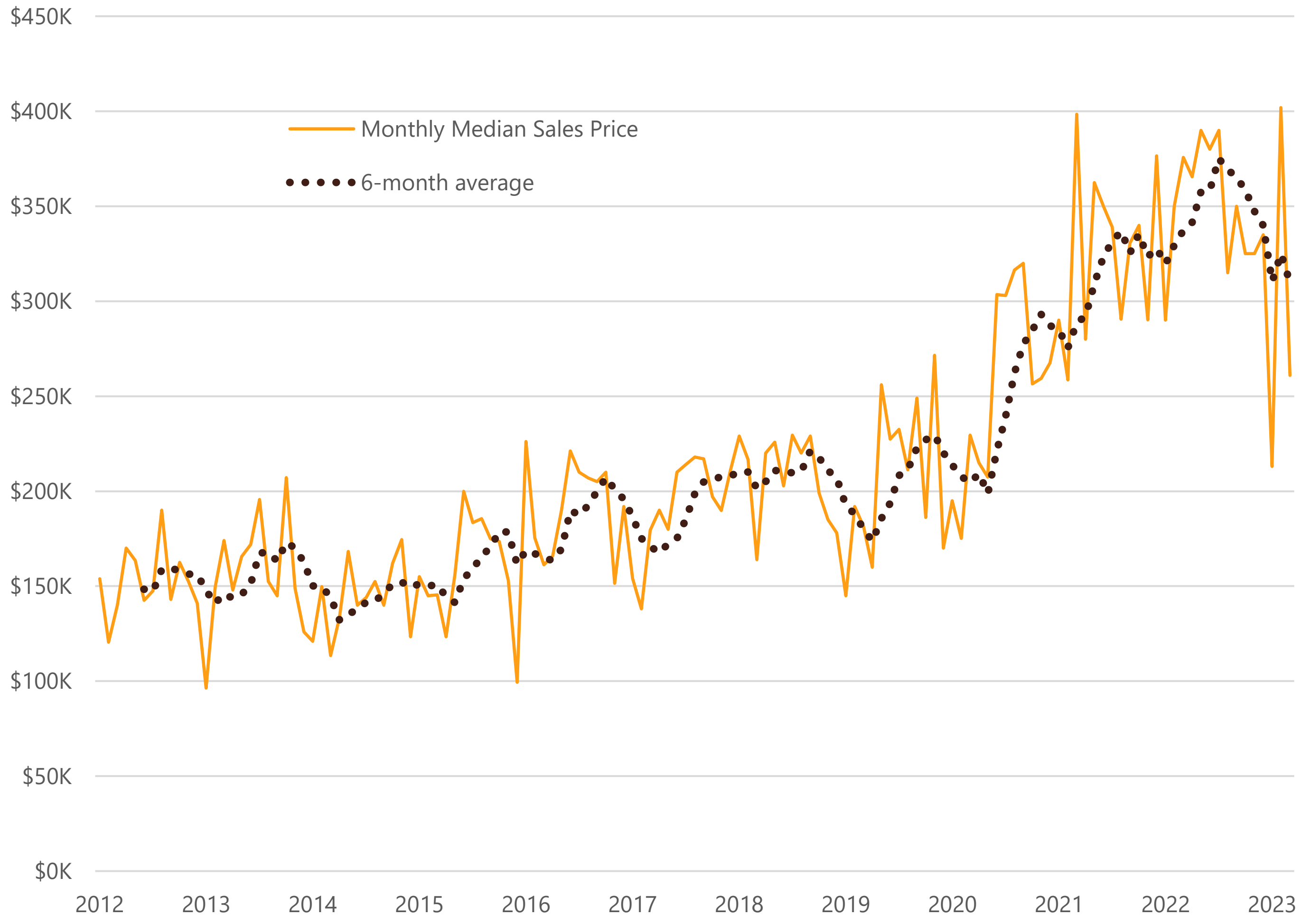
Source: ESRI, Redfin, Freddie Mac, Okanogan County, LCG

Housing prices have risen over the past decade in Okanogan County

Housing prices have risen in Okanogan County since 2012, with a particularly notable spike starting in 2020 with the COVID-19 pandemic, as shown at right. Average sales prices have now settled around $325,000, up from closer to $200,000 pre-pandemic. This reflects trends seen in many rural locations nationwide since the onset of the pandemic.

When combined with the affordability data and slow rate of housing production shown previously, this shows the need for **increased construction in the county to keep up with demand**, moderate prices, and provide housing for workers in the area.

Median Housing Sales Prices in Okanogan County, 2012-2023 (YTD)



Source: Redfin

Tribal workforce housing can cater to members and non-members

Most tribal housing built across the country is targeted towards housing Tribal members, given the significant housing shortages and needs on many reservations and for many Tribal communities. However, there are also several examples in Washington State of tribal housing strategies and development targeted to **non-tribal members**, primarily to serve the workforce at tribal enterprises. CCT could consider a more **comprehensive housing needs study that focuses on the needs of its workforce** as well as **development opportunities and potential partnerships** across the reservation to address the demonstrated need for workforce housing, as discussed further below under "Strategic Recommendations."

The **Jamestown S'Klallam Tribe** on the Olympic Peninsula undertook a Housing Solutions Study in 2019. The Tribe has 207 members living in their Designated Service Area. They operate the 7 Cedars Casino and Resort which employs a total of 485 people. As shown below, the study indicates a significant housing need for the Tribe's employees and workforce, potentially even exceeding tribal members' housing needs over the study period. The plan also surveyed Tribal members about housing preferences and recruited various private-sector housing manufacturers to present prototypes of potential modular and cottage housing developments during the planning process.

Jamestown S'Klallam Tribe additional housing units by 2025:

	2019-2015
Elder individuals and households age 55+	65-107
Families	60-80
Workforce	100-300*
Transitional	4-6
Total number of 5-year near term unit needs	229-493

*Includes Phase 2 of Resort Development, which may extend beyond 5 years.

The **Kalispel Tribe** has also been involved in studying housing needs and building housing for both Tribal members and non-members. Their K-Dev Corporation partnered with TWG, an Indiana-based real estate company, to construct the Salish Flats Apartments adjacent to their Northern Quest Casino in Airway Heights, near Spokane. These market-rate apartments cater both to employees of the casino as well as the general public in the area. The Tribe is also working on a Master Land Use Plan for their reservation area which addresses housing needs in the region.

Number of workers have declined since onset of COVID-19

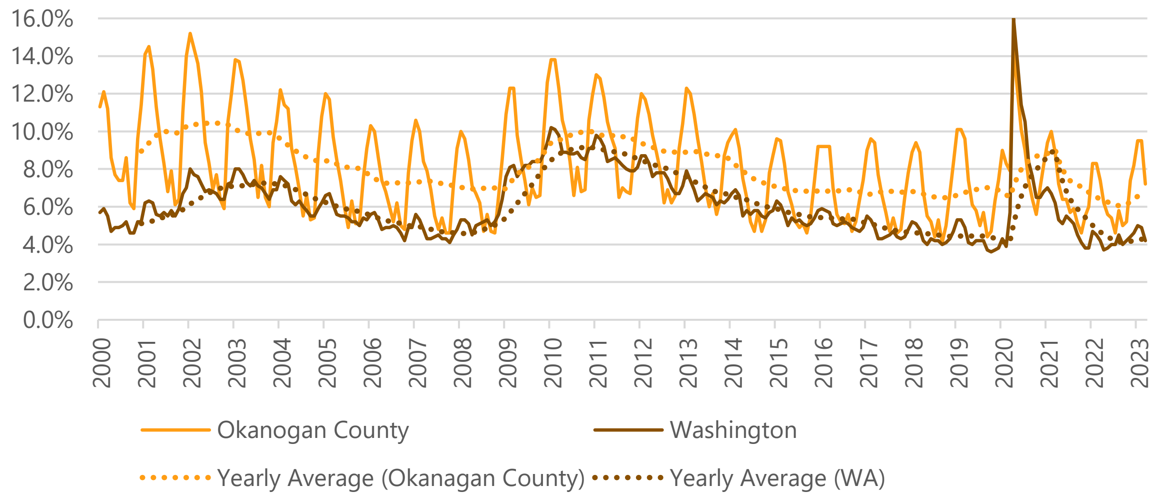
Due to the high level of agricultural employment in Okanogan County, the unemployment rate is cyclical and seasonal, peaking between March and June each year and hitting its trough in the Fall. However, Okanogan County's **general employment trends closely follow the State of Washington's**, as shown in the graph to the right.

Unemployment in Okanogan County tends to be higher than the state average. In January 2023 it was 7.2%, compared with 5.0% statewide.

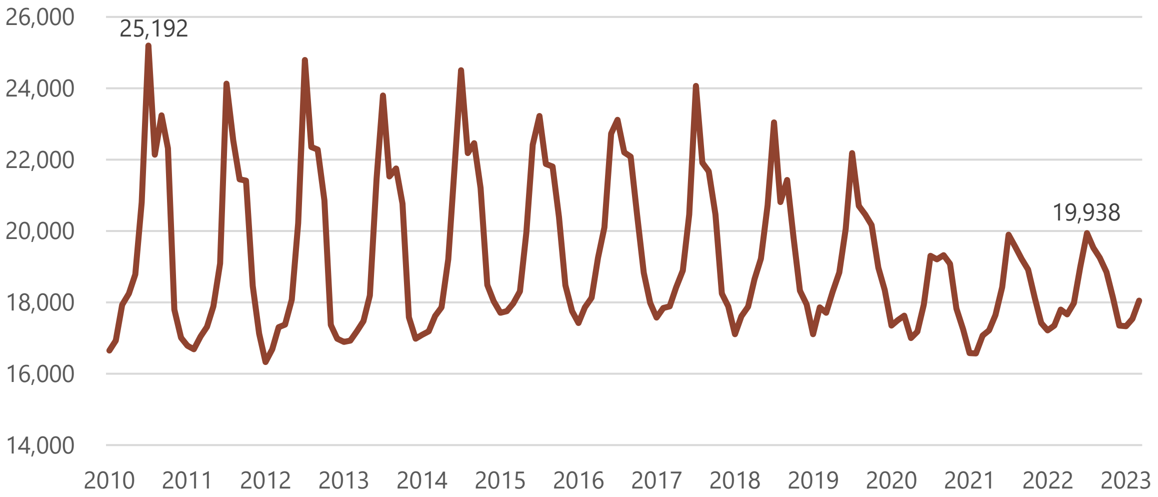
The overall labor force has declined over the past several years. The peak in July 2010 was over 25,000 workers, while in July 2022 there were just under 20,000. **The lack of available labor combined with the regional housing shortage will make it difficult for companies to recruit talent from within Okanogan County.**

Increasing the housing supply will be a crucial economic development tool. **Companies typically do not locate in places where their workers will be unable to find adequate housing**. A major challenge to employment in the region is the income restrictions for tenants of affordable housing units. **Implementing strategies to add more housing will help ease rent pressures**, potentially allowing some low-income housing residents to move into market rate housing.

Unemployment Rates in Okanogan County and the State of WA, 2000-2023



Employed Persons in Okanogan County, 2010-2023



Source: Federal Reserve Bank of St. Louis

Region lacking a highly specialized workforce

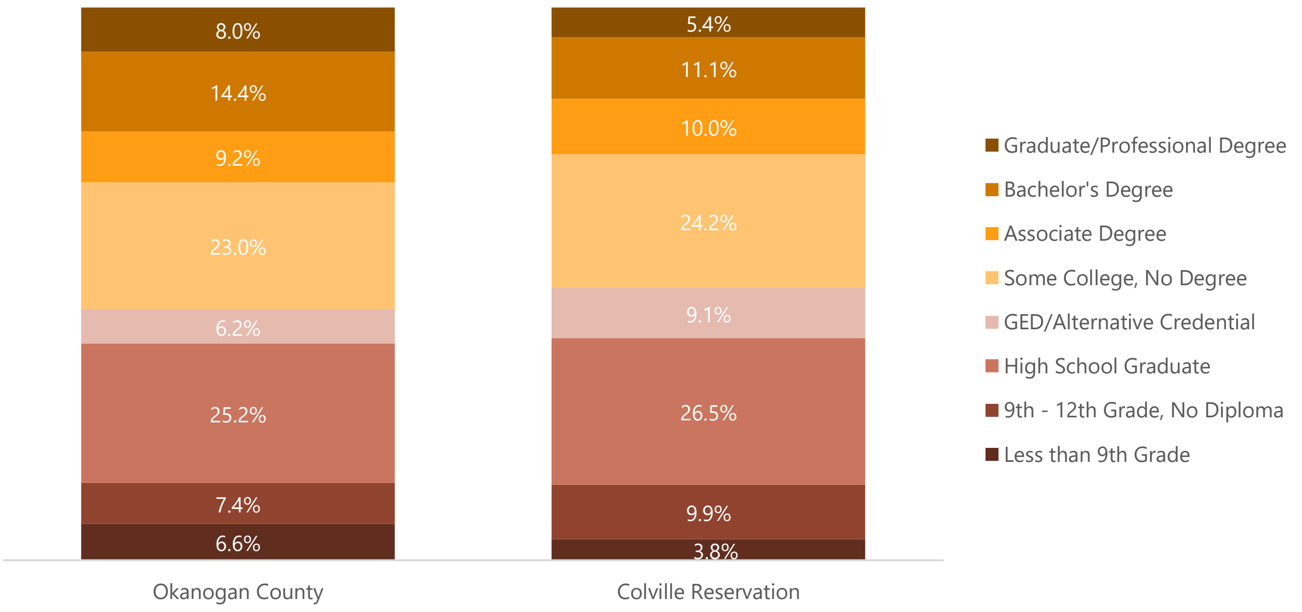
Over 50% of residents over 25 years old in both Okanogan County and the Colville reservation have completed at least some college. Okanogan County has a higher percentage of college graduates than the Colville Reservation. However, statewide 36.7% of residents have at least a bachelor's degree, compared with just 22.4% in Okanogan County.

Food processing, which dominates Okanogan County's industrial employment, does not typically require the same level of education as other industrial sectors, such as advanced manufacturing or aerospace engineering. Just 8.0% of Okanogan County residents and 5.4% of Colville Reservation residents have a graduate or professional degree. This indicates that **the types of industries that require a highly educated workforce are unlikely to locate in Okanogan County,** especially since there are existing clusters of highly educated and specialized workers elsewhere in the state.

54.4% of residents in Okanogan County have at least a high school degree or GED but have not graduated from college. An additional 9.2% have associates degrees. **This level of education could be attractive to some industrial sectors, including food, beverage, and tobacco product manufacturing as well as fabricated metal and non-metallic mineral manufacturing** – sectors that have been growing in Okanogan County over the past decade.

As CCT considers the best uses for its industrial land, it could **consider using some of it as an industrial job training facility**, potentially in partnership with other users on site. **Increasing the skills of the local workforce could help attract more industrial development in the future.**

Educational Attainment of Residents 25+, Okanogan County and Colville Reservation, 2022



Source: Esri, US Census Bureau, LCG.

Education, Health Care, and Agriculture are the top job sectors in Okanogan County

According to ESRI Business Analyst, the Colville Reservation has 215 businesses, compared with 1,800 businesses in Okanogan County.

The industry (by SIC code) with the largest number of businesses in both Okanogan County and the Colville Reservation is Services, followed by Retail Trade. 56% of the businesses in Okanogan County and 54% of businesses in the Colville Reservation are within these two industry sectors.

As of 2020, 13,881 Okanogan County residents were employed, compared with 2,233 on the Colville Reservation. Both the County and the Reservation lost workers between 2010 and 2020.

27% of workers in Okanogan County and 30% of workers on the Colville Reservation are employed in the Education, Health Care, & Social Assistance sector. Fewer than 10% work in Construction, Manufacturing, & Transportation (9% on the Reservation and 7% in Okanogan County).

Top Employment Sectors in Okanogan County and Colville Reservation, 2010-20

Sector	Colville Reservation		Okanogan County	
	2010	2020	2010	2020
Education, Health Care, & Social Assistance	571	667	3,468	3,779
Public Administration	529	462	1,675	1,425
Retail & Wholesale Trade	254	232	1,650	1,869
Agriculture, Forestry, & Mining	225	218	3,909	3,498
Construction, Manufacturing, & Transportation	168	203	893	1,041
Utilities & Waste Management	165	138	368	331
Information, Finance,' Insurance, Real Estate, & Prof. Services.	128	105	694	596
Arts, Entertainment, and Recreation	109	100	250	338
Accommodation and Food Services	110	78	939	819
Other Services (excluding Public Administration)	129	30	567	185
Total	**2,388**	**2,233**	**14,413**	**13,881**

Source: LEHD, LCG.

Industrial jobs in Okanogan County have declined since 2016

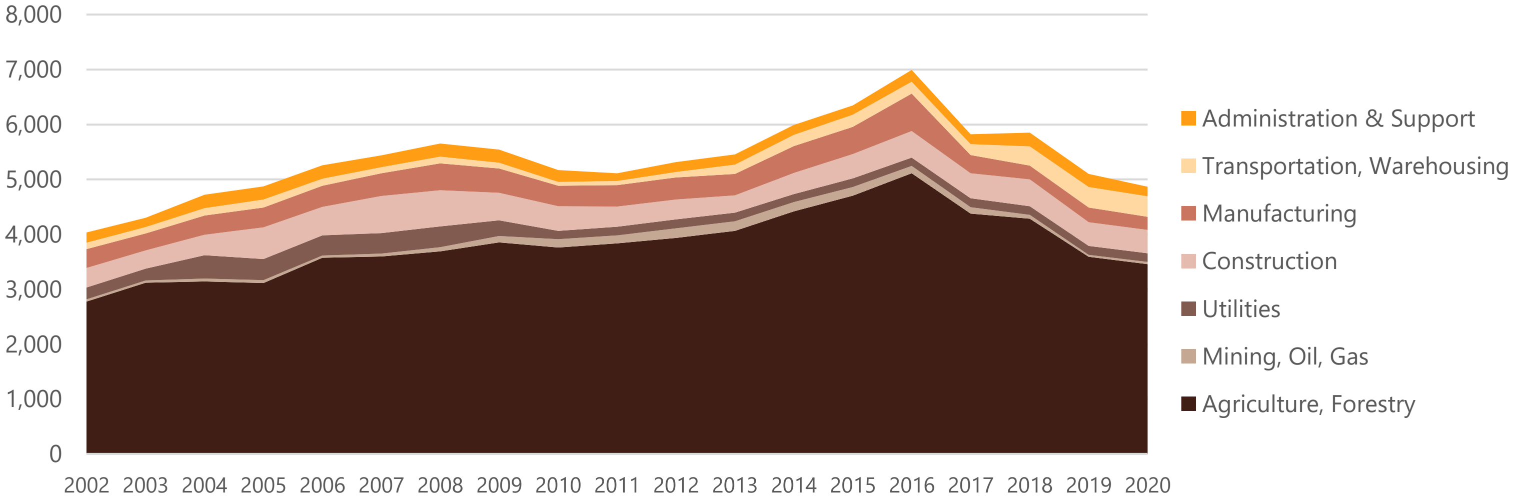
While the previous slide showed industries by SIC codes, the graphs on this slide and the next one are based on NAICS Industry Sectors. These are the same industry sectors depicted in the Location Quotient graphs later in this report.

Of the six industries in these charts, Agriculture, Forestry, Fishing, and Hunting employs the most residents in Okanogan County. **While this is not typically a job that is constrained to industrial land, there are some related industrial uses that could support employers in this industry. For example, agricultural supply manufacturing, repairs, and sales or food processing.**

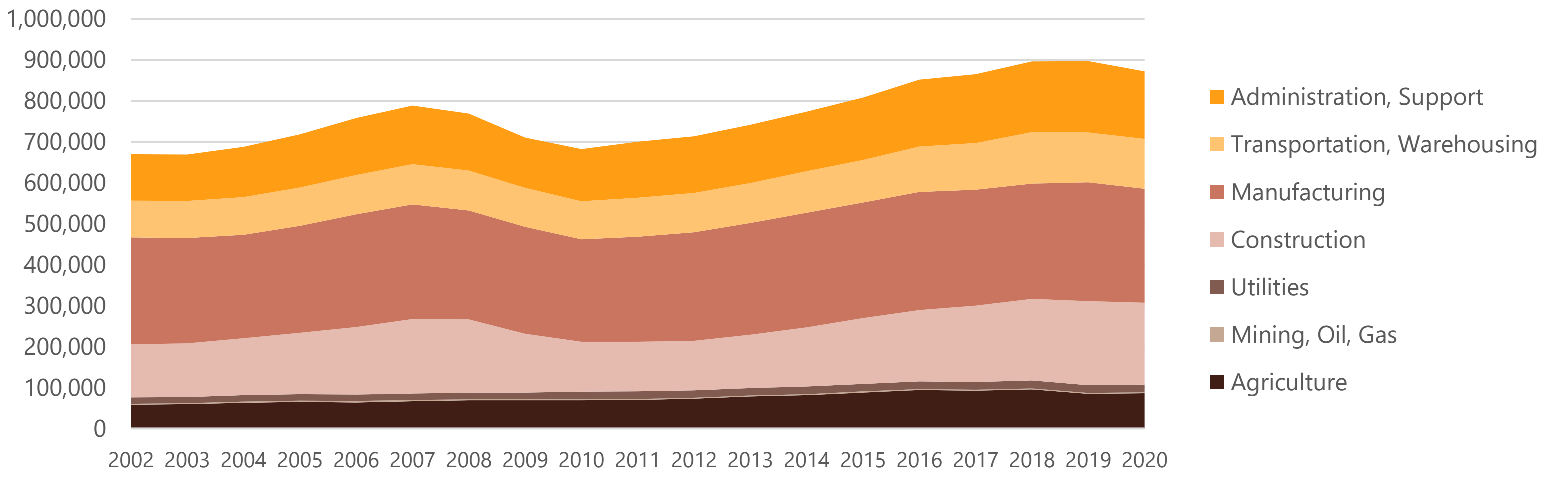
Together, the number of jobs in these industries in Okanogan County have been decreasing since 2016.

Compared with the State of Washington, Okanogan County has a much higher share of agricultural work and a much lower share of manufacturing.

Industrial Jobs in Okanogan County, 2002-2020 (LEHD)



Industrial Jobs in the State of Washington, 2002-2020 (LEHD)



Source: LEHD, LCG.

Industrial jobs in Okanogan County have declined since 2016

Removing Agriculture, Forestry, Fishing, and Hunting from the graphs of industrial jobs and workers gives a better picture of the variation in industrial employment in the County.

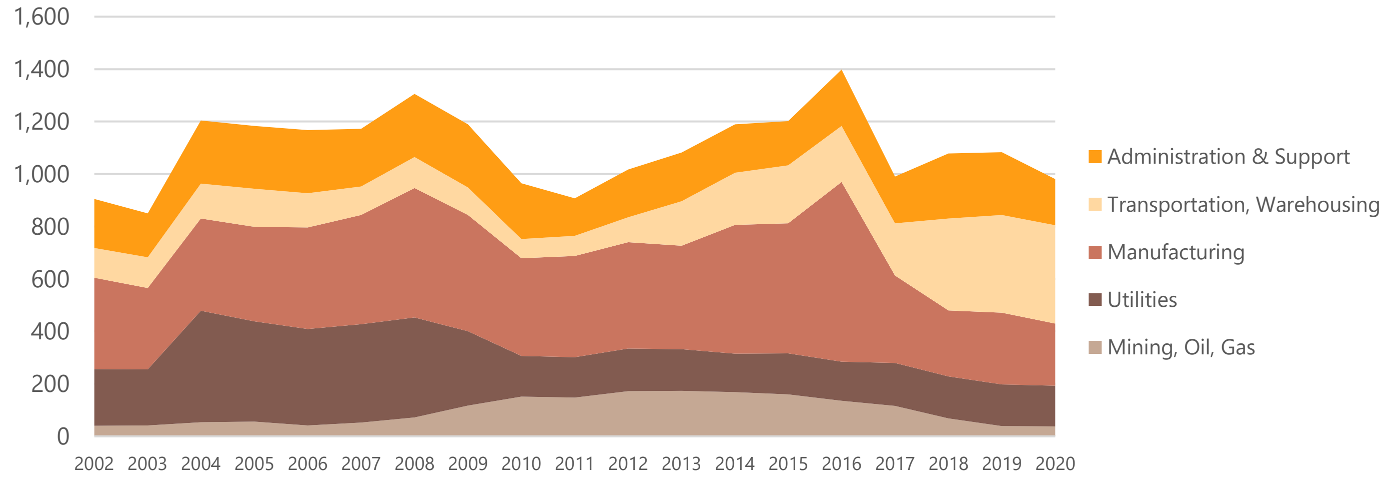
The number of **workers employed in the manufacturing industry grew between 2011 and 2014 but decreased between 2016 and 2020.** Mining/Quarrying/Gas Extraction has been declining since 2014.

Transportation and Warehousing has been growing since 2016, reaching 375 jobs county-wide as of 2020. That same year, 456 workers living in the county worked in Transportation and Warehousing.

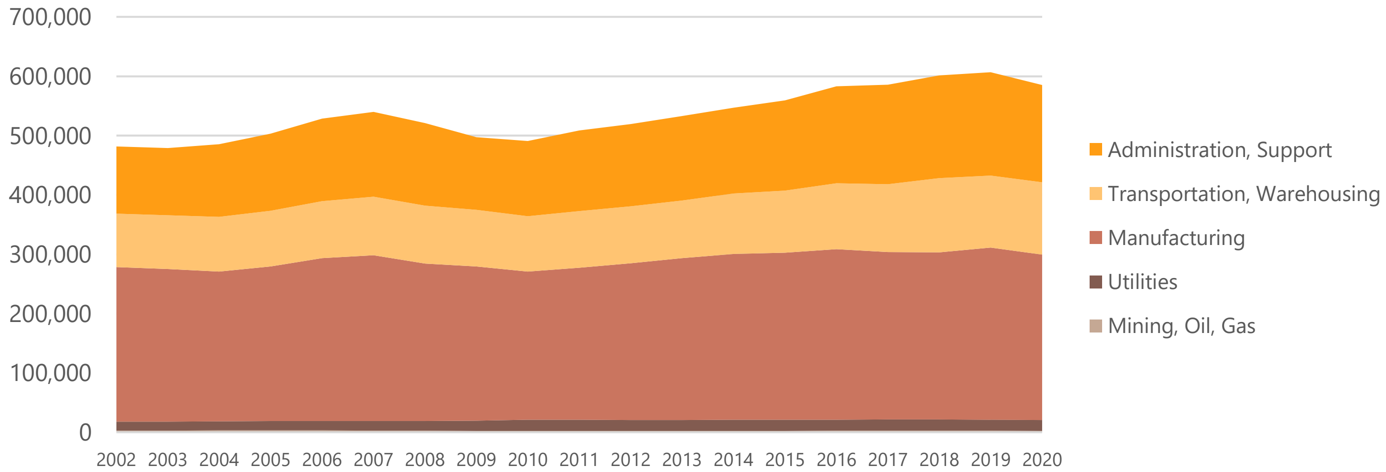
Utilities jobs in the County have not recovered post-Great Recession. In 2008, there were 381 Utilities jobs, compared with 155 in 2020 (a decrease of 59%). However, the number of residents who work in the Utilities sector has stayed relatively consistent. Between 2008 and 2020 the sector lost just 22 workers.

The significant **growth in transportation and warehousing jobs between 2017 and 2020 in Okanogan County outpaced statewide growth** in that sector.

Industrial Jobs in Okanogan County (excl. Construction & Agriculture), 2002-2020 (LEHD)



Industrial Jobs in the State of Washington (excl. Construction & Agriculture), 2002-2020 (LEHD)



Source: Esri, US Census Bureau, LCG.

Key Findings

While the largest sectors of the economy have remained mostly unchanged since 2010, there are some key considerations that may factor into the market appeal of the site.

- More, and diversified, employment opportunities will be important in **attracting and retaining younger workers** given the trends of population decline and an aging population in the county.
- The **lack of housing options** in the area may be a barrier to attracting large employers, or a younger workforce.
- The level of education of the existing labor force is not well suited for attracting employers in the advanced manufacturing or other highly specialized industries. Job training, potentially in partnership with a new employer, that focuses on **increasing the skills of the local workforce** may be an important consideration in attracting further industrial development.
- The **existing workforce is well suited to the value-added food & beverage processing industries** already prevalent in the county.

Regional Industrial Market Analysis

Industry Cluster Analysis

Introduction

The following section analyzes **national and regional market trends** that help to determine a baseline of market demand for the Omak industrial site.

The analysis is based on **projected employment growth by industry, as well as existing or proposed industrial square footage**, which together helps estimate the approximate absorption of new industrial development in the region.

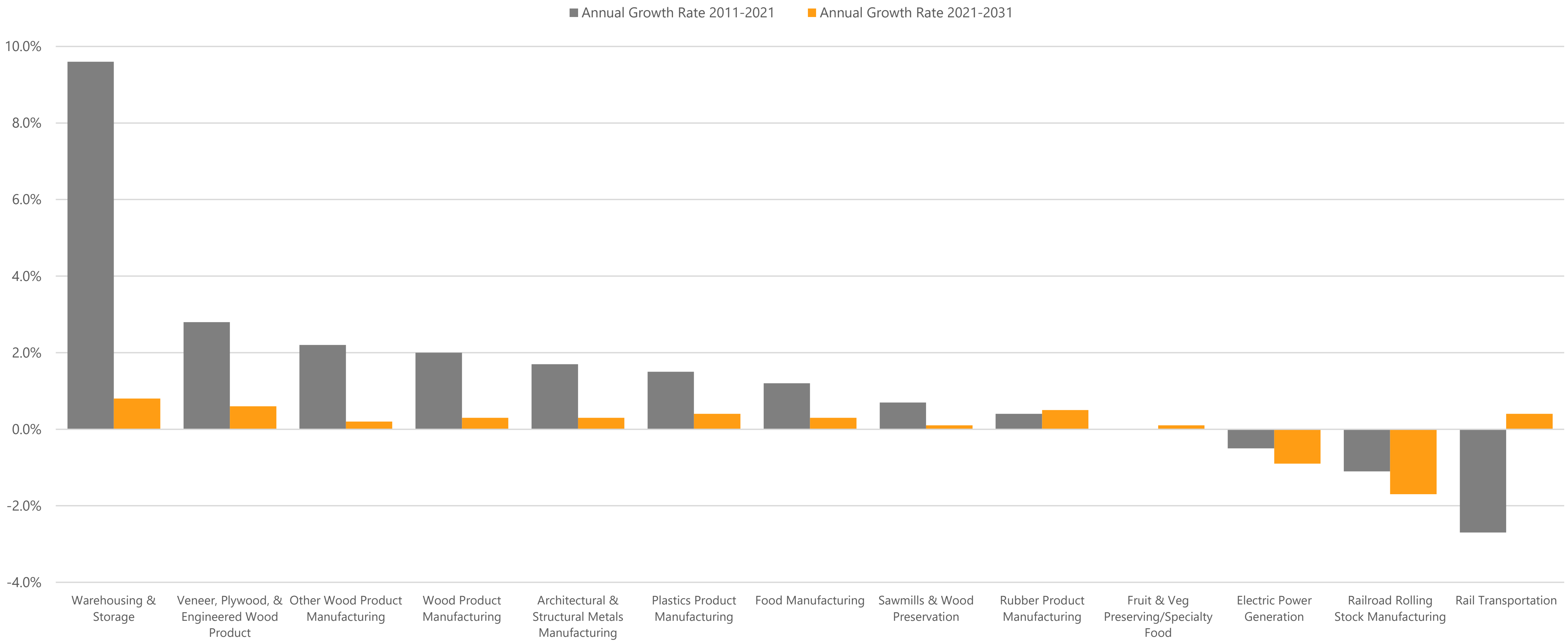
It should be noted that while these market trends may inform strategic decisions for the future of the site, they should not be considered as the only possibilities for development. Market data in rural areas tend to show slow, or moderate growth, especially in industries outside of the historical norm for the region. However, **through proactive marketing and forward-thinking strategies, CCT may be able to encourage other types of development that can meet their economic development goals**.

Some of these alternative industries and strategic recommendations will be outlined in the sections that follow this one.

Source: SunOpta

Nationally, Warehousing growth is expected to slow but still outpaces other proposed uses

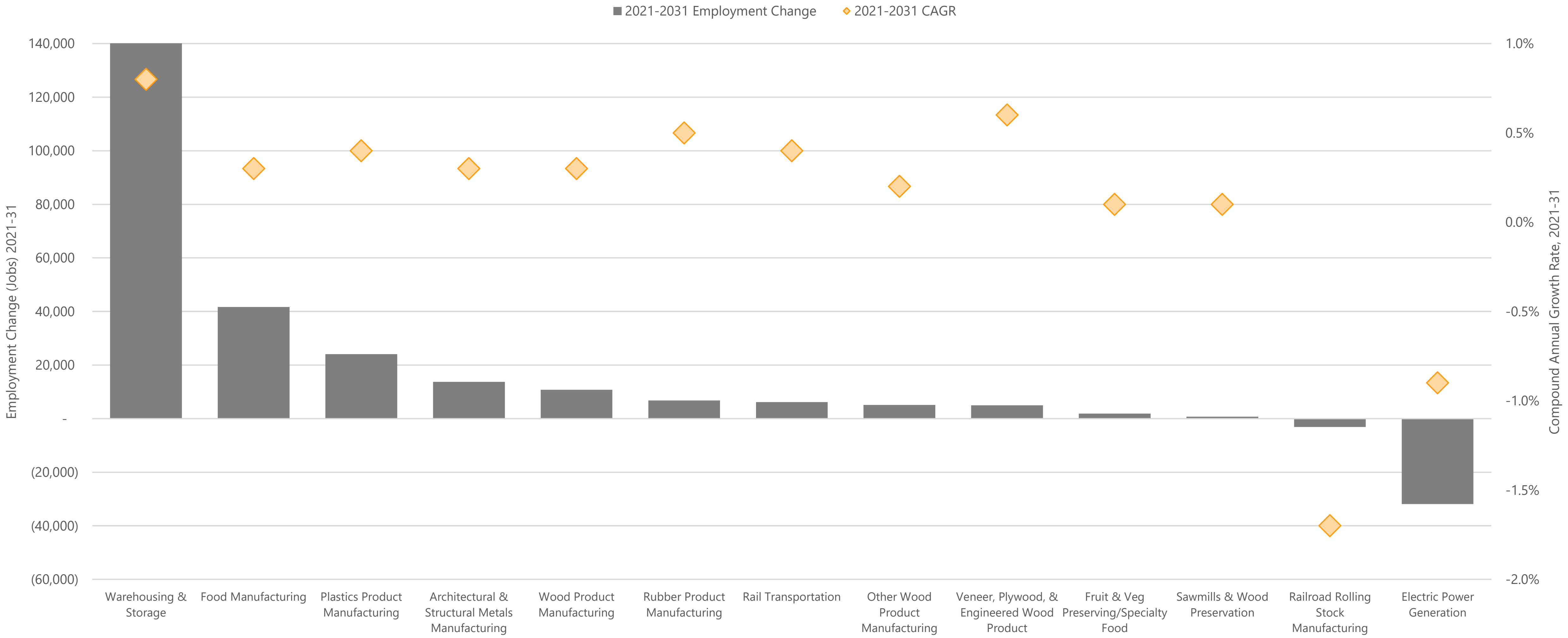
Annual Growth Rates of Select Industrial Uses, National, 2011-2031 (forecast)



Source: US Bureau of Labor Statistics Quarterly Census of Employment & Wages (QCEW)

Food manufacturing is expected to see nationwide growth in employment annually through 2031

Employment Change and Growth Rates of Select Industrial Uses, National, 2021-2031 (forecast)



Source: US Bureau of Labor Statistics Quarterly Census of Employment & Wages (QCEW)

Okanogan has much smaller industrial footprint when compared to its neighbors in Grant and Chelan

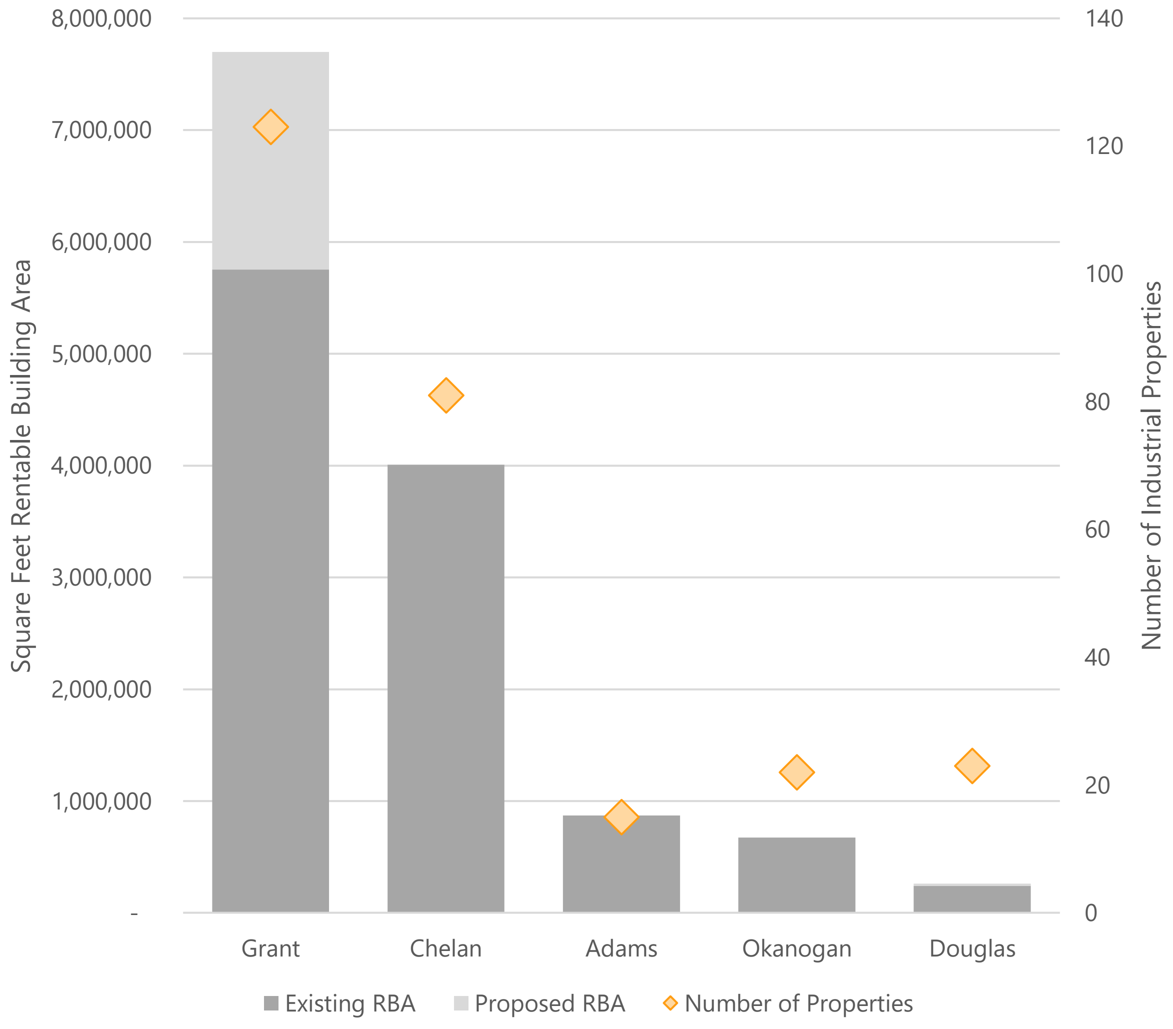
Grant County has the most industrial square footage (5.75 M square feet), with another 1.9 M square feet proposed across 7 properties.

Douglas County has the least industrial square footage (242,675 square feet). An additional 18,490 square foot industrial property is being proposed in the County.

According to CoStar, **Okanogan County has 22 industrial properties with a total of 673,134 square feet of rentable building area (RBA).** The average year built of industrial properties in Okanogan County is 1974, the lowest average in the 5-county area. Douglas County has the newest industrial properties, with an average year built of 1999. Grant County, which has the most industrial RBA, has an average year built of 1984 for its existing industrial properties.

1 million SF of the proposed new industrial space in Grant County is expected to be used for Manufacturing, while the new industrial space proposed in Douglas County is expected to be used for Distribution.

SF RBA and Number of Industrial Properties, North Central WA



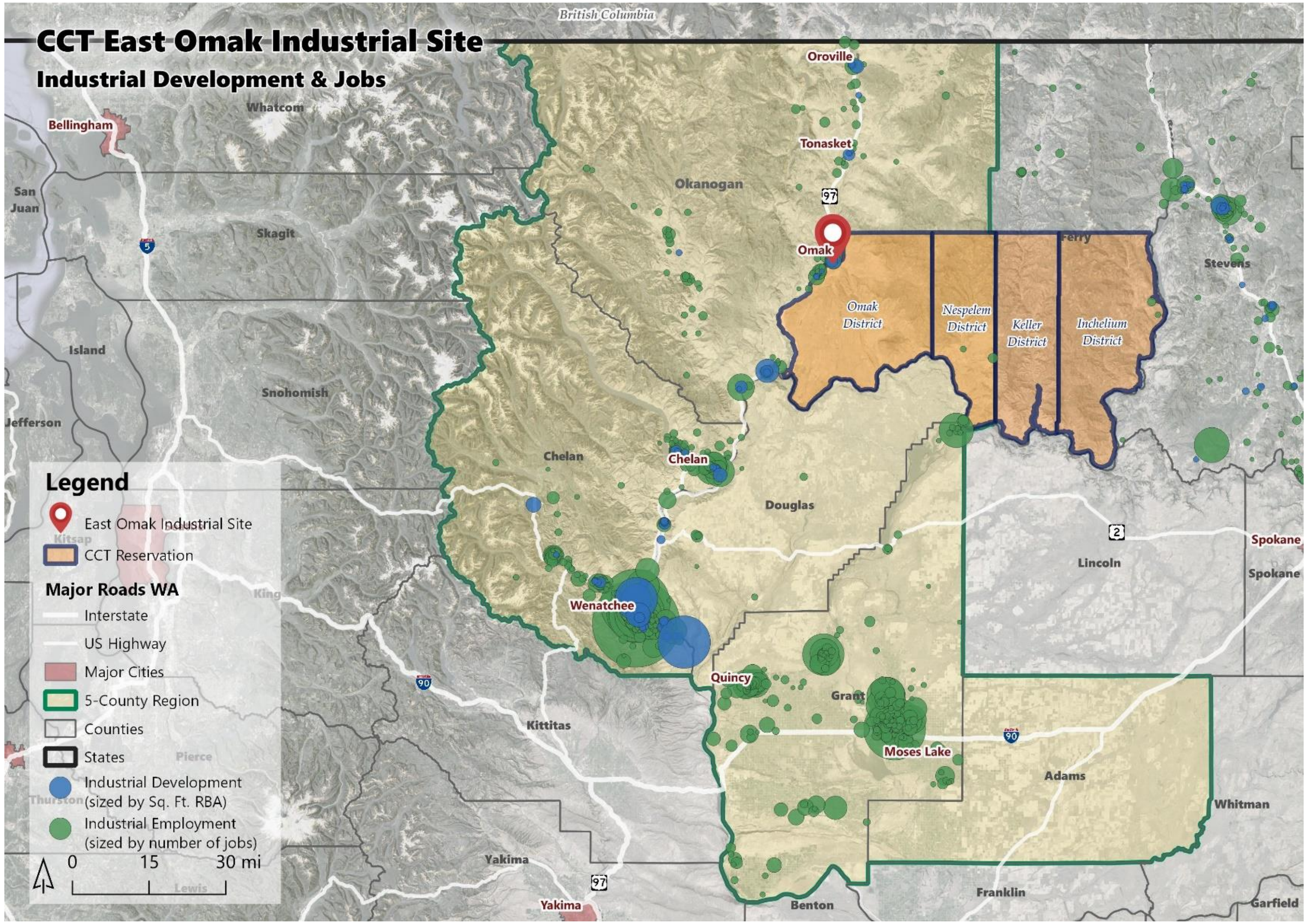
Source: CoStar, LCG.

Okanogan has much smaller industrial footprint when compared to its neighbors in Grant and Chelan

The map on the right shows the locations of existing industrial development (blue bubbles), and the existing industrial employment (green bubbles) in the five-county North Central Washington region, according to Costar and US LEHD data sources, respectively.

While this dataset is not completely comprehensive of the region's industrial footprint, it accurately portrays where the majority of industrial businesses and employees reside: primarily in Chelan and Grant counties.

12 data centers are located within the Wenatchee-Quincy area alone, with approximately 3.43 M square feet of building area.



Okanogan industrial uses are primarily warehousing, cold storage, and food processing

While Grant County's primary industrial property types are Manufacturing and Other, **Okanogan's is largely Refrigeration & Cold Storage**. Okanogan County has 3 of these properties, according to CoStar.

Grant County is the only county in North Central Washington with Telecom Hotel/Data Hosting facilities. This is an industrial type that relies on relatively inexpensive energy costs. Tech companies have recently built several data centers in rural Oregon and Washington for this reason. A data center inquiry was recently sent to Okanogan County's Economic Alliance. While this could be a potential growth area for Okanogan County, **it typically does not create many jobs beyond the initial construction period. In addition, it requires more power and utilities than the Tribes can currently provide**

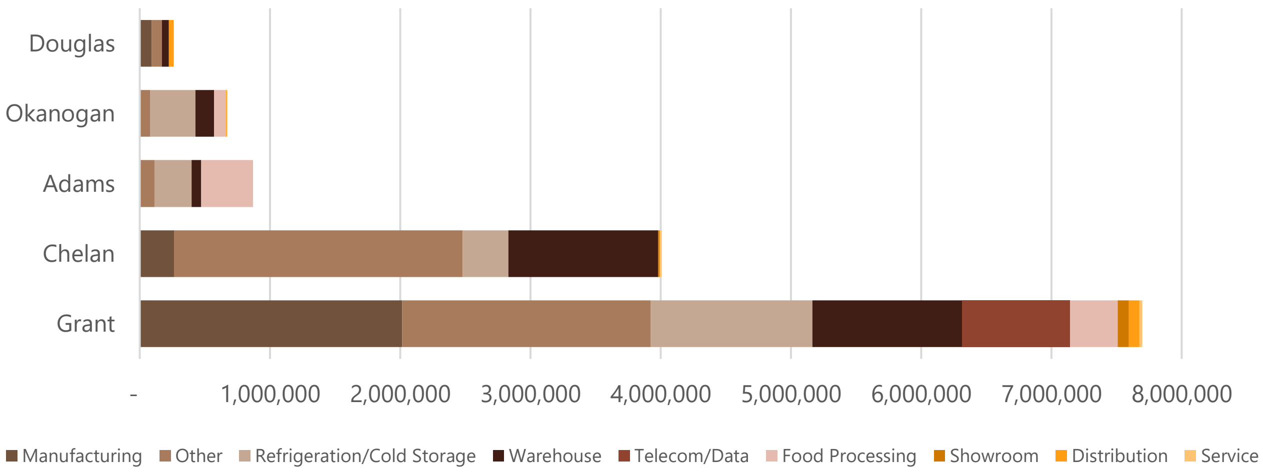
According to CoStar, Okanogan County has some Food Processing facilities, mainly those associated with SunOpta Healthy Snacks, while **Adams County has two food processing facilities with a total of nearly 400,000 SF RBA – nearly 10 times the space dedicated to food processing in Okanogan County.**

Two of Okanogan's three Refrigeration/Cold Storage facilities are owned and used by Gebbers Farms. The third, currently owned by Apple House Warehouses & Storage, is under contract with a new owner-user.

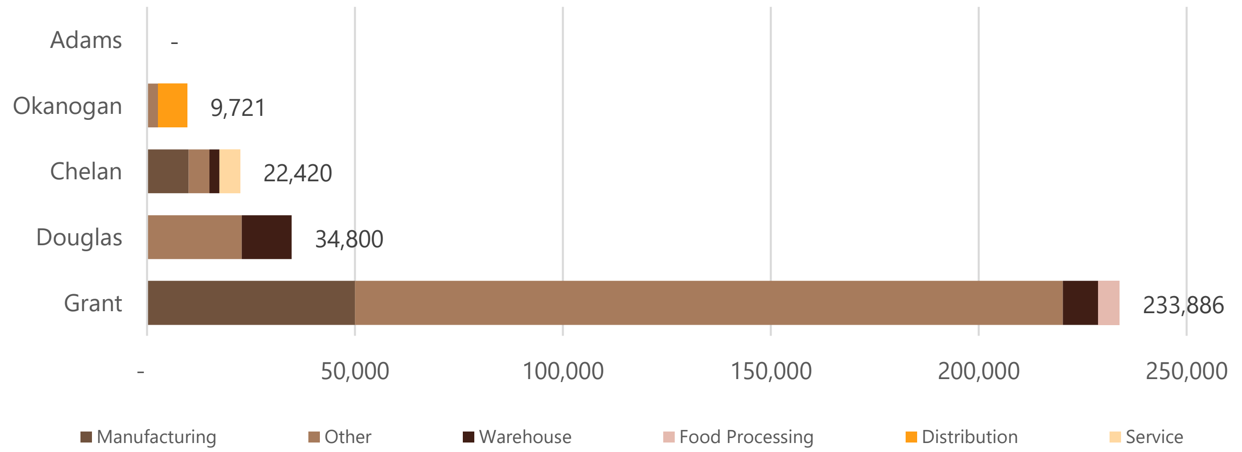
Since 2011, Okanogan County has seen a 1.5% increase in industrial space while Grant County has seen a 3.1% increase.

The data for these charts comes from CoStar, which does not necessarily have a complete inventory of all industrial properties in North Central Washington. The "other" category refers to properties without a designated secondary use type.

SF RBA of Industrial Properties by Type, North Central Washington Counties



SF RBA of Industrial Properties Built 2011 or Later by Type, North Central Washington Counties



Source: CoStar, LCG.

Omak & Okanogan County - Existing Industrial Site Profiles

SunOpta Healthy Snacks

Industry: Food Processing & Manufacturing

Address: 1124 5th Ave E, Omak, WA

Year Built: 1967

Building Area: 92,294 sq ft

Highlights:

- Largest industrial facility in Omak (Costar)
- Largest industrial employer in Omak, 116 Manufacturing and Wholesale Jobs (LEHD)
- Located directly north of project site

FedEx Ground

Industry: Transportation & Warehousing

Address: 1219 Koala Dr, Omak, WA

Year Built: 2012

Building Area: 7,017 sq ft

Highlights:

- Most recently built industrial development in City of Omak (Costar)
- Located at the north end of Omak along State Route 20 / US Route 97

Double S Meats

Industry: Meat processing

Address: 38 Tonasket Shop Rd, Tonasket, WA

Year Built: 2013

Building Area: 2,704 sq ft

Highlights:

- Most recently built industrial development in Okanogan County (Costar)
- ~25 miles north of Omak

Omak & Okanogan County - Existing Industrial Site Profiles

Chelan Fruit Cooperative

Industry: Agricultural Warehousing

Address: 26039 97 Hwy, Brewster, WA

Year Built: 1963

Building Area: 232,158 sq ft

Highlights:

- Largest industrial facility in Okanogan County (Costar)
- ~30 miles south of Omak

Apple House

Industry: Agricultural Warehousing & Refrigeration

Address: 475 Industrial Way, Pateros, WA

Year Built: 1965

Building Area: 50,164 sq ft

Highlights:

- Largest industrial employer in Okanogan County 324 jobs (LEHD)
- ~35 miles south of Omak on Hwy 97

Key Findings

- According to LEHD data, there are 106 total industrial sites within Okanogan County; 9 total industrial sites within Omak*
- According to Costar data, there has been very little recent industrial development in Okanogan County – Most recent in 2013, and small scale (2,704 sq ft)
- The largest industrial sites in Okanogan County are food processing and warehousing/cold storage facilities – Apple House, SunOpta, Chelan Fruit Cooperative

*Costar and LEHD datasets for individual employers are not comprehensive in Okanogan County – Not all industrial sites captured

Okanogan County saw the highest growth rate for Transportation & Warehousing Jobs, 2002-2020

Between 2002 and 2020 **Okanogan County saw the highest regional growth rate for Transportation & Warehousing jobs at 229%**, with a total of 375 jobs in that sector in 2020.

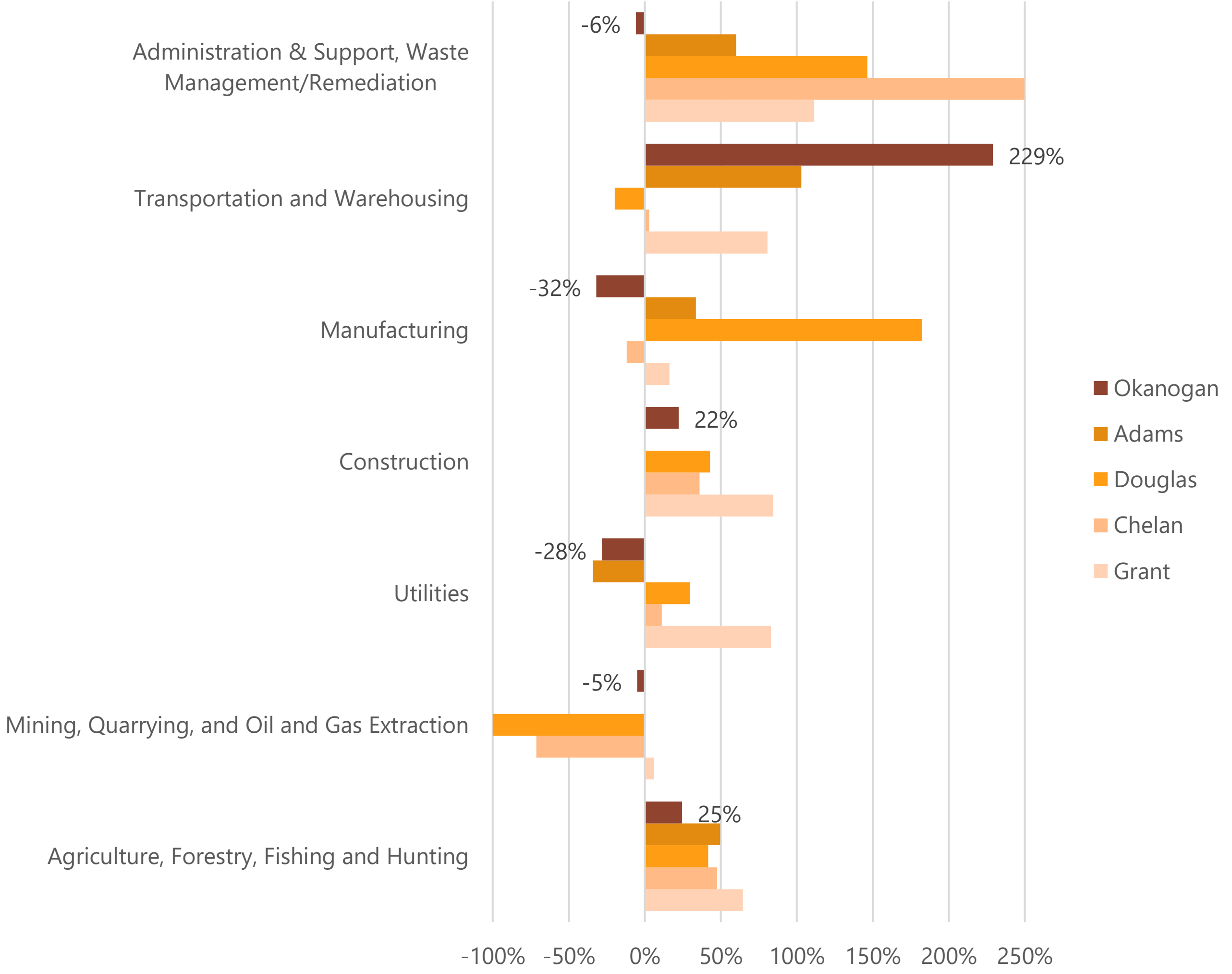
Manufacturing in Okanogan County decreased by 32% (111 jobs) over that time, in part due to the mill fire and subsequent closure.

Regionally, **only Grant County has seen any growth in Mining, Quarrying, and Oil and Gas Extraction**, gaining just 3 jobs between 2002 and 2020.

While both Adams and Okanogan County saw declines in Utility employment, this sector has grown elsewhere in the region. Grant County saw its utilities sector jobs increase by 83% to a total of 1,474 in 2020 and the Douglas County Utility sector jobs grew by 30% to 272 jobs.

The region's Agriculture, Forestry, Fishing, and Hunting sector remains strong, with all five counties showing positive growth. Okanogan County saw 25% growth in this sector, and as of 2020 has more jobs in this sector than either Douglas or Adams County.

Change in Industrial Employment by Sector in the 5-County North Central WA Region, 2002-2020 (LEHD)



Okanogan County gained industrial jobs between 2002 and 2020, but lost jobs in manufacturing

Okanogan County lost 185 jobs between 2002 and 2020, while gaining 1,021 (a net increase of 836 jobs). The biggest loss was in manufacturing, likely due to the mill closure.

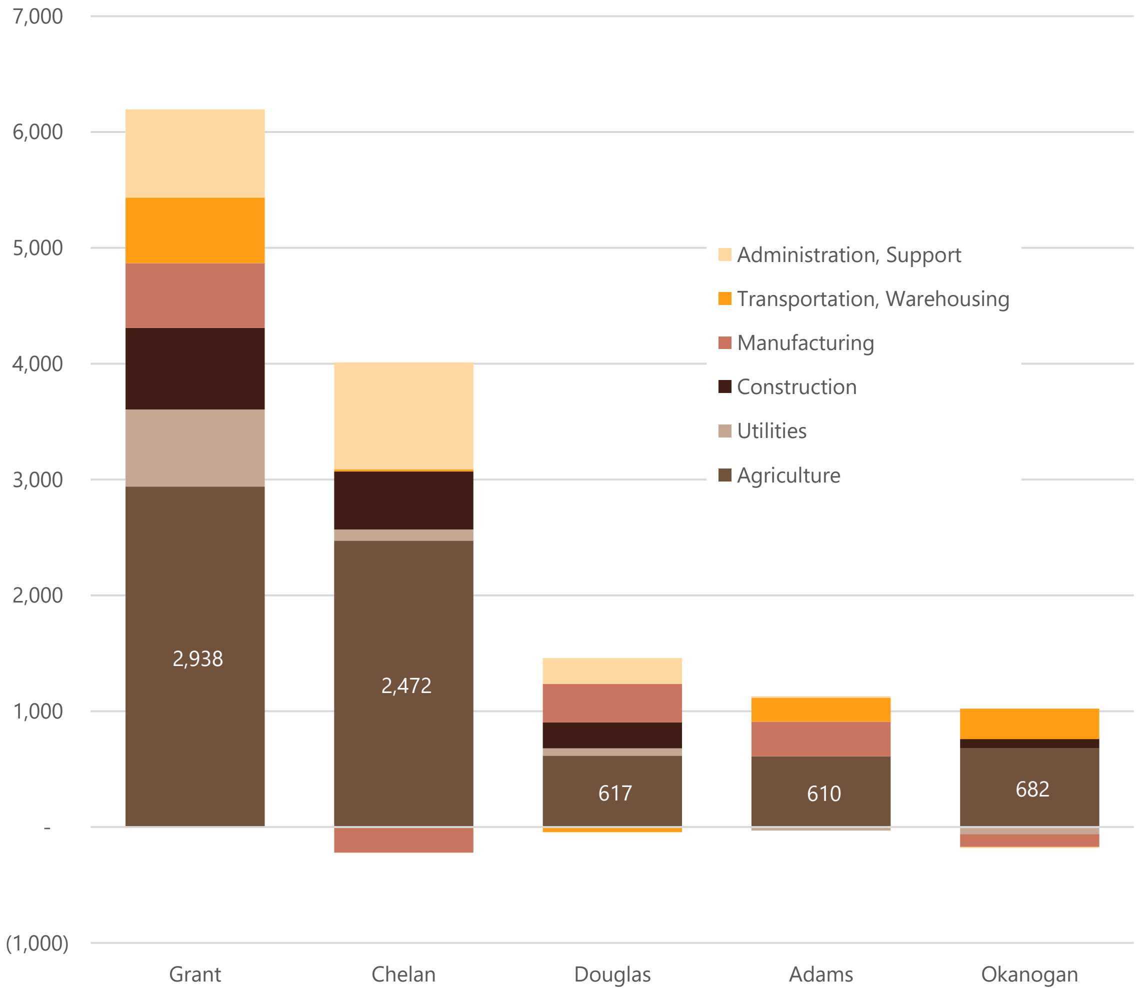
Over the same period, Chelan County had a net gain of 3,785 jobs and Grant County had a net gain of 6,199.

Okanogan County gained the fewest jobs in these sectors, with most of the gain in Agriculture, Forestry, Fishing, and Hunting. The County gained a net total of just 154 jobs in the other categories shown in the chart to the right.

Okanogan County gained the most Transportation and Warehousing jobs outside of Grant County, with 261 jobs added in this sector.

The recent loss of manufacturing jobs in Okanogan County does not preclude future manufacturing uses on the East Omak industrial site. The local workforce has experience in wood products manufacturing who are currently likely out of work or in other industries. Related manufacturing, such as prefabricated homes, could be a good fit for the site given the skills of the local workforce.

Change in Industrial Employment in the 5-County North Central WA Region by Sector, 2002-2020 (LEHD)

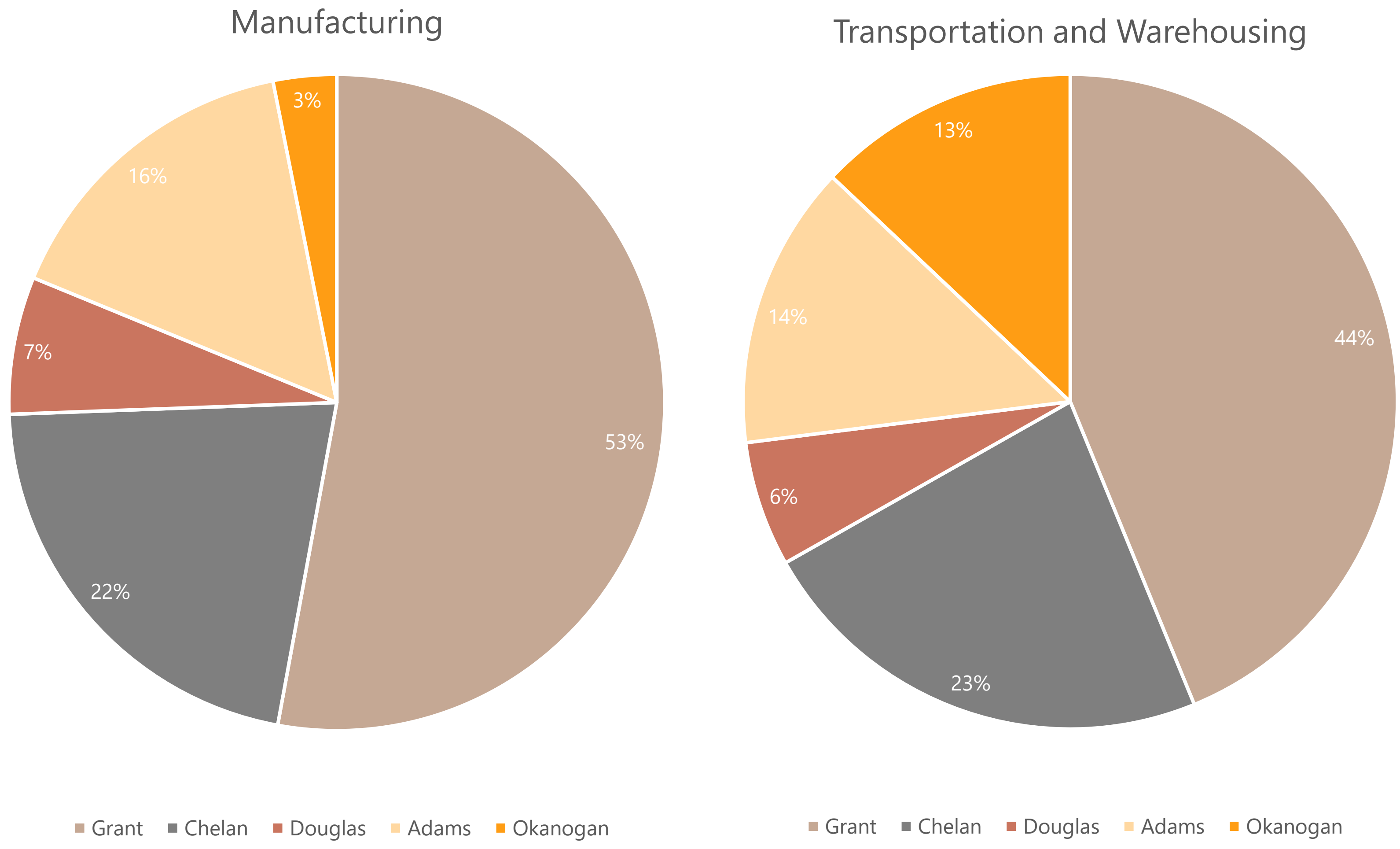


Okanogan County has a relatively low share of manufacturing jobs in the 5-county region

Only **3% of manufacturing jobs in the 5-county region are in Okanogan county**, considerably smaller than the other counties in the region. More than half of manufacturing jobs are in Grant County.

Grant county also has nearly half of the Transportation and Warehousing jobs in the 5-county region, but the remaining counties, including Okanagan, have a more equal distribution of jobs in this sector.

Distribution of Manufacturing and Transportation/Warehousing Jobs in 5-County Region, 2020



Source: LEHD 2020.

Okanogan County specializes in natural resources

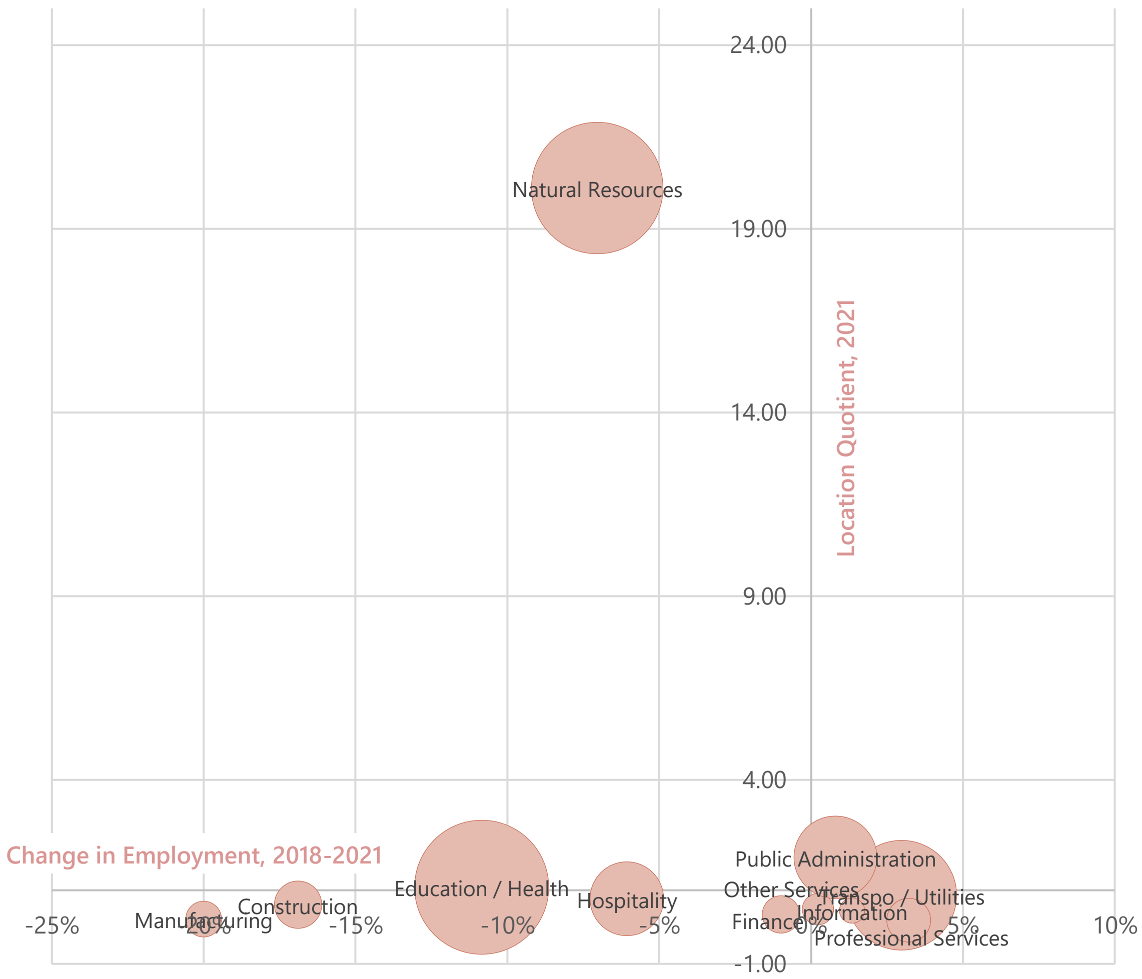
Location Quotient indicates regional advantage. It is a comparison between the percent of jobs by sector in the local economy vs. the national economy. A location quotient above 1 indicates a regional advantage.

Okanogan County has a strong regional advantage in the Natural Resources industry, though employment in that industry did not grow between 2018-2021.

The County has a slight regional advantage in Public Administration and Transportation & Utilities, with a small amount of growth over that time period.

Transportation and Utilities and Professional Services each grew their workforces by 3% between 2018 and 2021. They were the fastest growing industries in the County.

The number of manufacturing jobs in the County shrank by 20% over that time.



Source: QCEW, LCG.

The fastest growing industries do not require industrial space

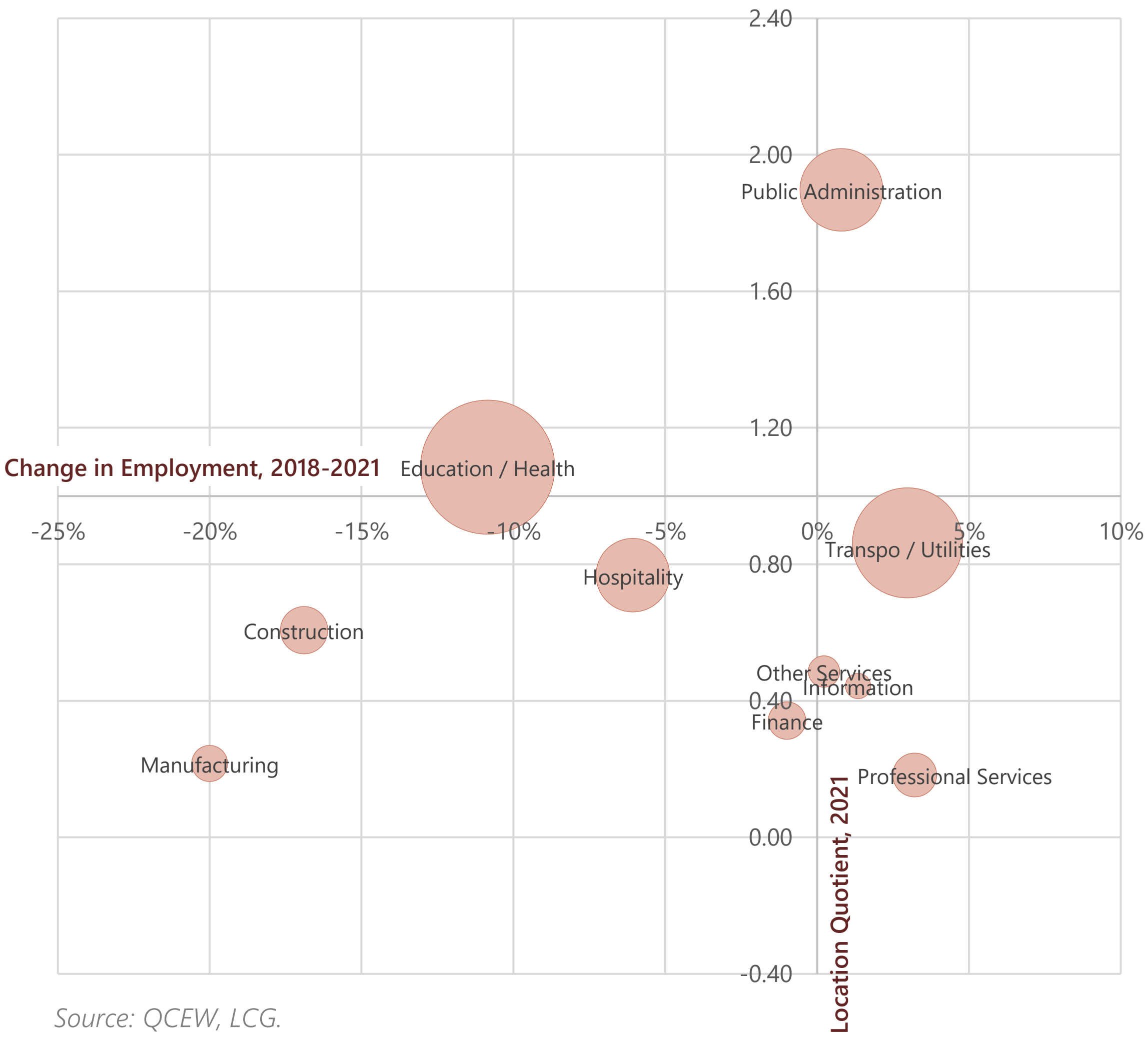
The chart to the right is the same as the one on the previous slide, with the Natural Resources category removed to show the other industries in more detail. **Other than Natural Resources and Public Administration, Okanogan County does not have a strong regional advantage in a specific industry**.

While this analysis does not point to an obvious use for the East Omak industrial site, this does not mean that opportunities are limited. **The recent loss of construction and manufacturing jobs, for example, may indicate that there are skilled but underutilized local workers in these industries**.

The 4 industries with the most growth between 2018 and 2021 were:

- Transportation & Utilities
- Professional Services
- Public Administration
- Other Services
- Information

Transportation and Utilities is the only sector with positive growth between 2018 and 2021 that could potentially utilize industrial space.



Source: QCEW, LCG.

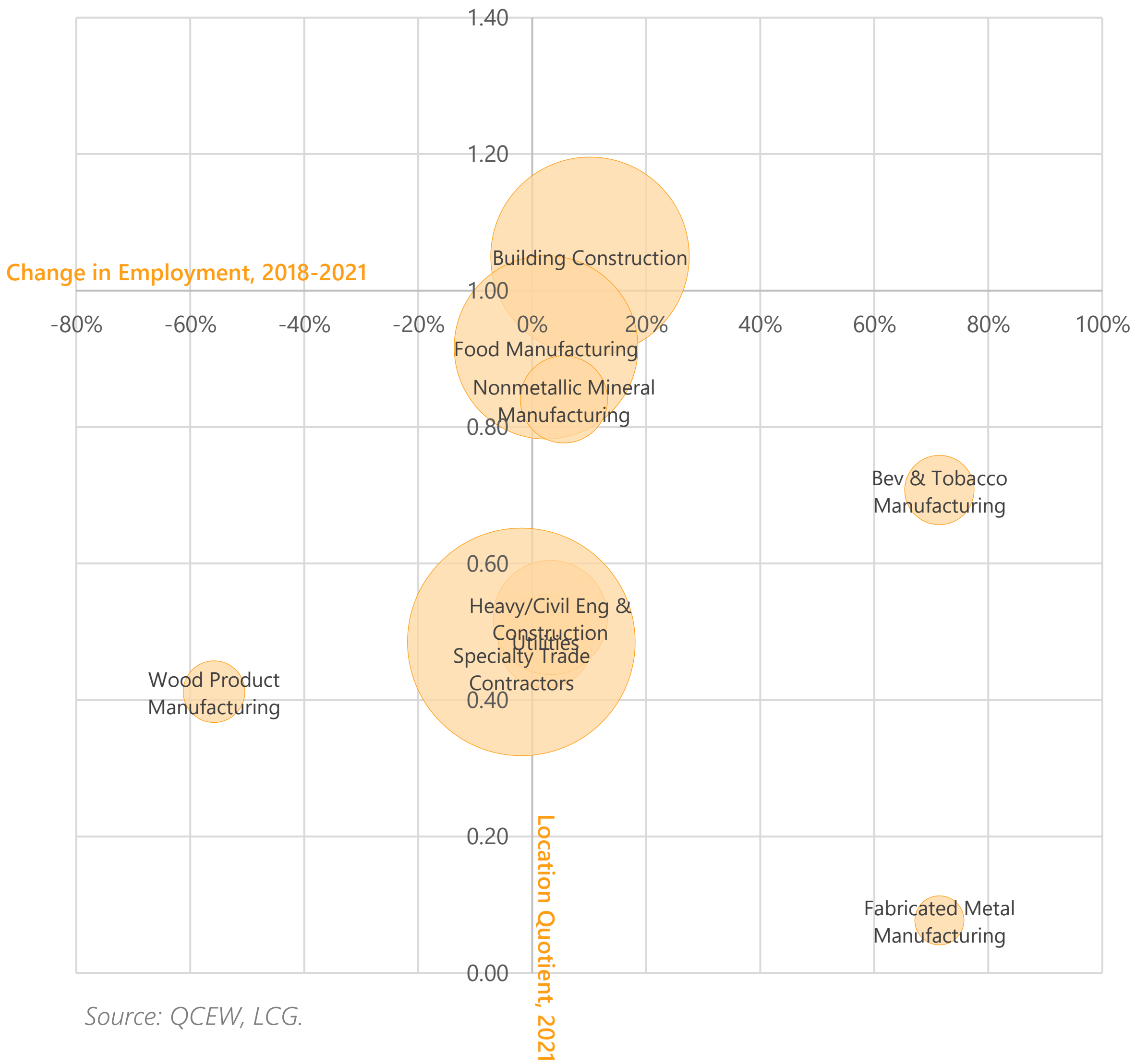
There is no obvious industrial sector CCT should be pursuing

Within the more specific industries that typically utilize industrial and/or flex space, Okanogan County does not have a strong regional advantage based on location quotient.

It has a location quotient above 1 for Building Construction, though that does not necessarily require a large amount of industrial land for day-to-day operations. **Industrial flex space may be more appropriate for construction offices. There may be an opportunity, however, to pursue prefabricated home manufacturing.** This type of manufacturing would utilize the skills of the existing workforce as well as local natural resources, like wood. It could also help address local housing challenges.

Food manufacturing employs 168 in the County and grew 2% between 2018 and 2021, with a location quotient of 0.92. SunOpta Healthy Snacks in Omak is the largest food producer in the county.

Beverage and Tobacco and Fabricated Metal manufacturing grew the most between 2018 and 2021, with each subsector growing its workforce by 71%. However, together they employ a total of just 36 workers.



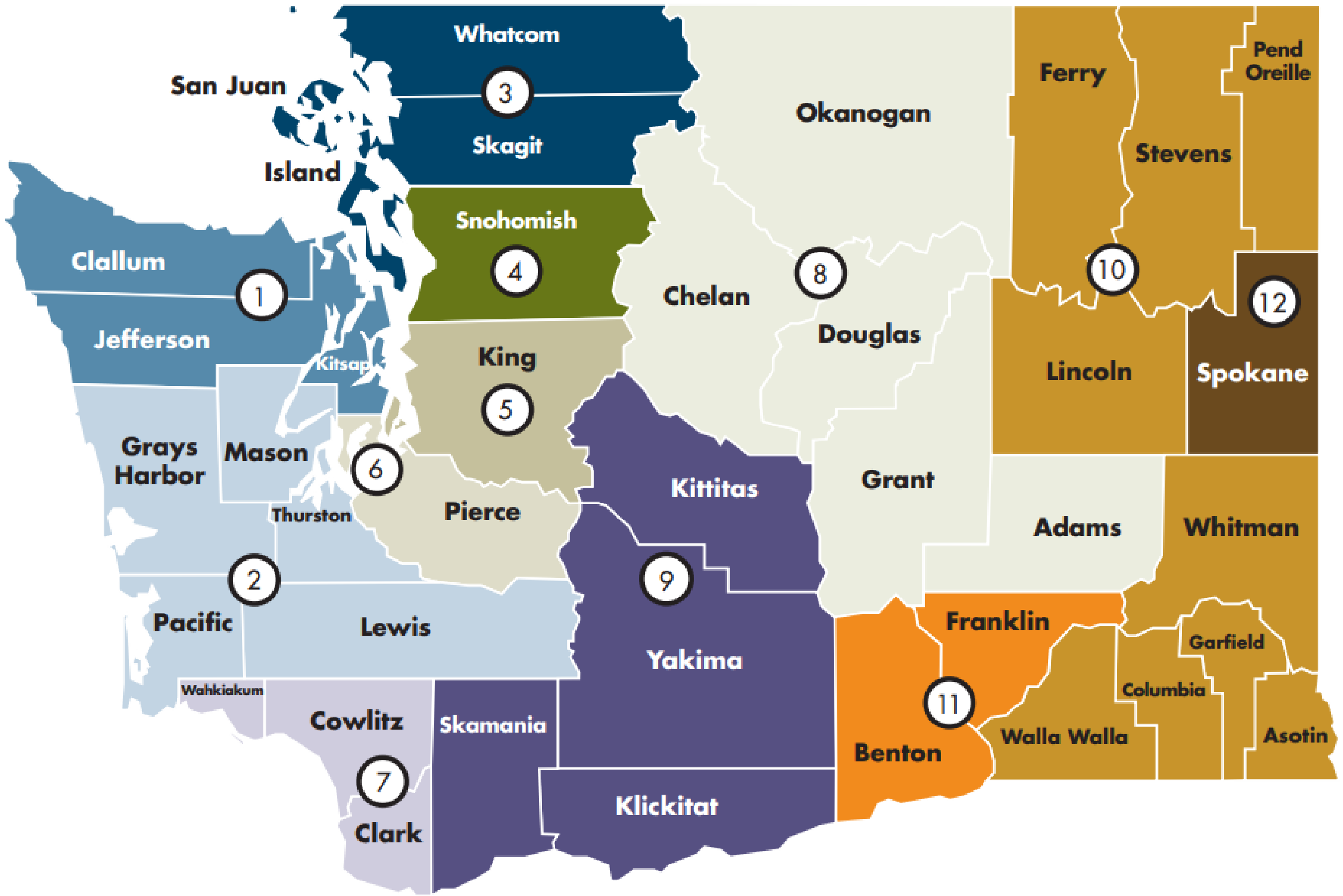
Source: QCEW, LCG.

WA Employment Security Department Projections

The Washington Employment Security Department issues 2-year, 5-year, and 10-year projections for non-farm employment in each of the state's 12 Workforce Development Areas.

Okanogan County is part of Workforce Development Area 8 (North Central Washington), which also includes Chelan, Douglas, Grant, and Adams Counties.

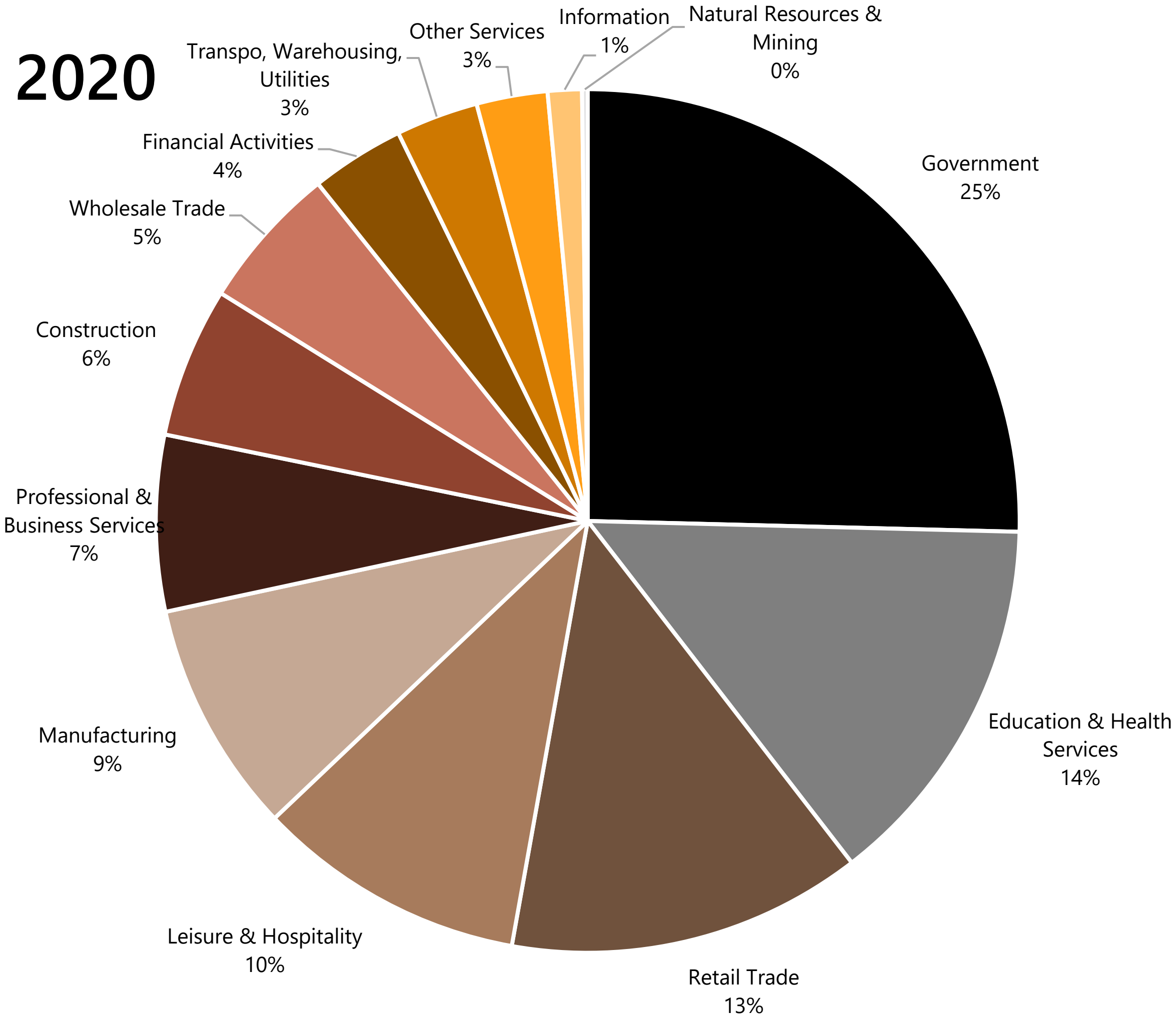
The following slides use the Department's Long-Term (10-year) projections for North Central Washington, which were published in July 2022. These projections use a base year of 2020 and project employment trends through 2030.

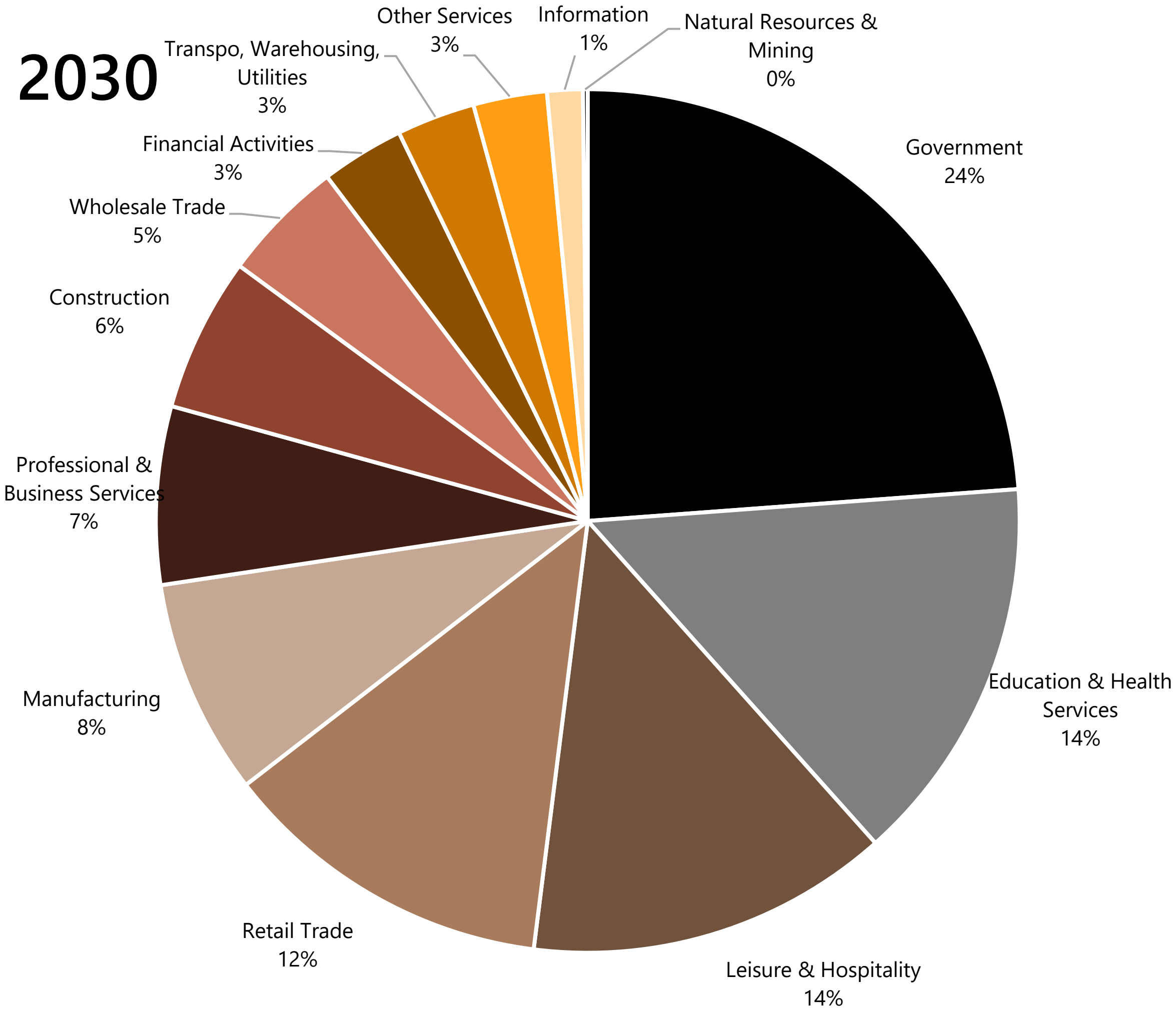


Source: WA Employment Security Department.

North Central Washington's non-farm job distribution is not expected to change substantially by 2030

North-Central Washington High-Level Non-Farm Employment Forecast by Sector, 2020-2030





Source: WA Employment Security Department, LCG.

Leisure & Hospitality is the fastest growing industry in North Central Washington

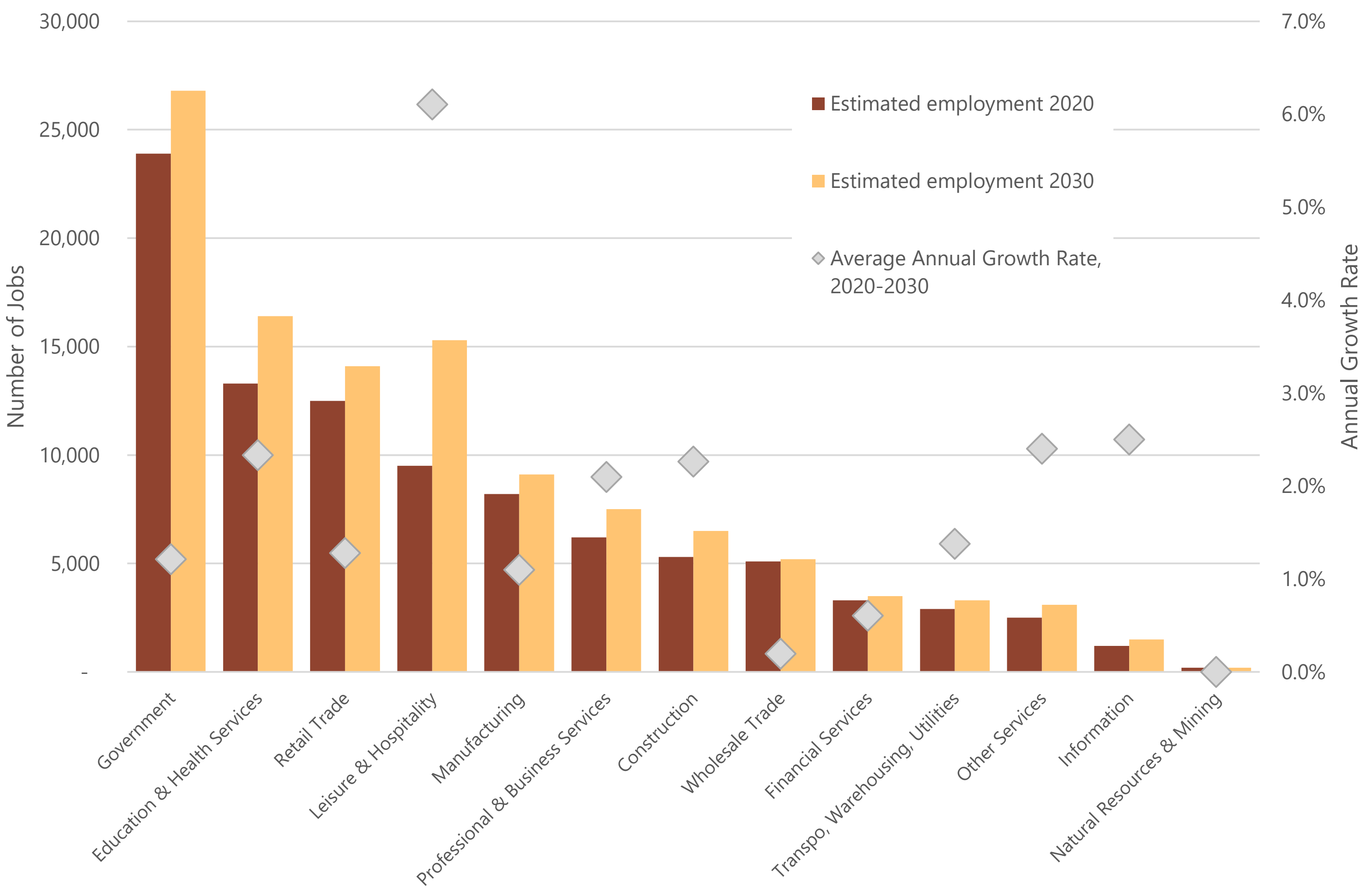
Government (which includes Tribal jobs) has the largest number of employees, followed by Education & Health Services. This is not expected to change over the next 7 years, though **Leisure & Hospitality is expected to employ more workers than Retail Trade by 2030.**

Leisure & Hospitality has by far the highest projected average annual growth rate through 2030 at 6.1%

Natural Resources & Mining is not expected to see any growth by 2030, and Wholesale Trade is only expected to grow by an average annual rate of 0.2%.

Both Manufacturing and Construction are expected to grow over this time, at projected average annual rates of 1.1% and 2.3%, respectively.

Projected Employment Growth by Industry, North Central Washington, 2020-2030



Source: WA Employment Security Department, LCG.

Continued growth in Food and Beverages Manufacturing

Food and Beverages Manufacturing employs the largest number of workers of any manufacturing sub-category in North Central Washington. This trend is expected to continue through 2030, with an expected average annual growth rate of 1.2%.

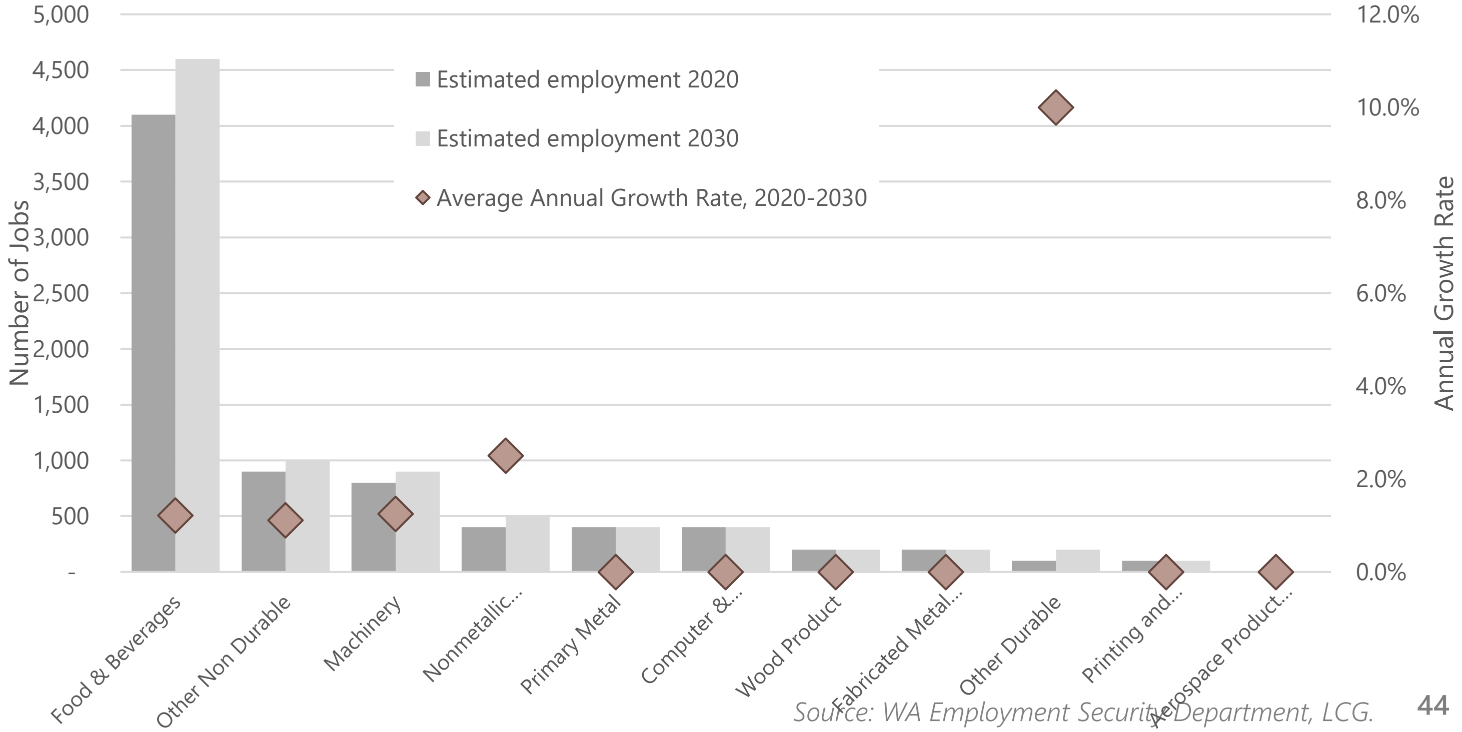
While Other Durable Goods only employed 100 workers in the region in 2020, it is expected to grow by an annual average of 10%, far outpacing growth in other manufacturing sub-categories. This will bring its total employment in the region to 200 jobs.

Nonmetallic Mineral Product Manufacturing is expected to grow at an expected average annual rate of 2.5% between 2020 and 2030.

Several manufacturing sub-categories are not expected to see any growth through 2030, including: Primary Metal, Computer & Electronic Product, Wood Product, Fabricated Metal Product, Printing & Related, and Aerospace Product and Parts manufacturing. **Statewide, the overall Manufacturing sector is expected to shrink by 1.79% annually through 2025** and by 0.53% between 2025 and 2030.

While these forecasts don't necessarily support the Tribes' vision for the East Omak site, this does not preclude CCT from working to attract employers in these sectors through a combination of marketing and infrastructure investment.

Projected Manufacturing Growth by Sub-Category, North Central Washington 2020-2030



Source: WA Employment Security Department, LCG.

The majority of industrial RBA in North-Central WA is in Grant County

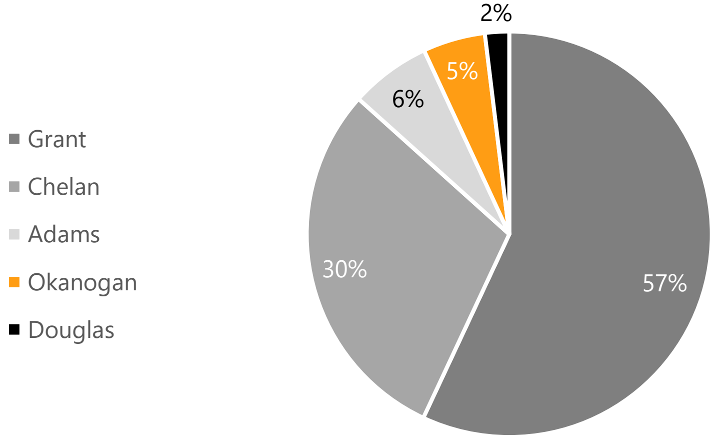
Per Costar, **Okanogan County has 5% of the region's total industrial RBA**, including 16% of the region's refrigeration & cold storage space, 11% of its food processing space, and 10% of its service industrial space.

All of the Telecom and Data facilities in the region are located in Grant County, primarily in Wenatchee and Quincy. The East Omak site currently lacks the energy infrastructure needed to support a data center and the Tribes have indicated that they would prefer a use that generates more jobs over the long term.

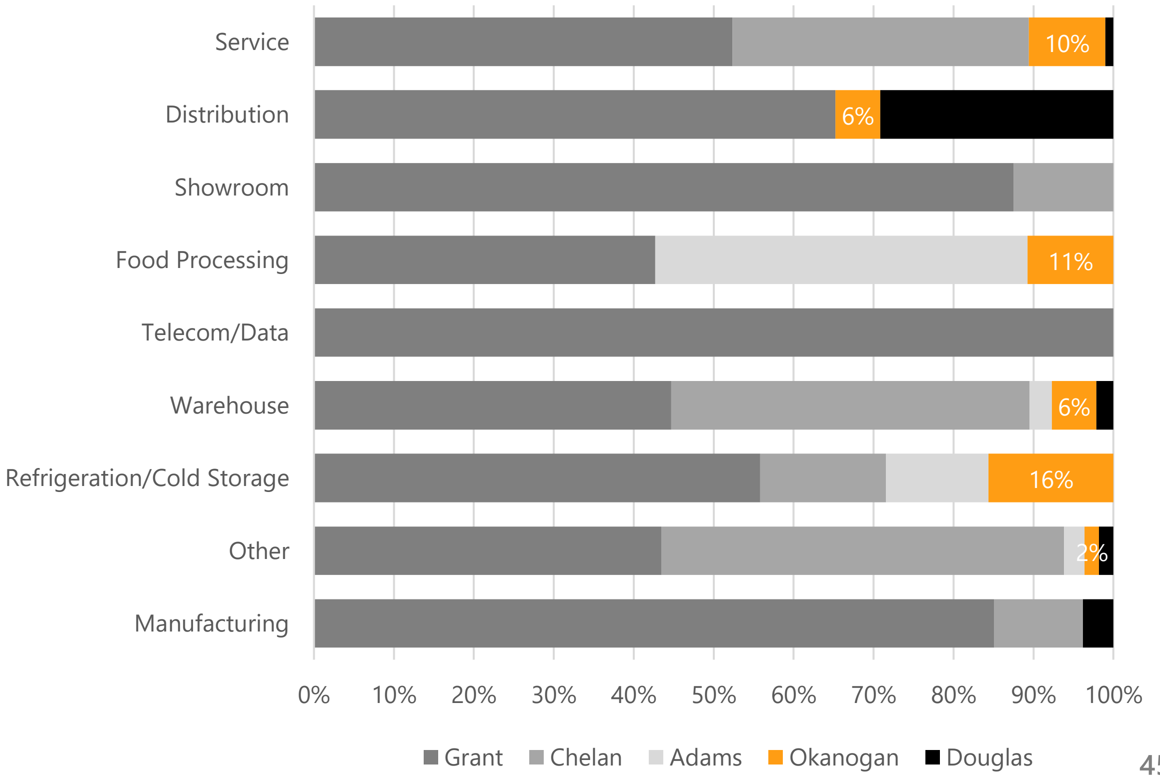
Food & Beverage Manufacturing is expected to grow by 500 jobs between 2020 and 2030 – **if Okanogan captures 11% of that growth, it would translate to 55 new jobs created over that time** (a 3% increase in the total workforce). In addition, much of the Refrigeration and Cold Storage in Okanogan County is related to its food processing operations. There may therefore be additional jobs created as a result of new food processing operations.

Between 2025 and 2030 the region is expected to gain 200 industrial jobs. **If Okanogan County continues to house just 5% of the region's industrial space, it will gain just 10 new industrial jobs by 2030.**

Share of Total Industrial RBA in North Central Washington by County



Industrial RBA by Type and County in North Central Washington



Okanogan can expect to absorb additional food manufacturing and warehousing by 2030

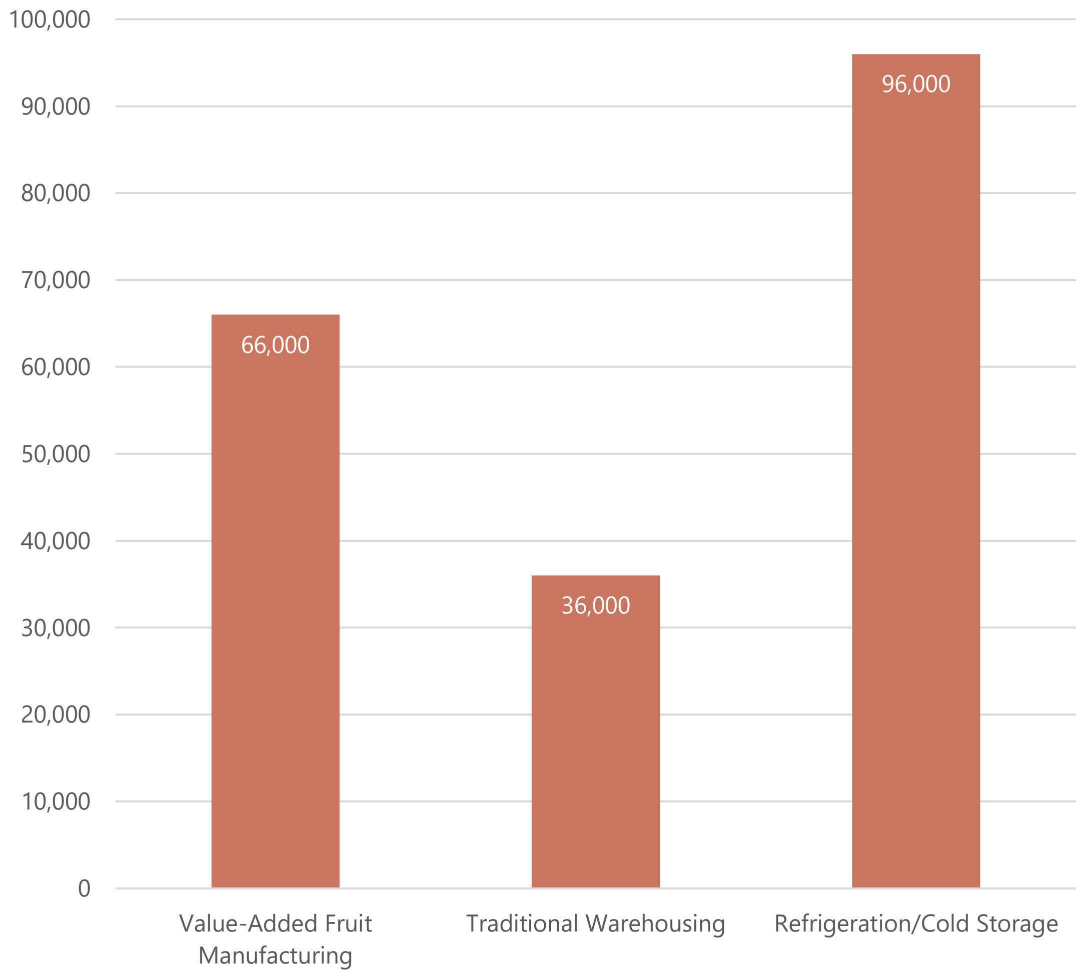
Based on WA Employment Security Department projections, Okanogan County can expect an increase in 500 Food & Beverage Manufacturing jobs and 400 Transportation and Warehousing jobs, by 2030.

Assuming a conservative estimate of 1500 square feet per worker for both industries, and the existing percentage of the NCW, 5-County RBA in each industry, it can be **expected that Okanogan County will build an additional 82,500 square feet of Food & Beverage Manufacturing facilities by 2030.**

Using the same assumptions for traditional warehousing and refrigeration/cold storage, **Okanogan County can expect to build EITHER an additional 36,000 square feet of traditional warehousing OR 96,000 square feet of Refrigeration/Cold Storage facilities.**

These figures represent the **most likely potential market absorption for future industrial uses** to be sited at the Omak Industrial Site were the site to capture all of Okanogan County's expected growth.

Potential RBA Market Absorption by Type for Okanogan County by 2030



Key Findings

This industry analysis paints a picture of slow to moderate growth within Okanogan County and the area surrounding the Omak industrial site. Following the market data, most of this growth can be expected to occur in the industries already with an active presence in the county, particularly in **food & beverage manufacturing or processing, refrigeration and cold storage, and general warehousing.** With moderate investment into the infrastructure readiness of the site, the development of a new industrial facility for these uses could be likely.

The closure, and subsequent removal, of the wood mill on the site has changed some of its market outlook. Without an active rail spur or wood manufacturing facility, there is **not strong enough demand** in the market, or locational advantages for the site, to suggest a high likelihood of **a new rail-user or wood manufacturing facility** locating on site. That said, as the following section on connectivity and freight states, CCT may be able to attract potential freight users through active marketing and partnership development for the site, in which case **CCT should maintain their ability to reactivate the rail spur in the future**.

One of the most highly active markets for new industrial development in the region is **data centers and colocation facilities**. However, nearly all of this activity has been in neighboring Chelan and Grant Counties, in and around the Wenatchee and Quincy area. Access to reliable and cheap power is the major driver of locating these facilities, and while Okanogan County does not currently have any data centers, some of these same competitive advantages are present on the Omak site, and it is not unrealistic to expect a data center could locate there were investments made to provide adequate infrastructure.

Incentives & Connectivity

Foreign Trade Zone (FTZ)

Omak Business Park & Foreign Trade Zone

- **Omak Business Park & Foreign Trade Zone** was named as an NCWEDD priority project in 2019.
- **2019 Project description:** The development of the Colville Tribes' Business Park to include a **biomass-to-energy operation**, **foreign trade zone**, and **technology businesses** will support the preservation of Eastern Washington forests, increase access to living wage jobs in an area adversely impacted by a mill closing, and will improve Washington's resiliency.
- **The Omak FTZ was never formally registered**, but could be in the future if it would incentivize the types of businesses CCT would like to see

What Is the Advantage of an FTZ?

- Foreign and domestic merchandise may be moved into zones for operations, not otherwise prohibited by law, including **storage, exhibition, assembly, manufacturing, and processing**
- Under zone procedures, the usual formal Customs and Border Patrol (CBP) entry procedures and **payments of duties are not required on the foreign merchandise unless and until it enters CBP territory for domestic consumption**, at which point the importer generally has the choice of paying duties at the rate of either the original foreign materials or the finished product.

Freight Rail – Cascade & Columbia River Railroad

Cascade & Columbia River Railroad (CSCD) runs adjacent to the site (owned by Genesee & Wyoming, Inc., formerly owned by RailAmerica). CSCD is a short line railroad (Class III), which provides collector/distributor services for larger railroads. It operates 145 route miles. A rail spur formerly served the East Omak site, but it has been removed and would need to be rebuilt to accommodate rail-supported industrial uses.

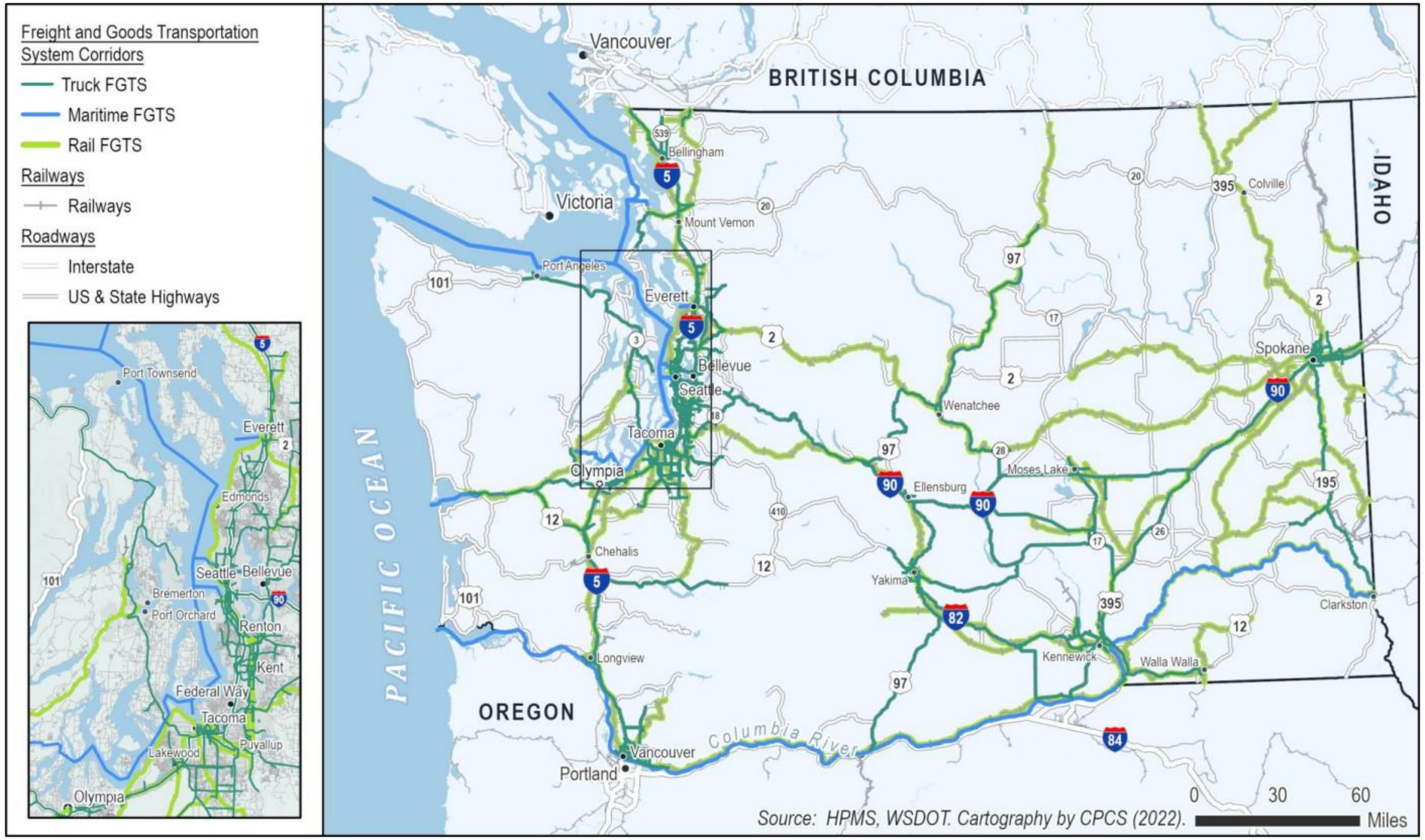
The CSCD connects Omak to Wenatchee to the south to Oroville at the Canadian border and hauls forest, agricultural, and mineral products. It runs concurrently with a trucking route along 97 until Omak. At this point, the CSCD rail is the only freight connection with Oroville.

As of 2017, the freight rail system in WA moved 42.8 million tons of cereal grains and other agricultural products, accounting for 35% of total statewide rail shipments.

Freight rail tonnage in Washington has been increasing over the past several years, reaching 128 million tons in 2017, up from a low of 103 million tons in 2012. The state's moderate forecast for 2040 predicts that 216 million tons of freight will be moved by rail in Washington. A labor shortage in the trucking industry could result in increased reliance on rail for freight movement.

The CSCD rail line carries between 100,000 and 500,000 tons of freight per year. It provides a direct connection from North Central Washington to the freight cluster at Wenatchee.

Freight Transportation System Corridors, 2022



Source

Agricultural Freight in North Central Washington

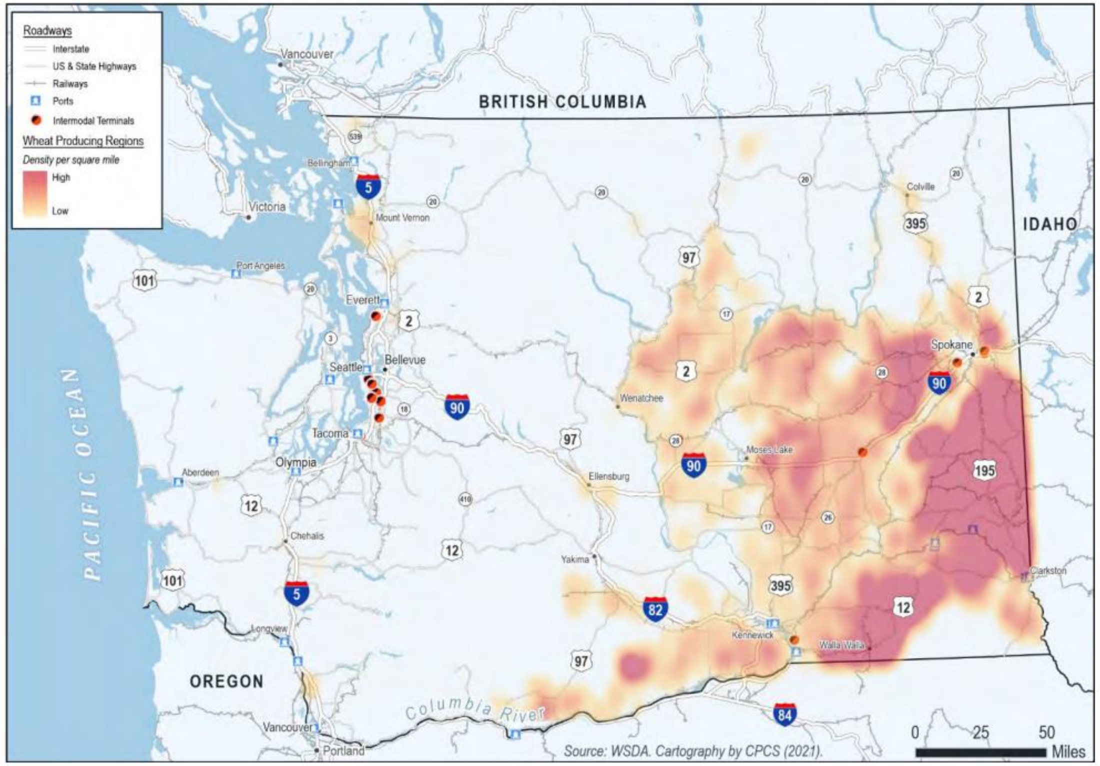
Wenatchee is a minor freight rail cluster in Washington, which connects by truck and rail to larger clusters in Seattle and Spokane. Agricultural and other goods traveling from North Central Washington by truck and rail to Wenatchee pass the industrial site in East Omak via rail and/or Highway 97. There are no other freight routes to Wenatchee from the north. Highway 97 is not a major trucking route. In 2019, it had a truck volume of under 2,500 trucks. It has far fewer truck parking locations and facilities than other Washington highways. The two private truck stops located in Omak are the only ones on Highway 97 between Wenatchee and the Canadian border.

According to [Washington's 2022 Freight System Plan](), wheat (a major agricultural product in central and eastern WA) typically travels less than 20 miles to a grain elevator for storage until it can be moved by train. However, wheat production is concentrated in Southwest Washington.

As of 2017, Okanogan County [ranked 6th in the state]() for crop production. It ranked 4th for the production of fruits, tree nuts, and berries and 18th for grains, oilseeds, dry beans, and dry peas. 8,597 acres of county land is dedicated to wheat production for grain. These agricultural products are typically brought by truck to the CSCD rail facilities, where freight trains transport them to larger markets.

There is currently a grain elevator in Brewster, south of Omak, and an intermodal facility at Oroville, near the Canadian border.

Grain Production in Washington, 2021



[Source]().

Rail Spur Analysis

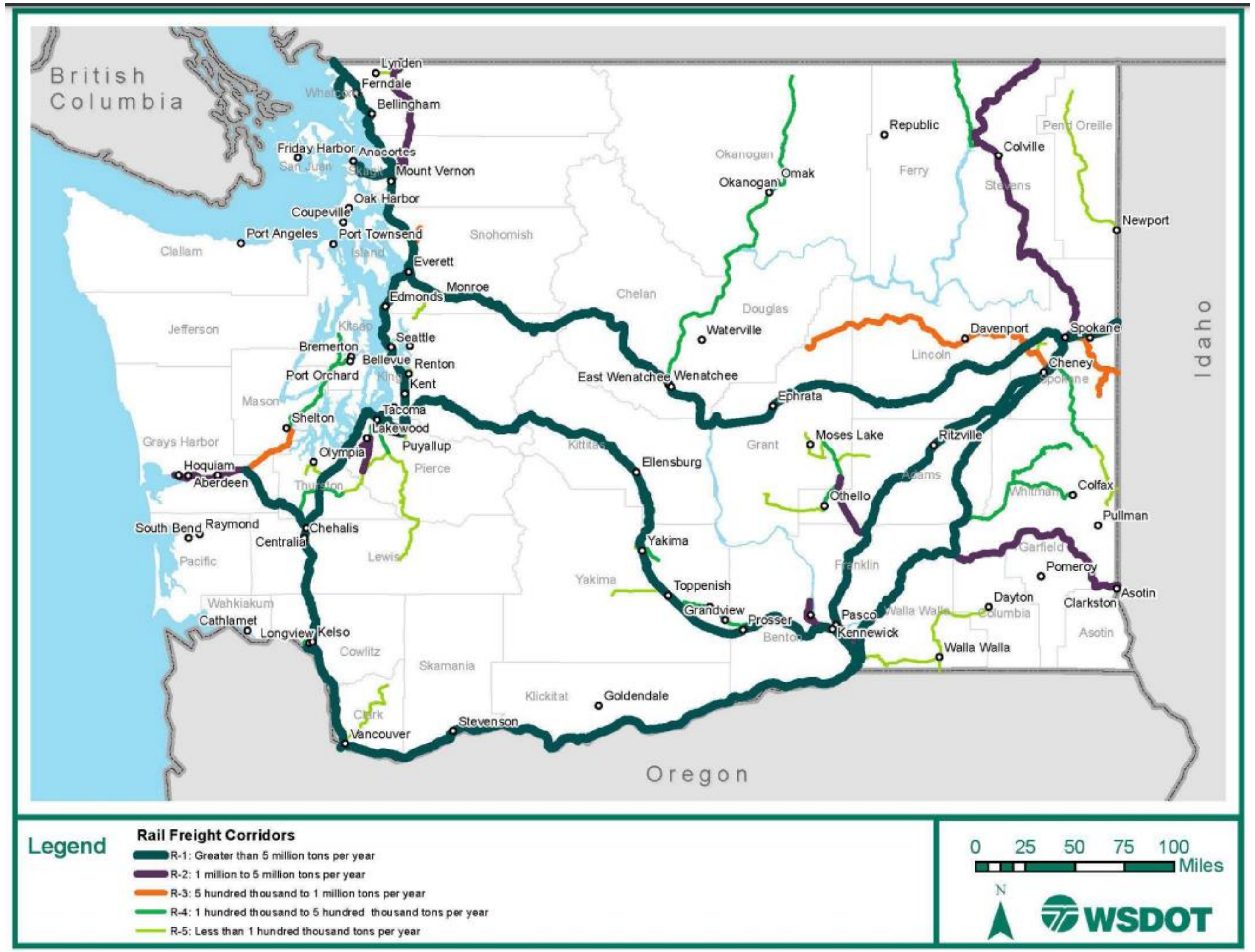
Inexpensive goods like grains and other agricultural products as well as high-end goods like cars are the most amenable to rail freight. The CSCD railroad is the only connection to the hub at Wenatchee from the north.

There may be an **opportunity to build an intermodal facility or agricultural goods warehouses** adjacent to the rail spur in East Omak if it is rebuilt. However, CCT should first **determine whether it can attract enough freight volume to justify a regular train stop** at this site. If rail-using facilities are unlikely to locate on site, the Tribes may choose to de-prioritize rebuilding the rail spur.

Because Okanogan County is a top producer of fruits, tree nuts, and berries, agricultural processing and storage facilities should focus on these types of crops rather than grain.

If CCT decides to rebuild the rail spur, it could **consider leaving some portion of adjacent land vacant so that it is available to host a rail-dependent use in the future.**

Rail Freight Corridors in WA, 2021



Source.

Oroville is an active port for truck freight

Among the border crossings into Canada located in Washington and Idaho, between 2016 and 2023 the top three crossings for truck freight (measured by Truck Containers Loaded) are Blaine and Sumas in Whatcom County and Eastport, Idaho.

Oroville, just north of Omak, is the fourth busiest, with 128,695 Truck Containers Loaded passing through the border between 2016 and 2023.

Between May 2022 and April 2023, 544.6 million pounds of freight (worth $1.156 billion) moved through the Oroville port. This freight was moved predominantly by truck. The top commodities by total value that moved through the port include:

- Wood & Articles (404.8 million lbs, $244 million)
- Vehicles other than Rail (10.1 million lbs, $187 million)
- Computer Machinery & Parts (9.6 million lbs, $163 million)
- Special Classification Provisions (19.5 million lbs, $118 million)

Over that same period, 19.7 million pounds of edible fruits and nuts (worth $59 million) passed through the Oroville border crossing.

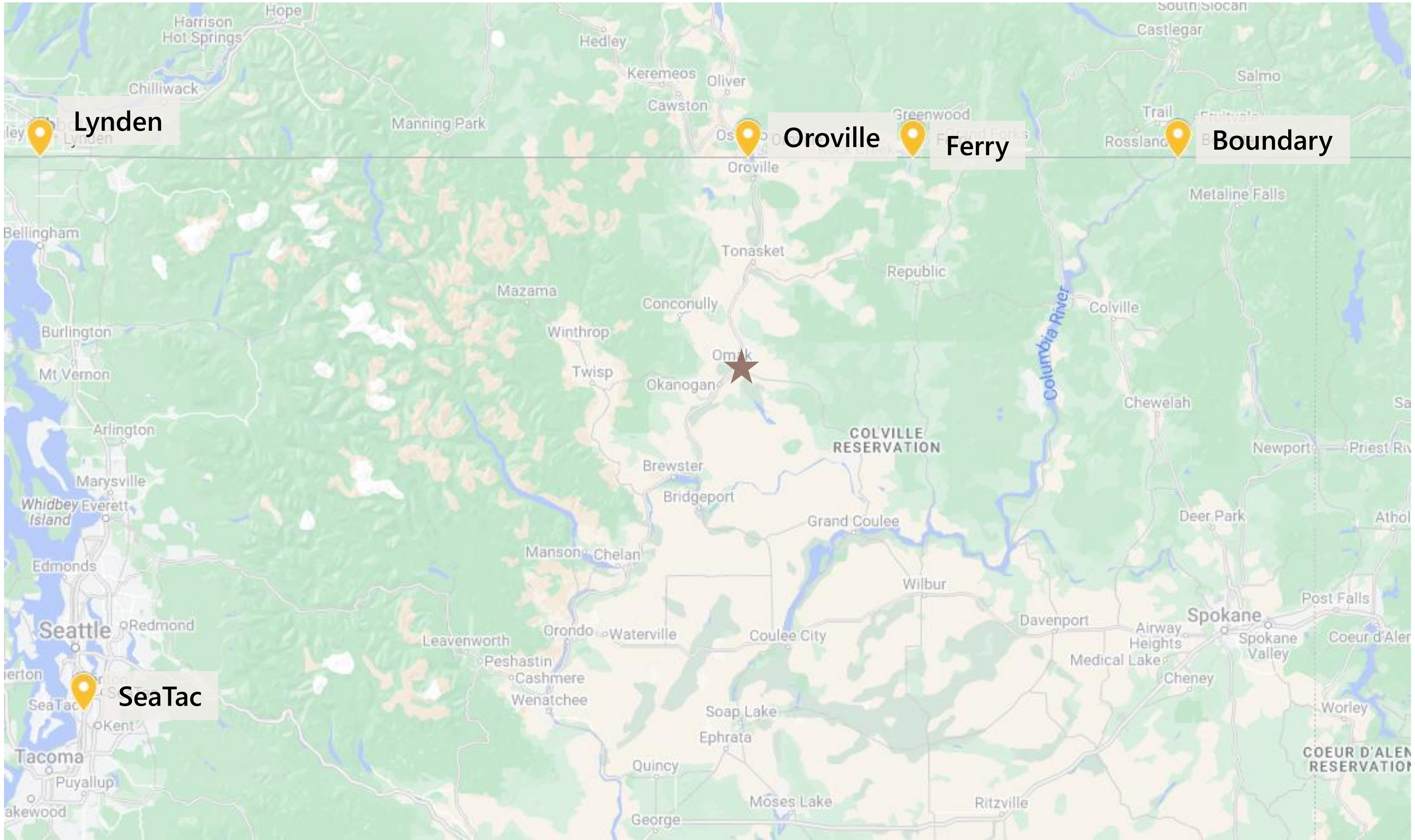
		Oroville	Ferry	Lynden	Boundary	SeaTac	Washington
May-22	Value	$103,680,000	$200,700	$89,560,000	$79,360,000	$69,600,000	$71,019,000,000
	Pounds	52,673,951	0	3,029,213	114,514,603	742,405	76,218,988,496
Apr-23	Value	$84,820,000	$324,200	$80,370,000	$63,340,000	$133,900,000	$63,778,400,000
	Pounds	38,537,765	0	1,493,951	104,598,494	354,620	69,922,309,337
Change 2022-2023	Value	-18.2%	61.5%	-10.3%	-20.2%	92.4%	-10.2%
	Pounds	-26.8%	0.0%	-50.7%	-8.7%	-52.2%	-8.3%
Last 12 Months	Imports ($)	$588,170,000	$2,290,190	$63,900,000	$681,400,000	$302,900,000	
	Exports ($)	$567,370,000	$2,381,000	$850,600,000	$800,000	$993,500,000	
	Truck (lbs)	544,353,291	12,123,391	113,550,221	766,954	6,414,114	
	Rail (lbs)	219,448	0	0	1,135,792,051	0	
	Air (lbs)	1,049	0	0	0	600,837	
	Other (lbs)	0	0	0	0	66	

Source: Bureau of Transportation Statistics

Despite its remote location, Oroville's port handles more truck freight than others nearby

The ports included in the table on the previous slide are shown in the map to the right. While the amount and value of freight moving through ports decreased statewide between 2022 and 2023, Oroville still processed nearly as much freight by value as Lynden, which is just off the I-5 Corridor.

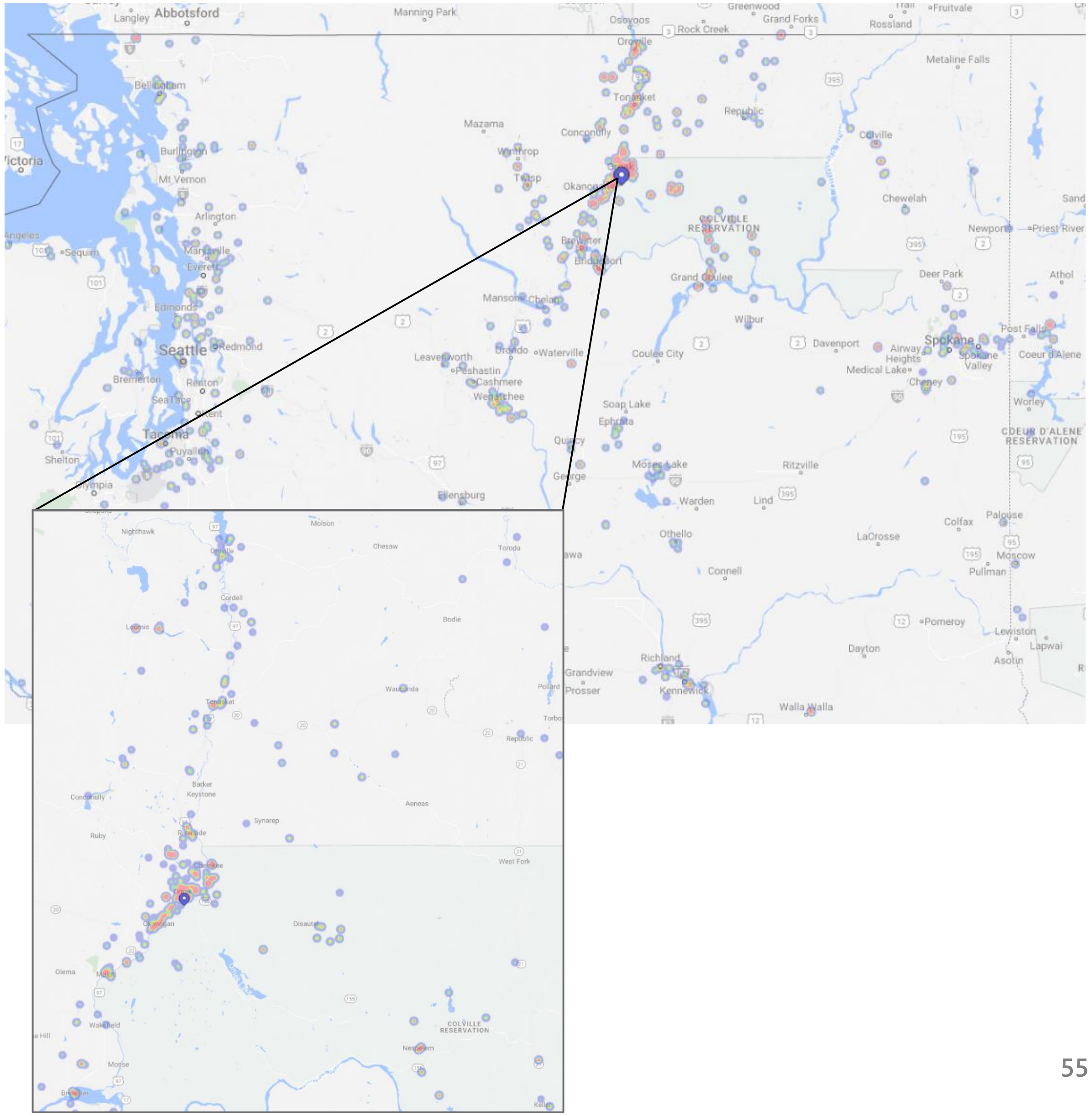
While some products, like prefabricated housing, are more likely to travel within the United States rather than cross-border, **the proximity of the East Omak site to the Oroville crossing could be attractive to industrial users who import and export parts and products**.



The Tribal Trails Truck Stop serves visitors from throughout Washington

According to anonymized cell phone location data provided by Placer.ai, in the 12 months leading up to June 2023, approximately 26,200 visitors stopped at the Tribal Trails Truck Stop a total of 94,000 times. 13.4% of these visitors came from Omak, 8% from Okanogan, 5.8% from Tonasket, 4% from Brewster, and 3.8% from Oroville. *(Note: Placer AI does not track data from outside the US)*

While the truck stop's trade area extends to population centers in the Puget Sound and Spokane, the high percentage of visitors from the Tonasket and Oroville areas indicates substantial traffic flow from northern destinations. This, combined with border crossing data showing significant truck traffic through Oroville indicates that **the industrial site is strategically located to take advantage of existing truck freight routes.**



Targeted Industrial Uses

Introduction

The following section analyzes specific industrial uses for consideration on the East Omak Industrial Site.

While "all the usual suspects" are present, like value-added food processing and warehousing, there are additional uses suggested based on compatibility with the site layout, as well as potential for local economic development and community resilience, both goals that have been stated by community stakeholders and Tribal Members.

At the end of this section is a summary of the pros and cons for each use based on market outlook, continuity with past plans, expected infrastructure needs, compatibility with the existing workforce, potential for job creation, environmental impact, and the potential to support Tribal sovereignty and community resilience.

Data Center

Sabey Data Center - Quincy, WA, built 2022

Acreage / FAR	34.3 / 0.26
Transportation	Minimal road access required after initial build out
Infrastructure	Power needs of 60+ MW; Moderate water needs for cooling systems
Risk	Potential high-risk, high-reward due to infrastructure investment needs to attract long-term tenant.
Likelihood	Medium to High

Pros	Cons
Compatible with neighboring uses	Fewer jobs than more traditional industrial uses
Potential to encourage other industry-adjacent users to Omak area	Local workforce may not be compatible with employer needs; outside employment a risk
Long-term outlook of data centers provides sustainable source of revenue	Requires high investment in electrical capacity for site readiness
Fewer transportation needs compared to other potential uses	

Market Outlook

- More than 2 million sq. ft. of data center inventory has been built in Grant and Douglas counties since 2011 – mostly in Quincy and Wenatchee – with market rent per square foot as of Q2 2023 at an estimated $17.09-$20.89.
- This growth represents steady demand for data center placement in North Central Washington. According to DatacenterHawk's 2023 Data Center Market Recap, the US data center market is nearing full capacity, especially in major markets like Northern Virginia and Washington state, and "data center operators can't build facilities fast enough."
- Lower cost of power within neighboring counties puts Omak at a competitive disadvantage in attracting data centers, however, these costs may be offset by special tax and business advantages available at the Omak site location.
- In Central Washington, many communities are resisting future new facilities, as they are concerned about both the lack of significant jobs along with the related pollution with the current concentration. (Source)

Craft Industrial

Whiteclay Makerspace – Whiteclay, NE

Acreage / FAR	1+
Transportation	Road access adequate, though would benefit from improved connectivity to highway
Infrastructure	Low
Risk	Low-risk, high-reward due to low construction and infrastructure costs and potential to support local economic development and entrepreneurship; risk of failure without shared vision and management plan
Likelihood	Medium to High

Pros	Cons
Compatible with neighboring uses - Meets a stated need by Omak area residents for creative space and fiber arts facilities	Smaller, incremental development – Not large-scale, employment based
Strengthen community resilience through support for homegrown entrepreneurs and enterprise	Likely require initial investment by Tribes or another mission driven investor – Not an outside investment vehicle
Market cultural identity through local business development	Ongoing management needs for sustained success

Market Outlook

- Though difficult to account for market growth, thousands of craft industrial sites – often referred to as “makerspaces” – have emerged globally in recent decades, with a growing number every year, including the successful TwispWorks campus in nearby Twisp, WA.
- Often community-based in nature, craft industrial sites have proven to be community assets that promote community resilience in times of crisis and help to grow a local entrepreneurial class.
- Several other tribes elsewhere in the U.S. have organized maker spaces for tribal members, including new spaces opening soon at Nebraska Indian Community College campuses in Macy and Santee, Nebraska for experimentation and featuring traditional tools and modern engraving and 3-D printing equipment.

Bio-fuels Manufacturing

SeQuential Biofuel Producer – Salem, OR

Acreage / FAR	7.7-45 acres
Transportation	Direct access to rail and improved highway access requirements
Infrastructure	High
Risk	High-risk, high-reward due to high upfront investment costs and volatility of the biofuels industry
Likelihood	Low to Medium

Pros	Cons
Complimentary to regional agricultural and forestry economy	Not compatible with neighboring residential uses
Potential to develop biofuel energy industry cluster around production facilities	Would require significant upgrades for access and re-opening of rail spur
Single-user industrial development with large number of jobs	Single-user reduces flexibility of future uses on site
Existing rail spur on site	

Market Outlook

- Canola production in Central Washington, as well as forestry related byproducts, provide a regional advantage in terms of access to some of the most common sources of biofuel production.
- As of July 2020, Washington has only two major producers of commercially available biodiesel, with an annual production capacity of 117 million gallons per year; REG Grays Harbor, located in Hoquiam, WA, is the second leading producer of biodiesel in the United States.
- Policy uncertainties and the volatility of oil prices have made biofuel a risky industry to invest in, with more than 9 biodiesel projects put on hold or cancelled in Washington since 2008 alone.

Flex Light Industrial

Chelan Business Center, built 2018

Acreage/FAR	1.5+ / 0.18
Transportation Needs	Does not need train access; Likely requires truck and car access to highway
Infrastructure Needs	Low
Market Risk	Ability to attract multiple tenants is market-dependent, but having a diversity of businesses can help protect against a major downturn. The quality of development will impact success. The Tribes' ownership model could help mitigate risks.
Likelihood	Medium to High

Pros	Cons
Compatible with neighborhood uses	Incremental, leasing up over time
Provides space for small local businesses	Requires interest from multiple tenants rather than a single tenant
Mix of office and light industrial broadens pool of potential users	Potentially higher tenant improvement costs than other typologies
Less resource-intensive than heavier industrial uses	

Market Outlook

- There are currently just 25 flex-industrial properties in the 5-county North Central Washington region.
- Market rent per square foot as of Q2 2023 is $19.11, up 1.9% year over year. It is expected to reach $21.98 by Q2 2028.
- There is currently a lack of flex space in Okanogan County, with the majority of flex space in the region concentrated near Wenatchee and Moses Lake.

Rail-Using Industrial

Dolco Packaging Company – Wenatchee, WA, Built 1964

Acreage / FAR	1.5-5 / 0.24
Transportation Needs	Direct adjacency to railroad spur; Truck access
Infrastructure Needs	Medium to High
Market Risk	Much of the existing freight in this region goes by truck rather than rail. Re-activating the rail spur could be costly and time consuming, and there is a relatively small universe of industrial tenants reliant on rail access.
Likelihood	Low to Medium

Pros	Cons
Compatible with local agricultural economy	Would require reconstruction of the rail spur connection
There is an existing rail spur on site	Inflexibility regarding location on-site
The vacancy rate for rail-adjacent industrial properties is low and there is a lack of supply north of Wenatchee	The rail is privately owned – the owner has the ultimate decision-making authority regarding the rail spur
	Railroad rolling stock manufacturing is expected to see a 1.7% compound annual decline in wage and salary employment through 2031

Market Outlook

- According to CoStar, between Wenatchee and Riverside, there are 25 railroad-adjacent industrial properties. These include warehouses, manufacturing facilities, and cold storage facilities. No new railroad-adjacent industrial facilities have been built since 2019 along this rail corridor.
- Just five of these railroad-adjacent industrial properties are located north of Wenatchee. The market rent per square foot as of Q2 2023 is $12.44, up 3.6% year over year. Rent is expected to reach $14.70 by Q2 2028.
- There is an existing railroad-adjacent site on the Colville Reservation that formerly housed Colville Indian Power and Veneer. This site has remained unused since its closure in 2009.
- Inexpensive goods like grains and other agricultural products as well as high-end goods like cars are the most amenable to rail freight.

Wood Product Manufacturing

Vaagen Brothers Lumber – Colville, WA

Acreage / FAR	30-55 / 0.13-0.21
Transportation Needs	Truck access
Infrastructure Needs	Medium to high
Market Risk	While the wood product manufacturing industry is expected to see modest growth over the next few years, volatility in prices and increased wildfire risk in Washington are impacting the feasibility of new operations. Cross-laminated and mass timber products could be a growth area, but there are already nine of these facilities in the Northwest.
Likelihood	Low

Pros	Cons
The site is adjacent to local logging industry	Omak lacks a direct highway or rail connection to existing forest product companies in the state
Existing workforce knowledge	Recent volatility in lumber pricing
A wood product manufacturing facility on this site could help reactivate the CIPV site in the future	Increase in fire season severity statewide pose a risk to timber-revenue forecasts
	Employment in the Wood Product Manufacturing industry is only expected to grow at a compound annual growth rate (CAGR) of 0.3% through 2031 in the US

Market Outlook

- The biggest opportunities in the timber industry currently are for mass timber products and other novel building materials. California-based Katerra announced the opening of a CLT factory in Spokane Valley in 2019, but it closed permanently in 2021 due to a combination of internal and logistics challenges.
- Vaagen Timbers, based in Colville, WA, and Mercer Mass Timber, based in Spokane Valley, are now the only mass timber manufacturers in Eastern Washington. There are 7 additional CLT manufacturers based in OR, WA, ID, MT, and BC.
- A 2018 report by the Beck Group for the State of Oregon estimated that 8 to 12 typical-scale CLT manufacturing facilities to meet the expected demand from states in the Council of Western States Foresters region.
- Most of the CLT producers operate out of existing lumber manufacturing plants rather than building new ground-up facilities.

Value-Added Fruit Manufacturing

Northwest Naturals Ross Manufacturing Facility, Selah, WA

Acreage / FAR	3-7 acres / 0.4-0.6 FAR
Transportation	Significant truck/traffic transportation required. Could utilize rail but less likely due to cold storage needs.
Infrastructure	Existing fruit uses reported to generate large amounts of wastewater. Some fruit manufacturing such as dehydration uses significant electricity. Refrigeration before processing would also require more power.
Risk	Moderate. Could be small or medium-sized, potentially adaptable to future alternative fruit uses, existing potential workforce.
Likelihood	Medium (given existing agglomeration??)

Pros	Cons
Existing agglomeration of fruit manufacturing and packing in Omak	Climate change, natural disasters, and consumer preferences can shift the market for fruit products.
Production of fruit products near farming areas reduces transportation and storage costs.	Existing fruit packing and manufacturing is well established in Wenatchee and elsewhere.
Variety of options including packing, drying, snack bars, juice, etc. Some require refrigeration and others do not.	Potential issues with wastewater

Market Outlook

- Washington apple exports have decreased slightly in recent years due to weather and climate, but the state is still the #1 apple, blueberry, cherry, and pear producer in the U.S. Notably, the market for Canadian exports of apples has increased over the past several years according to the USDA.
- Washington has seen an 11 percent increase in food manufacturing jobs and a 20 percent increase in food manufacturing firms between 2012-2021.
- Most value-added fruit production takes place at relatively small-scale facilities, though there has been some consolidation and sales in the Washington market recently. For example, Chelan Fruit, itself a combination of four former cooperatives, is now owned by North Carolina-based International Farming Corporation.

Solar Farm

Adams Nielson Solar Farm, Lind, WA (28 mW / 200 ac / 4,000 homes)

Acreage / FAR	"Community-Scale" 1-20 ac/<5mW "Utility-Scale" > 20 ac./ > 5mW Large farms in WA up to 1,800 ac.
Transportation	Very low impact after constructed. Some needed during construction.
Infrastructure	Would likely require additional power infrastructure to connect to grid for transmission (depending on scale)
Risk	Potential for small or larger-scale solar on the site offers flexibility.
Likelihood	Relatively high given flexibility of size, strong market for recent projects in SE and SC Washington, and statewide renewable energy goals.

Pros	Cons
Tribes could produce their own energy for uses on the site and/or income by selling to the grid	Very few jobs created after construction is complete (1-2 most likely)
Significant number of construction jobs and potential for revenue from land leasing.	Requires a significant amount of flat space which could be more profitable in other use
Solar siting here would not displace farmland or other habitat or environmentally constrained area	Other energy sources would still be required as generation would fluctuate with weather, season, etc.

Market Outlook

- Solar energy is booming in Washington due to statewide goals of achieving carbon-neutral electricity production by 2030 and 100% clean power by 2045.
- The Washington 2021 State Energy Strategy models suggest that electricity demand could grow 13-20% from 2020 levels by 2030 and 92% by 2050. By 2045, nearly half of Washington's energy use is expected to be from electricity, up from 21% today. Combined with the 100% clean power goal, this shows the expectation of continued demand for solar, wind, and other green energy sources over the next several decades.
- A number of large (80-100mW) projects are under construction near Yakima and even larger arrays have recently opened in Klickitat County, but there are not any large-scale active or proposed projects in North Central Washington. The area has a good outlook for solar production due to weather and location.

Intermodal/Transloading Terminal

Port of Quincy Intermodal Terminal, Quincy, WA

Acreage / FAR	6-10 acres for terminal. Can be combined with adjacent warehousing space (as shown above)
Transportation	High impact for road and rail, would require rebuilding rail spur and improving truck access to site
Infrastructure	Relatively low for terminal facility itself, some potential power considerations
Risk	May involve significant risk depending on cost of rail improvements and interest from railroad.
Likelihood	Low

Pros	Cons
Capture some revenue from other industrial users in the area both on and off the site	Significant transportation needs for truck and/or rail, plus associated pollution
Capitalize on existing rail spur and access to railway, as well as existing timber industry in the region.	Rail transportation is less cost-effective for fruit due to spoilage and refrigeration
	Location may be too remote to attract such a facility depending on volume of freight/rail traffic

Market Outlook

- Transloading from rail to truck is an integral part of the shipping business. There is a facility in Quincy but no such facility farther north in WA.
- A current truck driver shortage is driving demand for these facilities, and rail transport in general at present, but may be a short-term trend.
- Some facilities include large amounts of warehouse space for storage, including refrigerated storage. Could be combined with warehousing in some form.
- Transportation and warehousing is a growing industry in Washington, with a 31% increase in jobs since 2012, and has increased significantly since the pandemic with the continued popularity of online retail.

Warehousing

Gebbers Farms Cold Storage, Quincy, WA

Acreage / FAR	5-20 acres, FAR 0.15 – 0.3
Transportation	High impact for road, would require new road and rail crossing to improve truck access to site
Infrastructure	Potential moderate water and electricity usage, electricity could be higher if refrigerated.
Risk	Relatively low risk
Likelihood	Medium-High

Pros	Cons
Capture some revenue from other industrial users in the area both on and off the site	Significant truck traffic and need for improved access to site from highway
Provide storage space for the community or other tribal businesses and improve quality of warehouse space in Omak area	Relatively few jobs created compared to more intensive uses of site.
One of the fastest-growing sectors regionally, refrigerated warehousing important for regional fruit industry	Distance to major metros and interstate freeways may reduce demand.

Market Outlook

- Transportation and warehousing is a growing industry in Washington, with a 31% increase in jobs since 2012, and has increased significantly since the pandemic with the continued popularity of online retail.
- Flexibility of warehousing uses provides opportunities for tribal use or leasing of space to other nearby industrial, agricultural, or transportation users.
- Costar data indicates that the majority of warehousing space in the region, particularly non-refrigerated space, is relatively old.
- Proximity to Canada could be beneficial if FTZ established on site.

Prefabricated Housing Cluster

Method Homes – Ferndale, WA, Built 2021

Acreage/FAR	4-7 / 0.43
Transportation Needs	Truck access
Infrastructure Needs	Medium
Market Risk	Low to Medium. Competition with other prefab manufacturers closer to high-demand markets like Seattle, need for specialized labor that could be hard to find in North Central Washington.
Likelihood	Depends on whether CCT is interested in starting their own manufacturing business or whether they would try to attract an existing manufacturer.

Pros	Cons
Using the knowledge and skills of the existing workforce, the Tribes could start their own prefab home manufacturing facility	The Tribes would likely need a loan or outside investment capital to build the facility and fund initial operations
Prefab housing could help meet local and regional housing needs while also providing jobs	Most existing prefab housing manufacturers in Washington are closer to high-demand markets
Modular homes can be built with wood fiber rather than old growth timber, making it more sustainable and eco-friendly	Would likely require some highly specialized workers who would need to relocate to Omak

Market Outlook

- Throughout Washington and neighboring states there is a significant shortage of both housing and construction labor. Interest in prefabricated homes including manufactured homes, tiny homes, modular units, and other prefab housing has increased due to its ability to provide units quickly and at a much lower cost than traditional housing construction.
- The prefabricated housing market is expected to grow at a CAGR of 4.8% through 2028, with North America expected to see the largest market growth over that period.
- There are currently 7 prefabricated home manufacturers in Washington – four in the Seattle area, one north of Bellingham, one in Battle Ground, and one in Goldendale. There are no manufacturers in North Central or Western Washington.

TARGETED INDUSTRIAL USES

Summary Table

Use	Acres	Sq. Ft. RBA	Market Outlook	Infrastructure Needs	Existing Workforce Expertise	Tribal Sovereignty	New Job Creation	Environmental Impact	Continuity with Past Plans
Data Center	35	400,000	Medium-High	High	Construction only	Low	Low	Low-Medium	No
Craft Industrial	1+	8,000+?	Medium	Low	Yes	High	Medium	Low	No
Bio-fuel	7.5-45		Low-Med	High	Construction only	Low-Med	Medium	High	Yes
Flex Light Industrial	1.5+	12,000+	Medium	Low	Some	High	Medium	Low	Yes
Rail-Using Industrial	1.5-5	16,000-52,000	Low	High	Some	Low-Med	Medium-High	Medium	Yes
Wood Product Manufacturing	30-55	170,000-500,000	Low	Med	Yes	Low-Med	High	Medium-High	Yes
Value-Added Fruit Manufacturing	3-7	20,000-150,000	Medium	Med	Yes	Low	Medium-High	Medium	Yes
Solar Farm	1-100+	n/a	High	Low-Med	Some	High	Extremely Low	Low	No
Intermodal / Transloading Terminal	6-10	5,000-50,000	Low	Med-High	Some	High	Low-Medium	Medium	No
Warehousing	5-20	5,000-200,000	Medium-High	Med	Some	High	Low	Medium	No
Prefabricated Housing Cluster	4-7	70,000-122,000	Medium-High	Low	Some	High	Medium-High	Low-Medium	Yes

Uses Not Recommended in the Near Term

The following table outlines the reasons why specific uses are not being recommended in the following site program and strategic recommendations. While future market conditions may change, and therefore these uses should not be completely ignored as a potential future use, based on current market demand, infrastructure investment needs, and/or support for Tribal goals, these are not recommended in the near term.

Use	Market Reasons	Infrastructure Reasons	Tribal Reasons
Data Center	• Other counties nearby have better access to cheap power	• There is not sufficient electrical power currently on site • Constructing the infrastructure needed would be extremely costly and potentially politically difficult due to the Tribes' relationship with the utility	• Data centers do not generate enough jobs to justify the cost of necessary infrastructure
Bio-fuel	• The closure of the lumber mill and CTPV plant reduced the amount of byproduct available for bio-fuel production • Market volatility has reduced the likelihood of a new facility being constructed	• Significant Tribal resources would be required to prepare the site for bio-fuel production	• By-products of production could be hazardous to community health
Wood Product Manufacturing	• The market for wood products is weak, leading to the closure of lumber mills throughout the Pacific Northwest in recent years • Existing wood product facilities are sufficient to meet demand, with no new facilities constructed in recent decades.		

Key Findings

Given Okanogan County's existing share of the region's industrial market, as well as expected growth in both sectors, **East Omak's "lowest hanging fruit" would be in food processing with accompanying refrigeration & cold storage space, along with more traditional transportation and warehousing facilities.**

Bio-fuels manufacturing, once expected to be a major growth industry in the Pacific Northwest, **has seen volatility in the market due to policy uncertainty and fluctuating oil prices**. East Omak is competitively located to take advantage of the fuel sources needed to manufacture bio-fuels, however, there is not significant enough demand in the market to expect a bio-fuel business to locate on the industrial site without significant marketing and business development by CCT.

All of the data center and colocation facilities in the region are located in Chelan and Grant Counties, with 12 facilities in Wenatchee and Quincy alone. However, this does not mean that Okanogan County will be unable to attract data centers in the future, but it will **require active marketing and a substantial investment in power capacity to attract a user**.

Growth in the **solar energy sector is booming in Washington** due to statewide goals of achieving carbon-neutral electricity production by 2030 and 100% clean power by 2045. If paired with a user that could take advantage of on-site power production, solar could be a beneficial use for the upper portions of the industrial site.

Finally, while not a large-scale use or major employer, there may be sufficient demand for utilizing a portion of the site through incremental investment into smaller flex-industrial spaces, or craft industrial/makerspace. This would help support local business and craftspeople and provide a pathway for Tribal-led enterprise development.


Site Program, Case Studies & Strategic Recommendations

Site Program

Introduction

Key findings from the above analysis were discussed with Tribal stakeholders, including the Tribal Business Council, which led to the development of a **proposed site program**. Proposed uses for the site include:

- Prefabricated housing manufacturing
- Craft/Flex industrial
- Intermodal facility with adjoining warehousing
- Rail using industrial
- Retail

While all of these uses have been included on the following page, it must be stated that it is unlikely the entire program will be developed in the near-term. Rather, the program is a conceptual site plan representing a potential "full build out" for the site. It is more likely the site will develop in a phased program, with the scale of new development dependent on active marketing and site preparation by CCT.

Following the site program, the remainder of the report includes **case studies** for prefabricated housing and craft industrial, as well as **strategic recommendations** to assist CCT in their implementation of this site program.

EAST OMAK INDUSTRIAL SITE
Proposed Site Program
Clinic / Head Start Site
30 Acres
Craft/Flex Industrial
5-20 Acres
Intermodal Facility
6 Acres
Prefab Housing
5-7 Acres
Tribal Trails
Warehousing
4-6 Acres
Rail-Using Industrial
5 Acres
Retail
5 Acres
Wastewater Treatement Facility
Future Growth Area
Future Growth Area
Omak Creek
Water Tank
97
155
155
Legend
Landscaping Buffer
Proposed Roundabout
Proposed Road & Rail Crossing
Existing Rail
Potential Rail Extension
Areas of Development
Industrial Area
Parcel Boundaries
Omak City Limits
Highly Sloped Areas
Critical Areas
0
500
1,000 ft

Case Studies

Prefabricated Housing

There are several prefabricated home companies located across Oregon, Washington, and Idaho. A selection of companies are listed by home type below.

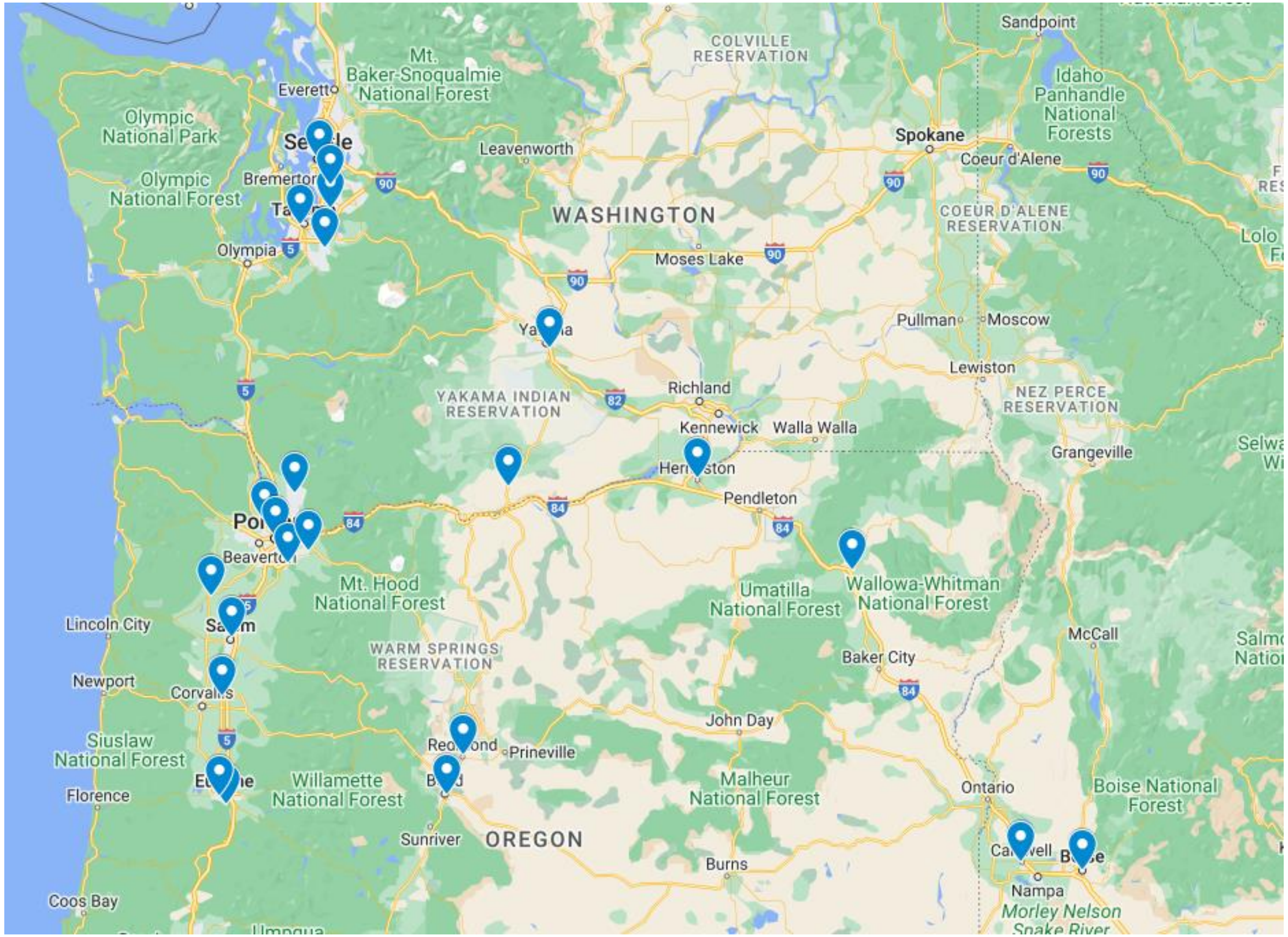
- **Modular Home Companies:**
  - ModsPDX – Portland, OR
  - Method Homes – Seattle, WA
  - Ideabox – Salem, OR
  - Blu Homes – Portland, OR
  - Buildhouse – Bend, OR
  - Marlette – Hermiston, OR
  - Wolf Industries – Battle Ground, WA
  - TLC Modular Homes – Goldendale, WA
  - DeTray's Custom Housing – Puyallup, WA
  - Timberland Homes – Auburn, WA
  - True Built Home – Tacoma, WA
- **Kit Home Companies:**
  - Relevant Buildings – Oregon City, OR
  - DC Structures – Damascus, OR
  - IndieDwell – Boise, ID
  - Lindal Cedar Homes – Seattle, WA
- **Manufactured Home Companies:**
  - Skyline Homes – McMinnville, OR
  - KIT Custom Homebuilders – Caldwell, ID
  - Clayton Homes – Albany, OR
  - Eastern Oregon Home Center – La Grande, OR
  - Central Homes – Redmond, OR
  - Valley Quality Homes – Yakima, WA
- **Container/Tiny Home Companies:**
  - Oregon Cottage – Eugene, OR
  - Tru Form Tiny – Eugene, OR

Prefabricated Housing

The headquarters of the prefabricated home builders listed on the previous slide are included in the map at the right. In Oregon and Washington, the majority of these home builders are based in cities located along the I-5 Corridor in the western portion of the states. However, some of these companies may be interested in expanding operations further east, as the housing shortage is no longer confined to urban areas.

The Tribes should consider reaching out to a selection of these or other prefabricated home builders to **determine what infrastructure or other incentives would be needed to establish a manufacturing facility on the East Omak site.**

While the lack of access to a major interstate could be a barrier to attracting a prefabricated housing manufacturer, access to timber and proximity to Canada could help make the site more appealing. Homebuilders may also see an advantage to showcasing their homes in a freeway-adjacent neighborhood.



Prefabricated Housing: TLC Modular Homes – Goldendale, WA

TLC Modular Homes was established in 1999 and manufactures **modular homes in** its factory in Goldendale, WA. TLC sells its Washington building code compliant homes directly to buyers in Washington, Oregon, Idaho, and California.

TLC specializes in:

- Custom residences
- Office building and medical centers
- Community recreation centers
- Agricultural worker housing
- Worksite operations and maintenance centers

Their homes range from just over 500 square foot tiny homes to nearly 3,000 square foot ranch homes. They also offer duplex home plans with units just under 800 square feet.

Prices for TLC's ranch homes range from $122,195 for a 769 square foot home to $300,044 for a 2,656 square foot home.

Prefabricated Housing: DC Structures – Damascus, OR

DC Structures is a **kit-home** company based in Damascus, Oregon. It specializes in pre-engineered heavy timber structures including:

- Apartment barns
- Horse barns & arenas
- Barn-style homes
- Contemporary cabins
- Custom homes
- Timber-frame homes
- Garages & workshops
- Event Barns

The variety of structure types could be a good fit for East Omak, as the region has a strong agricultural economy and a shortage of housing at a variety of price points.

DC Structures constructs its homes from Pacific Northwest Douglas fir timber and uses flexible floor plans to allow for customization. Their structures range widely in size and finish quality.

Because DC Structures does not offer construction services, the company partners with local builders nationwide through their builder network.

Makerspace

Makerspaces are frequently operated by nonprofit foundations and serve a variety of functions depending on the needs of the community, ranging from **artist spaces to small-scale manufacturing, educational programs, retail spaces, and assistance in connecting entrepreneurs with funding and resources**. The Tribe could spearhead such an enterprise on the East Omak industrial site or partner with a new or existing nonprofit wishing to operate such a space. An associated retail space featuring locally-made products could be located near the Tribal Trails truck stop, visible from US-97.

These types of spaces and programs have been popping up nationwide over the last several years. Prominent examples include:

- TwispWorks – Twisp, WA
- Mighty Tieton – Tieton, WA
- Pybus Public Market – Wenatchee, WA
- Ponyride – Detroit, MI
- Whiteclay Makerspace – Whiteclay, NE

Makerspace : Whiteclay Makerspace

The Whiteclay Makerspace is located on the Whiteclay/Pine Ridge Reservation area in Nebraska. It operates out of a former liquor store and is intended to address a lack of safe workspaces, storage, and access to supplies and resources for local artists.

According to the First People's Fund, 30% of all Native peoples are practicing or potential artists. On the Pine Ridge Reservation, 51% of households depend on home-based enterprises for income.

Whiteclay Makerspace uses a membership fee and commission model to sustain itself as well as selling art supplies and soliciting tax-deductible donations.

The makerspace provides tools to the artists who use the space, including:

- Carpentry tools
- Laser cutters
- Quilting machines
- Easels/worktables
- Sewing machines
- Canvas stretchers
- Other specialized tools & equipment

Makerspace : Mighty Tieton – Tieton, WA

Mighty Tieton is an **artisan business incubator** located in central Washington. Their goal is to establish successful, distinctive businesses by **connecting creative entrepreneurs with local resources**. This activity helps to improve the local economy by **generating jobs, revitalizing buildings, and instilling a sense of hope**, unusual possibilities, and dynamic connections with artisan businesses throughout the region and beyond.

Tieton's proximity to Yakima and business-friendly leadership have **attracted talented entrepreneurs who have helped to revitalize the city**.

The City of Tieton cultivated a small agglomeration of organizations and businesses that support local vendors as well as the community. These include **the Mighty Tieton Warehouse, Boxx Gallery, Tieton Made, Nomad Mercantile, and 601 Studios**.

The Mighty Tieton Warehouse holds a variety of local events and can also be rented out as a wedding venue.

Neighborhood Revitalization: Old Sawmill District – Missoula, MT

The Old Sawmill District is located on the 46-acre former Polleys Lumber Company site. Polleys sold the site in 1955 and by 2016, when the first Old Sawmill District properties were completed, **the site had been vacant since the early 1990s.** The $250 million site build out will include student housing, senior housing, condominiums, a mixed-use building with a neighborhood market and office space, and a parking garage, as well as a 14-acre park along the river.

Prior to redevelopment, the vacant site had attracted homeless camps in vacant buildings. The sense that the large site was "abandoned" reduced the sense of safety in the area. **Redevelopment and activation of the site has increased both safety and property values in the surrounding area.**

The Old Sawmill District is a large mixed-use development in an urban center – it is unlikely that a similar development will occur on the East Omak industrial site. However, it illustrates **the negative impacts a large vacant site can have on a neighborhood, and the benefits that can accrue when targeted investments generate economic activity.**

Neighborhood revitalization will be crucial to attracting employers to the site. In addition, **activity on site will increase the perception of safety in the area** and could positively impact surrounding property values.

Strategic Recommendations

Neighborhood Revitalization

Revitalization and reinvestment into the adjacent neighborhood and area will be crucial to attracting employers to the site. Building off the momentum of the nearby clinic, wellness center and Head Start facility development, CCT should consider:

- **Coordinated reinvestment in the existing housing stock** to remove health or safety hazards, and/or modernize the homes.
- Assisting eligible residents with applications for USDA Single Family Housing Repair Loans and Grants or other **rural housing assistance** programs.
- Potential of **prefabricated housing manufacturing** on-site to provide relatively affordable housing options to replace existing, aging housing stock.
- Use of the site for local **job fairs, workforce training, and business development/entrepreneurship** support programs.
- **Revitalization of Jackson Street** commercial node that includes a storefront showcasing local artisan products or other Tribal-led businesses.

USDA Single Family Housing Repair Loans & Grants eligible area, Source: USDA

Housing as Economic Development

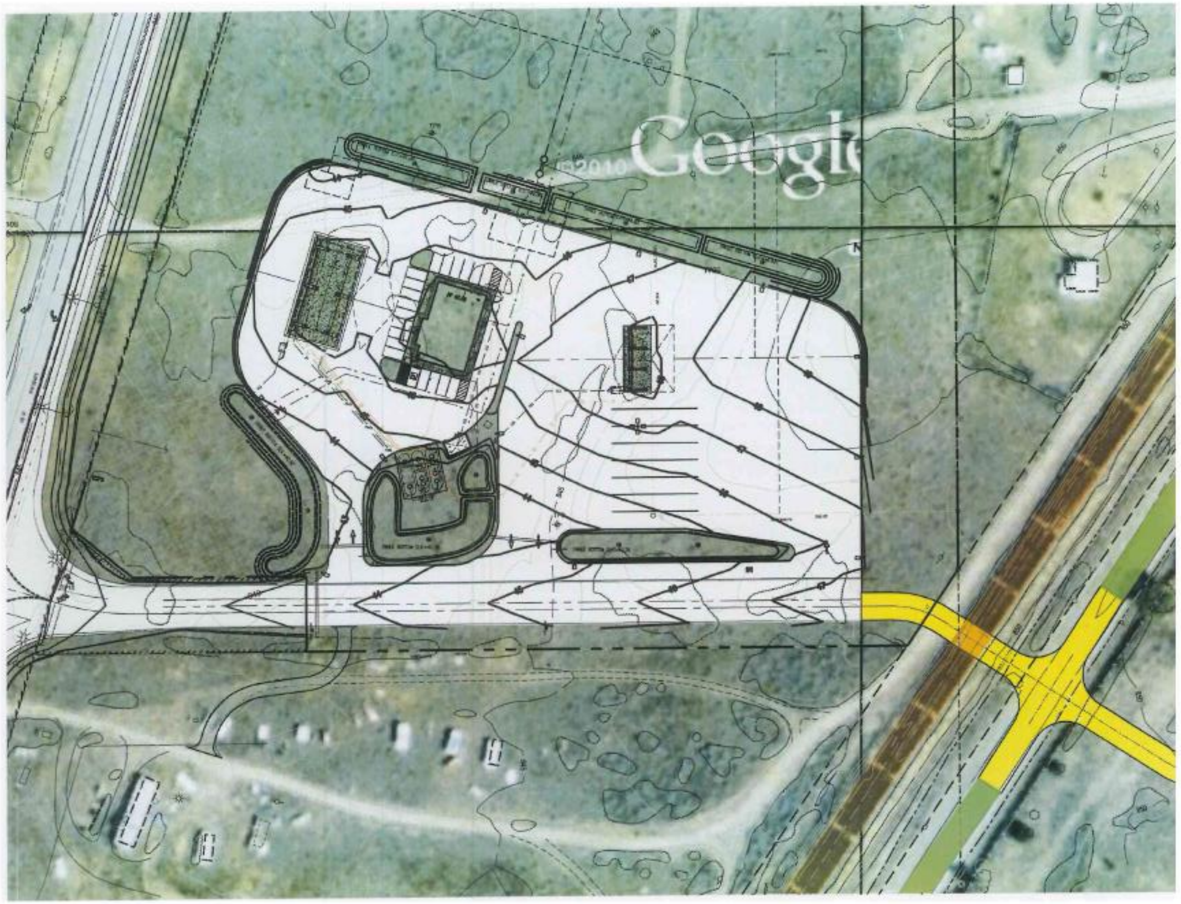
The lack of housing options in the area may be a barrier to attracting new and large employers, which in turn is a barrier to attracting and expanding the workforce, particularly for younger workers. CCT should consider:

- **Preserving a portion of the site for workforce housing** as an added incentive for prospective businesses and employees. A site with both housing and employment leads to 24/7 activation of the site, which may also increase safety and security and improve the attractiveness of the site to potential employers.
- Positioning the site as a **location for prefabricated housing manufacturing** and forging a partnership with the manufacturer to allocate a portion of production for local and regional housing needs.
- Working with employers and local partners to develop a **Reservation-wide housing strategy** that accounts for workforce housing needs and housing development.

New Access Points

Existing site **access is a limiting factor for any potential industrial user**. Providing new access, and improving existing access points, will improve site readiness and attractiveness. CCT should consider:

- Developing the proposed **new rail crossing** on the west end of the site at the Tribal Trails Truck Stop. This will improve access from Hwy 97 and help prevent disruption by freight traffic accessing the site through the existing neighborhood off of Jackson Street.
- Integrating new industrial development with the access and circulation plan of the new clinic and Head Start facility **to ensure freight traffic accesses through the west** of the site and community traffic through Jackson Street and/or new Hwy 155 access.



Proposed Rail Crossing (in yellow) at Tribal Trails Truck Stop

Gateways & Signage

Current access to the site off Jackson Street limits the visibility and attractiveness of the site to prospective users. As new access points are developed to the site, there is an opportunity to make the property a "gateway" into East Omak, both via access from Hwy 97 and Hwy 155, and build site identity that can help drive further development and interest on the site. CCT should consider:

- **Creating attractive and modern signage** at the new access points at the Tribal Trails Truck Stop off of Hwy 97, and the new clinic off of Hwy 155.
- Creating **branded signage and wayfinding**, and a "gateway" moment onto the site, **to develop site identity** around a local craft industrial/Tribal arts business cluster.

Agricultural Partnerships

Agriculture is by far the largest economic driver of Okanogan County and the North Central Washington region, and the industrial site has a **locational advantage due to its proximity to fruit producers and value-added fruit manufacturers**. In order to capitalize on this regional advantage, CCT should consider:

- Being proactive in developing partnerships with regional farms and orchards to **assess interest for additional food processing and storage**, or potential demand for an **intermodal terminal facility**, that could be located on the site.
- Developing **partnerships with local fruit producers to develop Tribal-led businesses** like cider making, wine making, a distillery, a brewery, or other value-added food products.

Workforce Training

The existing local workforce is an asset for agricultural and adjacent industries, like food processing & manufacturing, and CCT should try to capitalize on this strength. However, the level of education of the existing labor force is not well suited for attracting employers in the advanced manufacturing or other highly specialized industries. Job training in partnership with a new employer that focuses on increasing the skills of the local workforce may be an important consideration in attracting further industrial development. CCT should consider:

- Attracting a business to the site in the fruit processing & manufacturing industry in order to **capitalizing on existing regional workforce**
- **Proactively engage with local institutions**, like Wenatchee Valley College in Omak and the Okanogan County WorkSource Center, **to develop local workforce training/apprenticeship programs** in partnership with regional employers to encourage local hiring and skill development for more highly specialized industries like prefabricated housing, biofuels production, solar panel manufacturing, and woody bio-mass products.

Tribal Enterprise Development

Though capacity constraints may be a limiting factor, there are good reasons to **utilize a portion of the site for Tribal-led enterprises**, particularly if the goal is to initiate change in the near-term. Doing so will help show others the Tribes are actively pursuing improvements on the site, which may help encourage additional businesses to locate nearby. CCT should consider:

- Developing **craft industrial "makerspace"** on-site in partnership with the local craft community, with a focus on local fiber arts and other Tribal crafts, or showcasing local produce and agricultural products, with an **adjoining "trading post" storefront** to showcase local artists and products.
- Developing **business & entrepreneurial support programs** as a part of the craft industrial space.
- **Initiating the development** of high-quality warehousing, or flex/light industrial space, to meet demand of local producers.

Quality

A large portion of the **existing industrial properties in the region are old, and show a general lack of "quality",** especially warehousing and food processing & storage facilities. There is a high likelihood that both existing and new businesses would be attracted to any new, high-quality industrial space, providing an opportunity to meet this demand on the East Omak industrial site. In addition, improving the quality of surrounding uses and neighborhood will help with the marketability of the site to prospective users. CCT should consider:

- Initiating the **development of modern, quality warehousing** space to meet demand within existing industries.
- Modern warehouse design includes:
    - Easily adaptable spaces
    - Higher bays to accommodate efficient and safe material handling, and improved circulation
    - Green design, including solar panels, LED lighting, cool-roof systems, skylights, green building materials
    - Separate receiving and shipping areas
    - Improved fire protection capacity
    - Source: Warehouse | WBDG - Whole Building Design Guide

Marketing

In order to maximize the potential for the site, CCT will need to make a concerted effort to **actively market the site towards targeted industries and businesses**. Because the site is not located in a "hot" market, inquiries into site readiness and development may be sporadic and unexpected, making it all the more important to have unified messaging on how to market the property. CCT should consider:

- Bringing together all relevant Tribal entities and outside partners to share the results of this site readiness report and create a shared understanding of current opportunities and goals for the site to ensure **coordinated messaging and continuity in inquiry response**.
- **Develop a site prospectus** showcasing the site readiness and the Tribes' willingness to partner or provide incentives in business development.
- Proactively market the site towards targeted industries like prefabricated housing manufacturers – like those included on page 77 – fruit producers & value-added manufacturers, and developers of light industrial and warehousing facilities.
- **Dedicating a full staff member for site management and marketing**

Get a "Quick Win"

Due to prolonged site inactivity, and the lack of perceived momentum towards new investment, the Tribes should aim to get a "quick win" that shows initiative and spurs renewed interest in the site. CCT should consider:

- Working with the railroad to develop the new rail-crossing at the Tribal Trails Truck Stop.
- Incremental development of flex/light industrial that has a low-cost original buildout with room to scale.
- Developing site marketing materials.
- Initiating a steering committee with Tribal artisans to develop a plan for craft industrial enterprise development – Partner with NCWEDD, Economic Alliance, and other regional partners to develop small business development programs.
- Facilitating discussions amongst fruit processing and other agricultural businesses to assess interest in rail spur expansion and intermodal terminal.

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Appendix C
Transportation Access Study

Transportation Access Study

East Omak Industrial Site Readiness Report
Omak, Washington

Prepared For:
Confederated Tribes of the Colville Reservation

Prepared By:
SCJ Alliance
108 N Washington, Suite 300
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June 2023

Transportation Access Study

Project Information

Project:	East Omak Industrial Site Readiness Report
Prepared for:	Confederated Tribes of the Colville Reservation Agency Campus, 21 Colville Street Nespelem, WA 99155

Reviewing Agency

Jurisdiction:	Omak, Washington

Project Representative

Prepared by:	SCJ Alliance 108 N Washington, Suite 300 Spokane, WA 99201 360.352.1465 scjalliance.com
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Project Reference:	SCJ #23-000139
	Path: G:\Shared drives\23-000139 East Omak Industrial Master Plan\Phase 07 - Readiness Report\Final Reports All\2023-0628 Colville Transp Study.docx

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1 Introduction

Building on an earlier 2011 *Master Development Plan*, which in turn built on a 2004 *Master Plan*, the Confederated Tribes of the Colville Reservation (CCT) are now undertaking the preparation of a *Site Readiness Report* for the East Omak Industrial property. The Readiness Report will produce a detailed vision and recommended actions for improving the infrastructure and services that will allow for and support the full development of the 386-acre mixed-use industrial site. Recommended improvements will address the potential need for additional wastewater treatment plants, water supply, and electrical grid upgrades, as well as rail and transportation system solutions. When complete, the Readiness Report will be a comprehensive document to guide CCT in the next steps for site development from both an engineering and market feasibility perspective.

1.1 Purpose and Context of the Study

This report documents the analysis of the existing and potential future transportation system serving the East Omak site. Analysis included both the development and evaluation of an internal roadway system to provide access to future businesses located on the site, as well as any necessary improvements to the surrounding public street system that serves the site. Having a well-thought-out, multimodal transportation system to provide access to and circulation within the site benefits the community by providing ways for employees to get to work, resources and materials to reach manufacturers, and finished products to reach their intended markets. The system serving the site should be multimodal – that means serving more than just autos and trucks. As important as vehicular trips are, having safe, high-quality access for pedestrians, bicyclists, and/or transit opens up opportunities for reducing worker dependence on having a car. It would also accommodate future rail service on the site to provide more cost-efficient movement of completed products.

The analysis documented in this report will include an assessment of various land development and transportation circulation and site access alternatives. The analysis will focus on the evaluation of transportation system performance and will identify the need for improvements that provide for effective and efficient multimodal circulation. This report includes a corridor study to evaluate Highway 97 and Jackson Street connections to the industrial site with a focus on extending Jackson Street to provide improved freight access to the site, and to enhance safety and walkability to, from, and within the site.

This report will be one of several studies that will be prepared as part of the comprehensive Readiness Report that will also include:

- Evaluation of potential rail improvements to serve the site
- Water supply analysis
- Electrical grid assessment and demand analysis
- Wastewater collection system and treatment plant feasibility analysis
- An updated market feasibility assessment

Each study within the report will accompany actionable items for CCT to improve the site and bring development to fruition. The readiness report is intended to update and explore findings in the Master Site Plan and guide improvement recommendations that address the necessary improvements to the surrounding infrastructure and site utilities.

1.2 Study Area

The East Omak Industrial Site is located in the southeastern portion of the city of Omak in Okanogan County, Washington. The location of this site in relation to the surrounding community and the areawide transportation system is illustrated in **Figure 1**. **Figure 2** presents the more immediate transportation study area which focuses primarily on connections to the key roadway corridors serving Omak – SR 20/US 97 and SR 155.

SR 20 is an east/west corridor that connects Omak to Twisp, North Cascades National Park, and ultimately to the I-5 corridor south of Bellingham to the west, and the Idaho panhandle in the east.

US 97 is a significant north/south corridor that crosses the Canadian border to the north connecting to Penticton and Kelowna in the British Columbia interior. To the south US 97 connects with Ellensburg and the Yakima Valley, before moving on to destinations through Central Oregon and ending in Weed, California near Mt Shasta. This route provides significant access for both tourism and freight mobility for Okanogan County and Omak in particular. SR 155 connects eastward to the communities around Grand Coulee Dam ending in Coulee City.

The community is also served by the Cascade and Columbia River Railroad which connects northward to the town of Oroville near the Canadian border and southward to Wenatchee where it joins the Burlington Northern Santa Fe (BNSF) mainline, one of the major east/west rail corridors in the United States.

The population of Omak was 4,845 in 2010[1], growing to 4,860 by 2020[2]. This data indicates that the population in Omak grew only very slightly during the ten years between 2010 and 2020. The population of Okanogan County in 2010 was 41,120 of which Omak represented 11.8 percent. By 2020, Okanogan County's population increased to 42,104[2] of which Omak was 11.5 percent indicating that Omak grew more slowly than the county as a whole during that decade. Based on projections published in the Okanogan Council of Government's *2040 Regional Transportation Plan for the Okanogan Region*, Omak's population is expected to grow to approximately 5,385 by 2040, an increase of 10.8 percent. The County as a whole is expected to grow to about 45,700, an increase of 8.5 percent.

Omak is the largest city in Okanogan County and serves as a regional center for services and trade. Key employment in the county includes agriculture and forestry, government, health care, educational services, retail trade, tourism, and manufacturing.

1.3 Report Content and Organization

This report is organized into seven chapters, the first of which is this Introduction. **Chapter 2** identifies and discusses the existing transportation system in the vicinity of the *East Omak Industrial Site* including an overview of the land use context, a roadway inventory, existing traffic volumes, crash history, existing transit service, and active transportation.

[1] https://www.census.gov/quickfacts/fact/table/okanogancountywashington,WA/PST045222
[2] https://www.ofm.wa.gov/sites/default/files/public/dataresearch/pop/april1/ofm_april1_poptrends.pdf

Figure 1. Site Vicinity Map

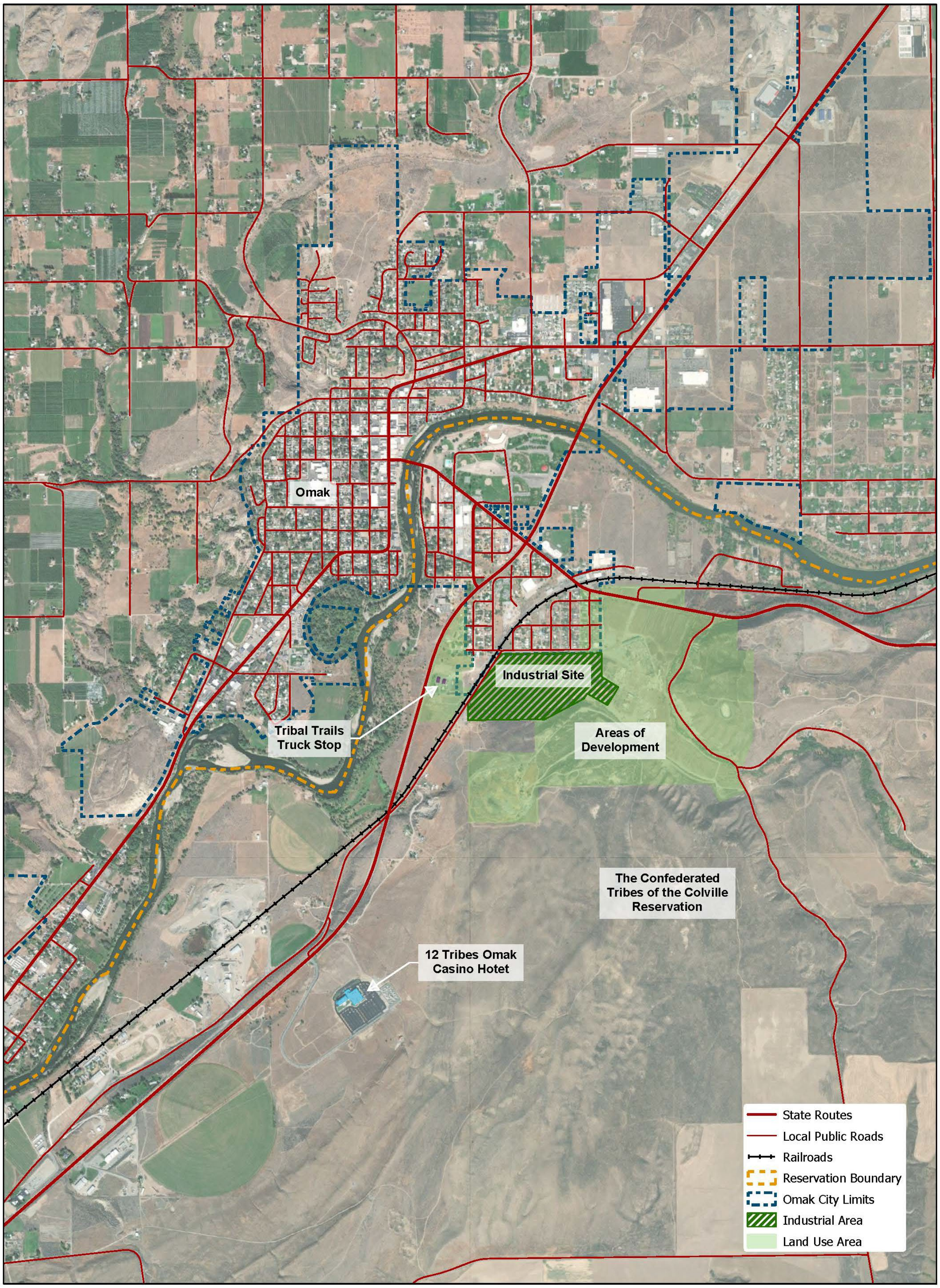
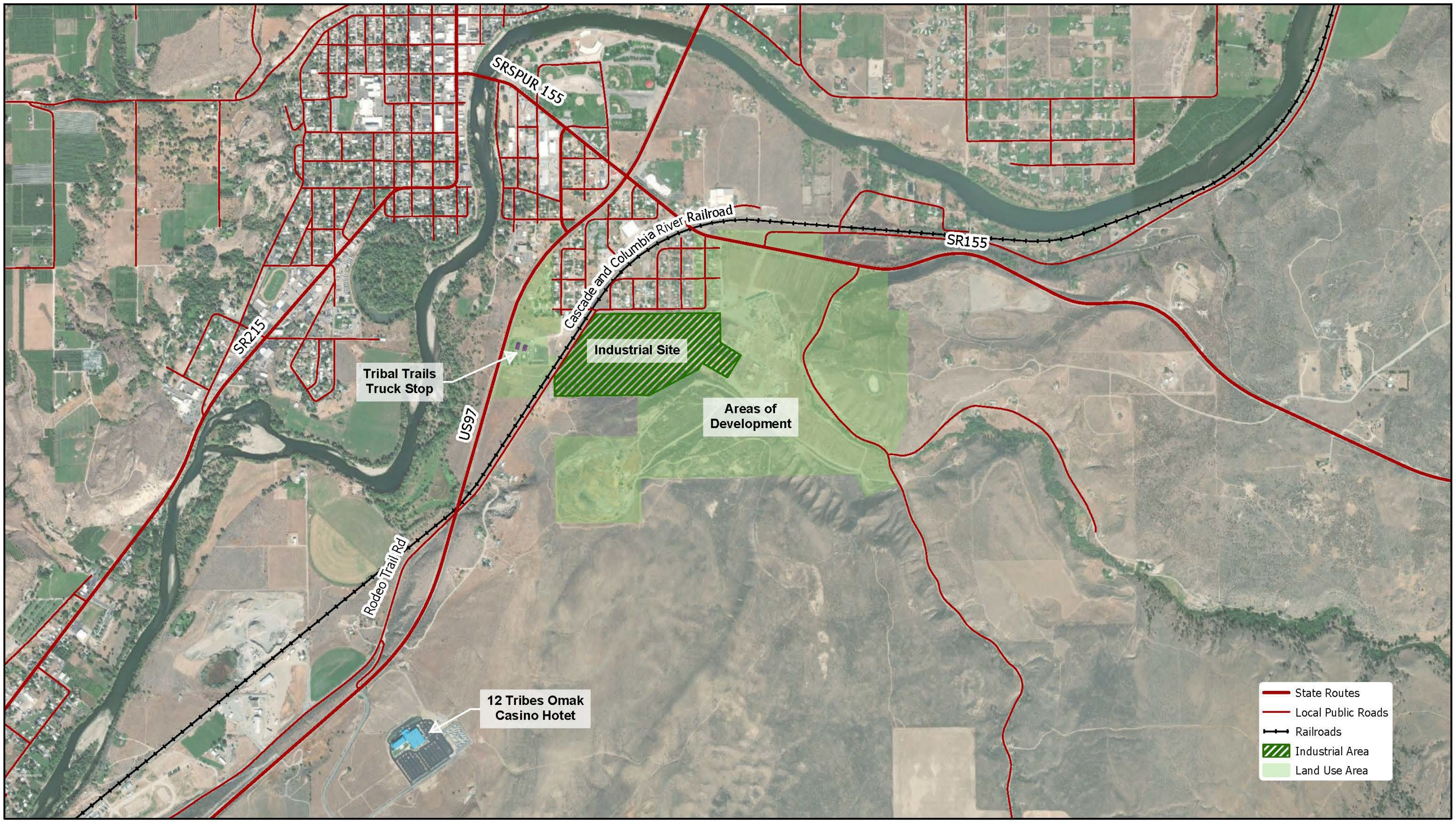


Figure 2. Study Area Transportation System



Chapter 3 documents the analysis of future transportation conditions in the long-range planning horizon year of 2045. Included are a synopsis of recent relevant planning studies, a summary of proposed and/or pending transportation system improvements, future peak hour baseline traffic volumes, and future peak hour baseline operations analysis at key study area intersections.

Chapter 4 describes the preferred land use alternative for industrial site development and three transportation system alternatives that will serve this development. This discussion is intended to provide context for the analysis of future transportation performance and the need for infrastructure improvements that will be addressed in the following chapter. Included in the discussion is a brief overview of land use assumptions, potential site access and circulation to serve these uses, and an estimation of peak hour traffic that could be generated by each alternative and its likely distribution pattern on the surrounding street and highway system.

Chapter 5 focuses on traffic impact analysis for the preferred land use alternative and the transportation circulation alternatives, identifying expected operations at study area intersections, and determining the need for various roadway improvements to accommodate expected demand. The chapter includes an evaluation of the need for and impacts associated with developing a full roadway connection through the East Omak Industrial site (Jackson Street Extension or Thoroughfare) which can also serve other properties owned by the CCT which could be developed in the future.

Chapter 6 presents a discussion of recommended improvements associated with each transportation alternative. This information is intended to provide a useful guide for incremental development of the site by illustrating the range of road, intersection, and multimodal improvements that should be considered over time. Cost estimates for each alternative are also included.

Chapter 7 presents a summary of the key findings and recommendations of the transportation study.

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2 Existing Conditions

2.1 Area Land Uses

The proposed *East Omak Industrial Site* development will be located south of 8th Avenue and east of the corridor shared by the Okanogan/Omak East Road (also known as Rodeo Trail Road) and the Cascade and Columbia River Railroad. To the east of the site lie several industrial uses that are accessed via Jackson Road or directly off SR 155 east of the Jackson Road intersection. The area south of the site is currently vacant. There is a residential neighborhood on the north side of 8th Avenue which includes the Colville Tribes Federation Corporation-Casino Headquarters. Further north are a variety of commercial uses along SR 155 and the East Omak Elementary School which lies between the Jackson Street intersection and the SR 20 overcrossing.

2.2 Roadway Inventory

A roadway survey was conducted to identify pre-existing conditions of the primary traffic facilities serving the proposed development on the *East Omak Industrial Site*.

2.2.1 SR 155

SE 155 (Omak Avenue) is a two-lane roadway that runs east/west through the City of Omak originating at the intersection with Main Street and heading east beyond the city limits to other communities along the route to Grand Coulee and Coulee City. SR 155 is classified by the Washington State Department of Transportation (WSDOT) as an Urban Minor Arterial and is classified by the Okanogan (Regional Transportation Planning Organization (RTPO) as a Highway of Regional Significance. SR 155 is also designated as a National Scenic Byway between Othello and Omak and is further designated as a Managed Access facility Class 3 east of Jackson Street and Class 5 west of Jackson Street.

In the study area, SR 155 has 12-foot travel lanes and 8-foot shoulders. The highway has intermittent sidewalks or widened shoulders coupled with areas with little or no shoulders for bicycle and pedestrian circulation. An improved sidewalk and wide shoulders are provided along the highway frontage adjacent to the East Omak Elementary School with crosswalks located on the west side of the Hanford Street intersection and the east side of the Garfield Street intersection. There is a two-way left turn lane between Hanford Street and the westerly school driveway just to the west of the Garfield Street intersection. A signalized and gated crossing of the Cascade and Columbia River Railroad exists just to the west of the intersection with Jackson Street. The street is posted for 35 mph speeds, which increase to 60 mph about 450 feet east of the SR 155/Highway 280 intersection.

2.2.2 SR 20/US 97

SR 20 and US 97 run conjointly through the Omak area providing two travel lanes in a north/south direction. SR 20 is a Highway of Statewide Significance and serves destinations to the east and west of Omak connecting to the I-5 corridor and the Idaho Panhandle. US 97 runs between the Canadian border and Weed, California, and serves as a major truck route. Within the study area, the SR 20/US 97 corridor is classified as an Urban Other Expressway and access is limited to major intersections. SR 20/US 97 is grade-separated from SR 155 where the two highways intersect in East Omak. The highway has 11.5-foot travel lanes and 8-foot wide shoulders and is posted for 50 mph speeds.

2.2.3 Jackson Street

Jackson Street is a north/south Urban Minor Collector roadway that has one travel lane in each direction between SR 155 on the north and 8th Avenue on the south. The roadway has curbs and gutters along both sides with wide shoulders that are used for parking. There are limited sidewalks or no designated bicycle lanes but these functions can be accomplished on the wide shoulders. There is no posted speed limit but speeds are assumed to be limited to 25 mph through the residential and minor commercial areas served by the road.

2.2.4 Garfield Street

Garfield Street is a north/south local roadway that has one travel lane in each direction between SR 155 on the north and 5th Avenue on the south. Traffic can continue through the neighborhood in a north/south direction via 5th Avenue and Ferry Street to reach 8th Avenue and local destinations further south. There are no sidewalks or designated bicycle lanes on the street. There is no posted speed limit but speeds are assumed to be limited to 25 mph through the residential area served by the road.

2.2.5 Hanford Street

Hanford Street is a north/south local roadway that has one travel lane in each direction between SR 155 on the north and 5th Avenue on the south. Traffic can continue through the neighborhood in a north/south direction via 5th Avenue and Ferry Street to reach 8th Avenue and local destinations further south. There are no sidewalks or designated bicycle lanes on the street. Hanford Street is positioned approximately opposite the east entrance to the East Omak Elementary School which lies on the north side of the SR 155 intersection. There is no posted speed limit but speeds are assumed to be limited to 25 mph through the residential area served by the road.

2.2.6 8th Avenue

8th Avenue is an east/west Urban Minor Collector roadway that has one travel lane in each direction between Jackson Street on the east and Dayton Street on the west. The Minor Collector designation is a continuation of the designation on Jackson Street and continues south on Okanogan/Omak East Road. There is an at-grade railroad crossing between Edmonds Street and Okanogan/Omak East Road. Crossing protection is minimal with no gates or flashing indicators. The roadway has curbs and gutters along both sides with wide shoulders that are used for parking. There are no sidewalks or designated bicycle lanes but these functions can be accomplished on the wide shoulders. There is no posted speed limit but speeds are assumed to be limited to 25 mph through the residential and minor commercial areas served by the road.

2.2.7 Highway 280 (Omak Riverside/Eastside Road)

In the study area, Highway 280 is an east/west Rural Minor Collector roadway that has one travel lane in each direction between SR 155 on the west and continuing east and then to the north to various destinations east and north of the City of Omak. For approximately 950 feet east of the intersection with Jackson Street, this road is surfaced with gravel and then is paved at a second intersection with SR 155. The roadway continues along the east side of the Okanogan River to serve the Town of Riverside to the north of Omak. There are no sidewalks or designated bicycle lanes on the street but there are wide shoulders. There is no posted speed limit but speeds are assumed to be 50 mph through the rural area.

2.2.8 Dayton Street

Dayton Street is a north/south Urban Minor Arterial roadway that has one travel lane in each direction between SR 155 on the north and SR 20/US 97 on the south. This street is commonly used to make a connection between SR 20/US 97 and SR 155 since there is no direct connection where these two streets intersect. There are no sidewalks or designated bicycle lanes on the street but there are narrow shoulders that can be used for this purpose. The road is posted at 35 mph speeds and serves a mix of residential, commercial, and industrial uses.

2.2.9 Okanogan/Omak East Road

Okanogan/Omak East Road (also known as Rodeo Trails Road) is a north/south Urban Minor Collector roadway that has one travel lane in each direction between 8th Avenue on the north, passing under SR 20/US 97 and transitioning to Rodeo Trail Road, ultimately ending on the east side of the river in the town of Okanogan. The road serves both the 12 Tribes Omak Casino and the Okanogan County Fairgrounds between Omak and Okanogan. There are no sidewalks or designated bicycle lanes on the street but there are narrow shoulders that could be used for this purpose. The road is posted for 50 mph speeds except approaching the intersection with 8th Street where it is posted for 25 mph.

A summary of the existing intersection channelization and control type for the study intersections is provided in **Figure 3.**

2.3 Traffic Volume Data

2.3.1 Hourly Traffic Volumes on State Highways

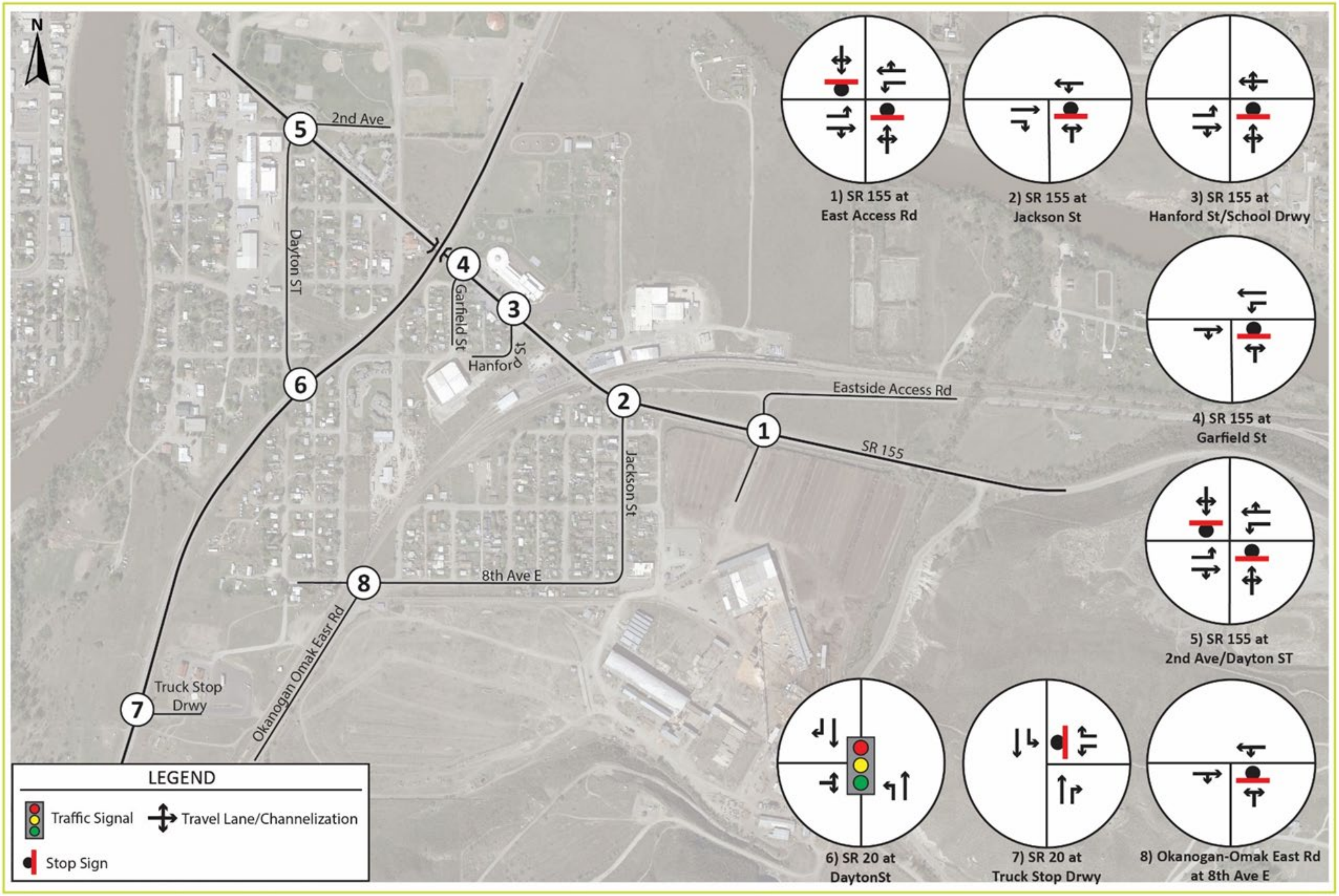
Traffic Count Consultants, Inc. (TC2), a transportation data collection service, provided hourly traffic counts for a 24-hour period at two locations:

- SR 20/US97 between the Tribal Truck Stop and Dayton Street – total ADT measured was approximately 9,200 vehicles.
- SR 155 between Jackson Street and East Access Road – total ADT measured was about 4,400 vehicles.

These counts were taken on Thursday, April 13, 2023 and are illustrated in **Figure 4.** This figure shows the daily volumes at both locations by hour and direction. Of particular interest is the relatively heavier southbound volumes on SR 20 during the AM peak with the opposite heading north in the PM peak.

2.3.2 Vehicle Classification Volumes on SR 20

More detailed information is available from the hourly traffic counts that describe the classification of vehicles on state highways in the study area. **Figure 5** illustrates the percentages of cars and small trucks in comparison with large trucks on SR 20 in both northbound and southbound directions. As shown in the figure, large trucks comprise a higher percentage of total northbound traffic on the highway between the hours of 2:00 and 4:00 AM and between 5:00 and 6:00 AM. There is a similarly high percentage of heavy trucks in the southbound direction between 3:00 and 4:00 AM.



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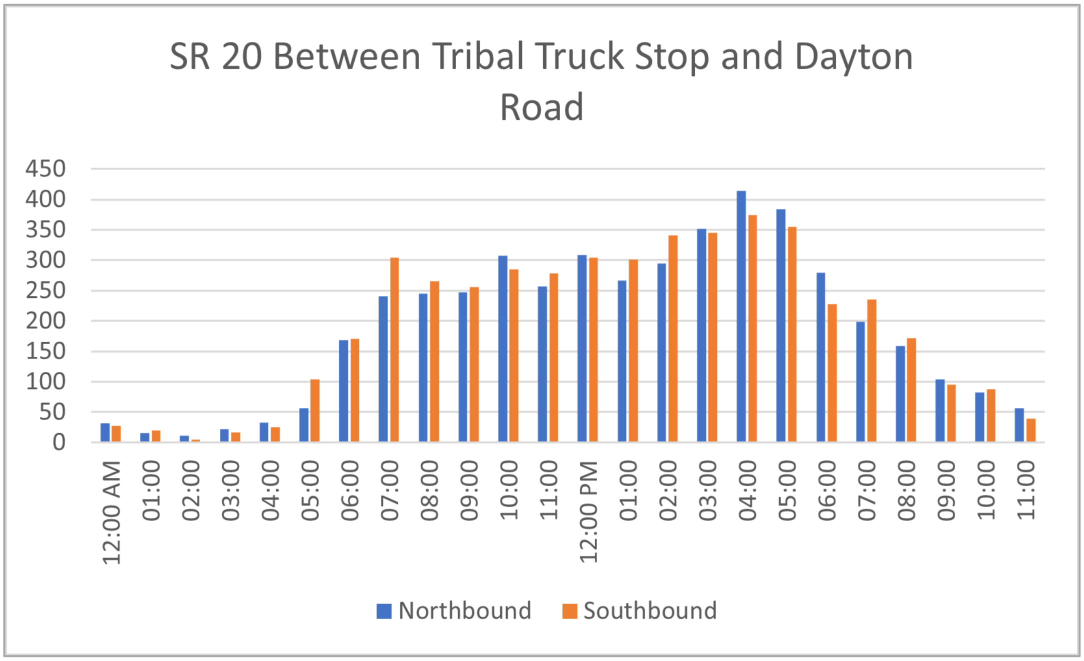
Omak, Washington

Figure 3
Intersection Channelization and Control

Figure 4. Hourly Traffic Volumes on State Highways



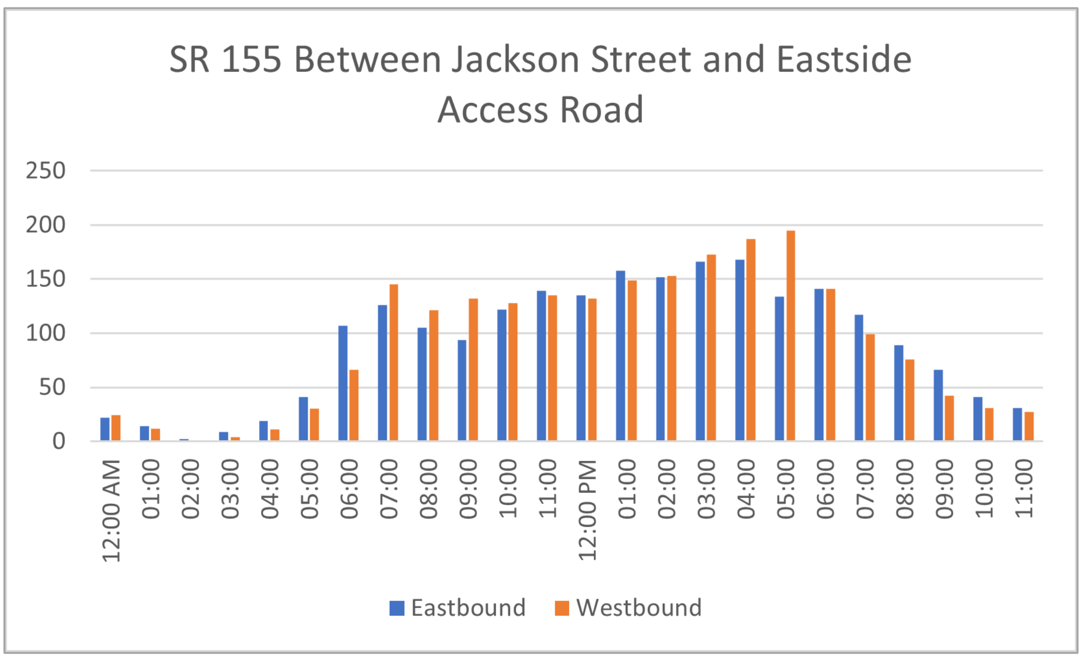
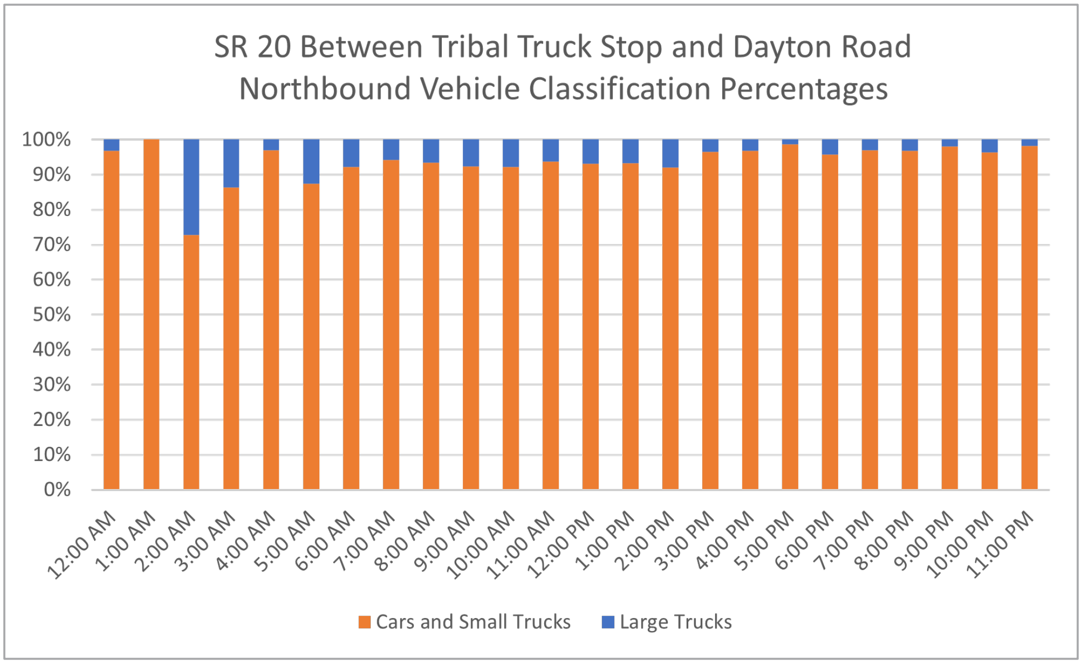


Figure 5. Hourly Vehicle Classification by Percent on SR 20



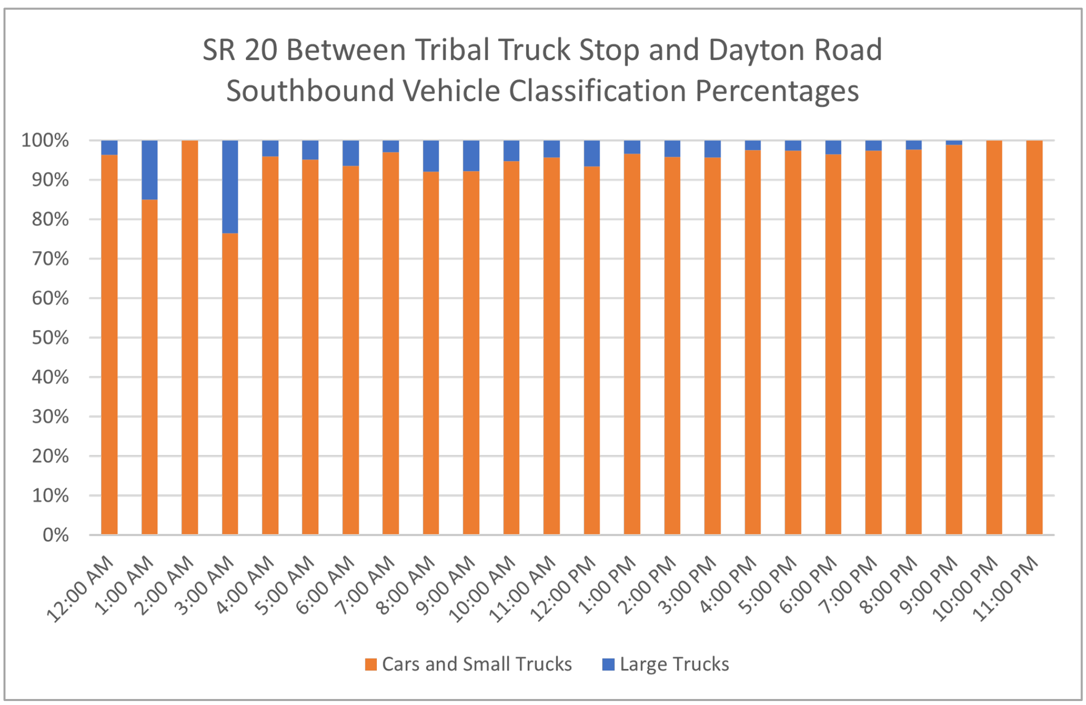
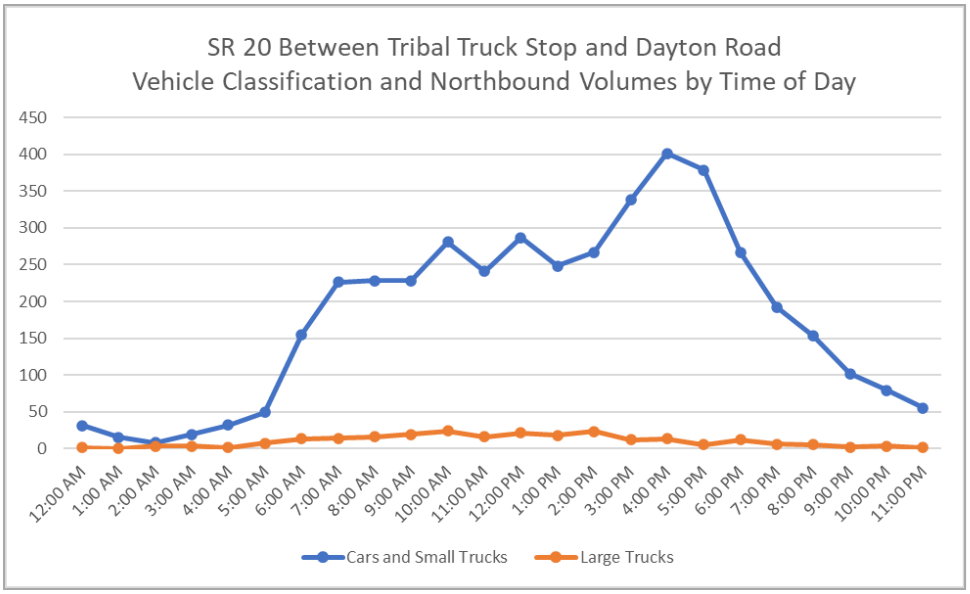
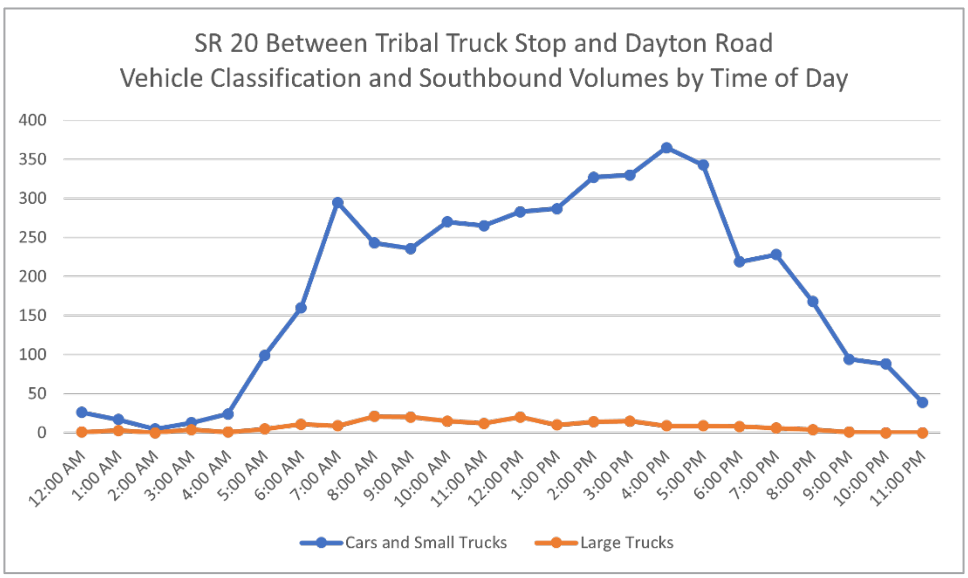


Figure 6 shows hourly vehicle classification volumes by time of day. Cars and small trucks dominate traffic on the state highway with discernable peak periods. Truck volumes appear relatively consistent over the day. Raw traffic count data is included in **Appendix A**.

Figure 6. Hourly Vehicle Classification by Time of Day on SR 20





2.3.3 Peak Hour Traffic Volumes

Turning movement counts for the study area intersections were also collected on April 13, 2023. The counts were conducted from 6:00 to 9:00 AM to identify the AM peak hour, and between 2:00 and 6:00 PM to identify the PM peak hour at the following locations:

- SR 155 at Dayton Street
- SR 155 at Garfield Street
- SR 155 at Hanford Street
- SR 155 at Jackson Street
- SR 155 at Highway 280

- SR 20/US 97 at Dayton Street
- SR 20/US 97 at Tribal Truck Stop
- Okanogan/Omak East Road at 8th Avenue E

The existing 2023 traffic volumes for the study intersections for the AM peak hours are presented in **Figure 7**, while **Figure 8** includes PM peak hour volumes. The turning movement count diagrams are also included in **Appendix A.**

2.3.4 Pedestrian and Bicycle Traffic

The AM and PM peak period traffic counts collected at study area intersections included data on pedestrian and bicycle activity as well as vehicles. Pedestrian activity was highest in the vicinity of the East Omak Elementary School with entrance driveways located generally opposite the intersections of SR 155 with Garfield and Hanford Streets. Seventeen pedestrians were observed during the AM peak hour at the two intersections, and 31 pedestrians were observed during the PM peak hour, with higher volumes for the entirety of the two peak periods. Some jaywalking activity was observed crossing SR 155 between the two intersections, primarily northbound during the PM peak hour. These people were adults who appeared to be walking to school to pick up children.

Very little bicycle activity was observed at study area intersections with some activity along SR 20/US 97, but the highest activity along 8th Avenue in the vicinity of Okanogan/Omak East Road.

2.4 Crash History

The Washington State Department of Transportation provided crash data for the study intersections. The data includes all reported crashes occurring over the most current complete five-year span of January 1, 2018 through December 31, 2022. Only two intersections in the study area experienced reported crashes during this period – SR 20/US 97 at Dayton Street and SR 20/US 97 at the Tribal Truck Stop entrance.

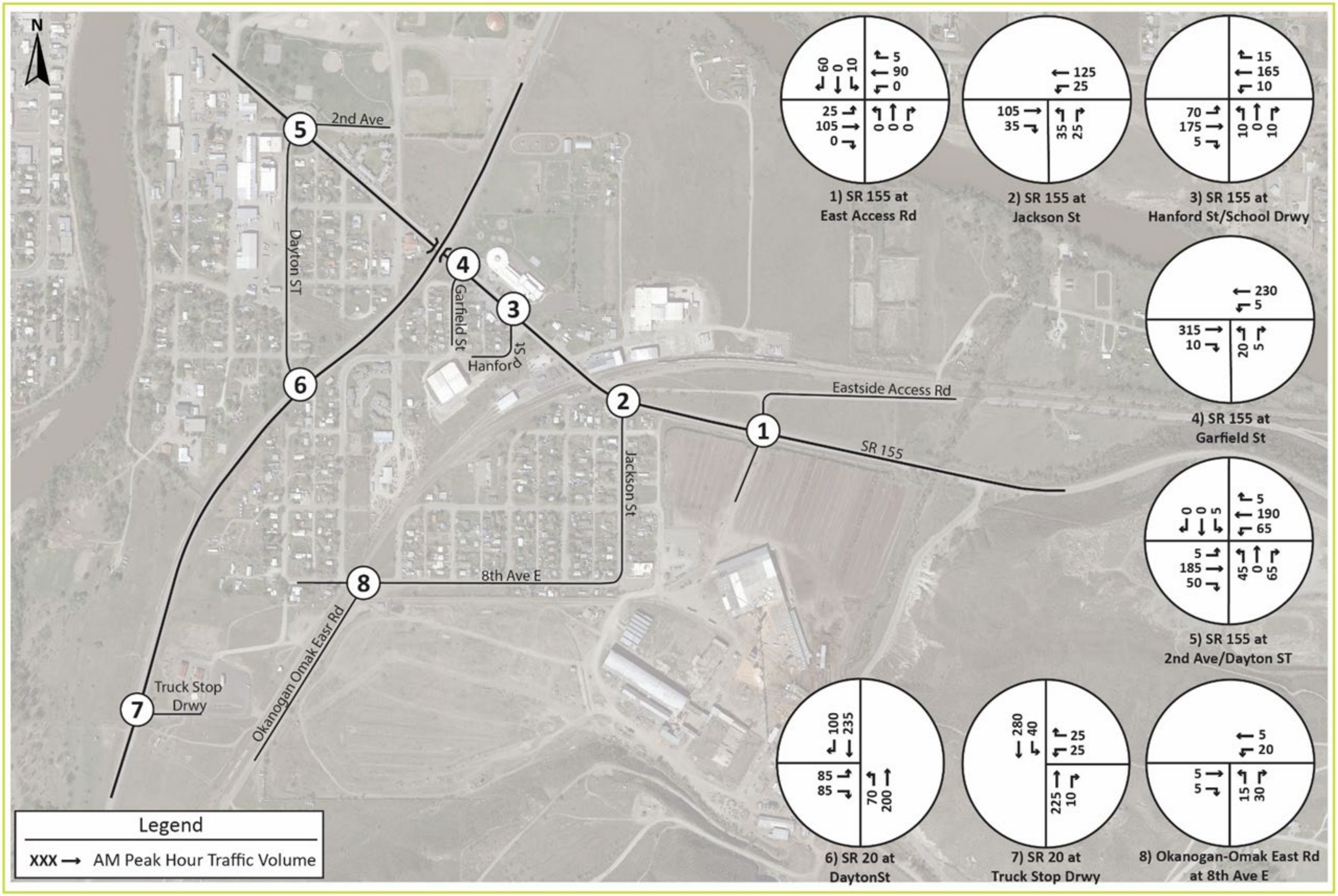
2.4.1 Crash Rates

A crash frequency rate per Millions of Entering Vehicles (MEV) was calculated for the study intersections based on the following formula:

$$\text{Crash Rate} = \frac{1{,}000{,}000 \text{ X Total Crashes}}{365 \text{ X Number of Years X Average Daily Entering Traffic}}$$

The average daily traffic entering each of the study intersections was determined using the ratio between the PM peak hour counts and the 24-hour tube count data collected on SR 20/US 97 north of the Tribal Truck Stop. Based on that data the PM peak hour volumes were multiplied by a factor of 9.1. Crash data for the study intersections are summarized in **Table 1**.

The crash rates per MEV ranging between 0.10 and 0.63 are within a reasonable range for a suburban/rural setting and do not suggest roadway geometric deficiencies. The crash summary data provided by WSDOT are provided in **Appendix B**.



Omak Industrial Park
Omak, Washington

Figure 7
Existing 2023 AM Peak Hour Traffic Volumes

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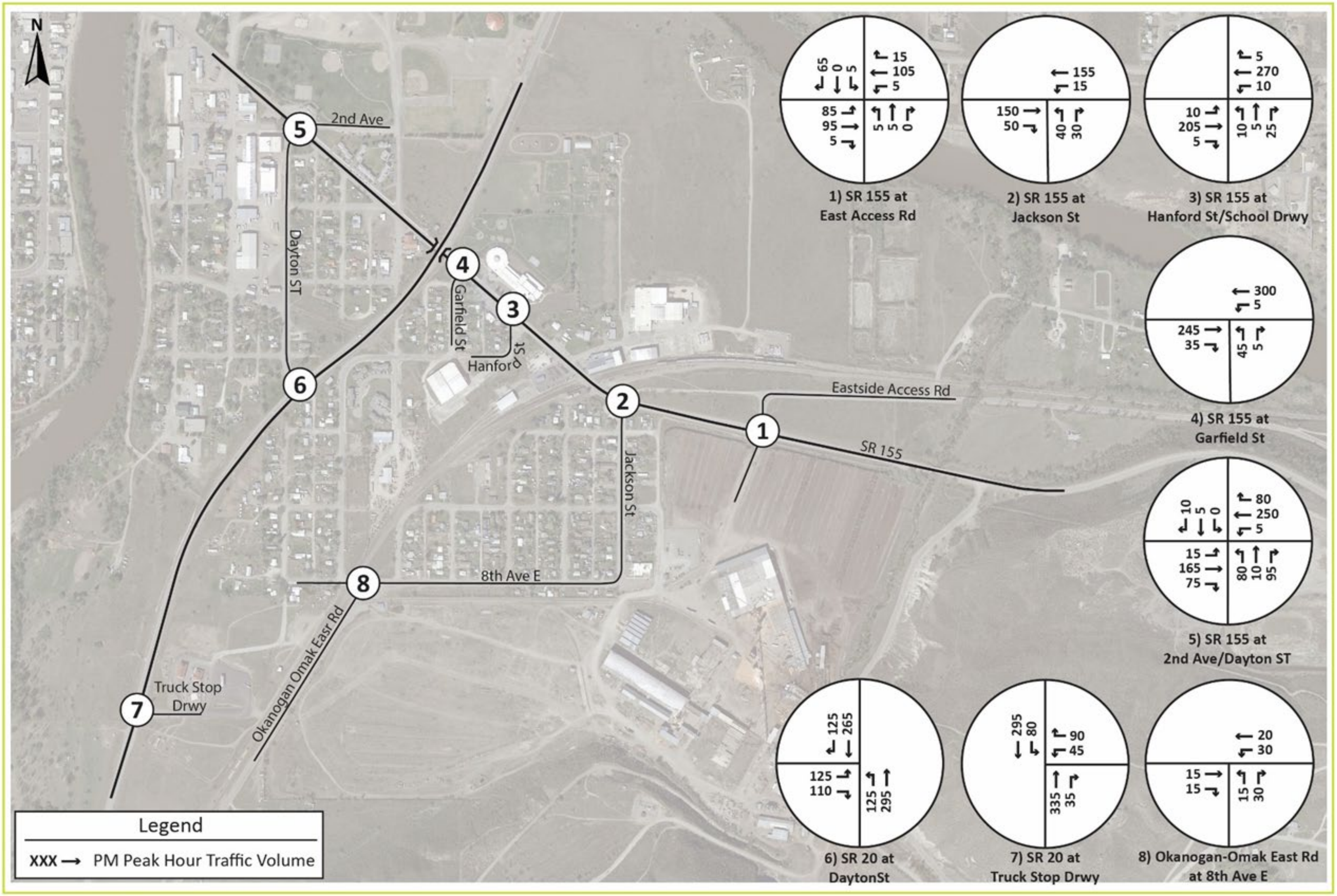

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Omak Industrial Park
Omak, Washington

Figure 8
Existing 2023 PM Peak Hour Traffic Volumes

Table 1. Crash Summary - 01/01/2018 through 12/31/2022

Intersection	Total Number of Reported Crashes	Number of Injury Crashes(1)	Average Crashes per Year	Average Daily Entering Traffic	Crashes per MEV
SR 155 at Highway 280	0	0	0	0	0
SR 155 at Jackson Street	0	0	0	0	0
SR 155 at Hanford Street	0	0	0	0	0
SR 155 at Garfield Street	0	0	0	0	0
SR 155 at Dayton Street	0	0	0	0	0
SR 20/US 97 at Dayton Street	12	6	2.4	9,165	0.72
SR 20/US 97 at Tribal Truck Stop	2	2	0.4	9,165	0.12
Okanogan/Omak East Road at 8th Avenue E	0	0	0	0	0

(1) Crashes listed with a "possible injury" were included in the injury crash totals.

2.4.2 Crash Severity

Table 2 summarizes the severity of crashes at the two intersections that experienced collisions during the study period. As noted, there was one fatality and one serious injury crash at the intersection of US 97/SR 20. Both of these crashes involved pedestrians with contributing causes attributed to the pedestrian (either failure to yield to the vehicle or disregarding the traffic signal).

Table 2. Crash Severity

Intersection	Fatal	Serious	Minor	Possible	Non-Injury	Total
SR 20/US 97 at Dayton Street	1	1	1	3	6	12
SR 20/US 97 at Tribal Truck Stop	0	0	1	1	0	2
Totals	1	1	2	4	6	14

2.5 Transit

There are several transit providers in the Omak area, offering vital services that connect people and places within and across Okanogan County and beyond. Key transit operators serving the Omak area include:

- *Okanogan County Transportation & Nutrition* (OCTN) - countywide fixed-route, door-to-door, and intercity services for all as well as nutrition services. Local door-to-door service is provided to Omak and Okanogan on Monday through Friday from 6:30 AM to 5:30 PM. Service is provided on Saturdays for medical and dialysis appointments only from 8:30 AM to 4:30 PM.
- *TranGO*, Transit for Greater Okanogan (Okanogan County Transit Authority) - fixed-route scheduled service, complementary paratransit services, and vanpools. TranGO offers several

routes to accommodate the needs of greater Okanogan County including the city of Omak but excluding the Coville Reservation. They partner with OCTN to provide safe, reliable, and cost-effective transportation services. The Omak/Okanogan route operates from 7 AM to 7 PM on weekdays and from 8 AM to 6 PM on Saturdays. Services operate on 30-minute headways with 1-hour headways during the midday. Service is hourly on Saturdays. ADA-accessible services are available at the same times as the agency's fixed route services. Rideshare services operate independently, Monday through Friday, generally from 5:00 AM to 6:00 PM. TranGO transports passengers to the Apple Line (intercity bus line) pick-up location in Omak as well as other cities.

- *Northwest Trailways Apple Line* – in partnership with WSDOT, this operator provides a single round trip daily between Omak and Wenatchee, continuing to Ellensburg with numerous connections in between. The morning service departs Omak at 7:00 AM, returning to Omak at 3:30 PM. Service is provided seven days per week. Connections are available to Amtrak and Greyhound.
- *People for People* – non-emergency medical transportation broker for Medicaid-eligible trips. In Okanogan County, PFP contracts with Omak Taxi, TranGO, Okanogan County Transportation and Nutrition, and TranCare Volunteer Driver program. PFP provided 8,709 trips for eligible Okanogan County clients from January 1, 2021 through December 31, 2021. Total trips included gas vouchers, mileage reimbursement, public bus, and transportation provided by others.

2.6 Pedestrian and Bicycle Facilities

Pedestrian and bicycle facilities are limited in the study area. SR 155 has intermittent sidewalks or widened shoulders coupled with areas with little or no shoulders for bicycle and pedestrian circulation. An improved sidewalk and wide shoulders are provided along the highway frontage adjacent to the East Omak Elementary School with crosswalks located on the west side of the Hanford Street intersection and the east side of the Garfield Street intersection. There are limited sidewalks or designated bicycle lanes on Jackson Street, and no sidewalks or bicycle lanes on 8^{th} Avenue, or Highway 280 but these functions can be accomplished on the wide shoulders that exist on both roads. Dayton Street and Okanogan/Omak East Road do not have sidewalks or bicycle lanes but do have narrow shoulders. Other local streets in the project area do not currently provide sidewalks or bicycle lanes and have minimal shoulders.

2.7 Freight Mobility System

Freight mobility is an essential transportation function as the movement of commodities is essential to maintaining a strong economy. The street and highway system in the study area has been classified by WSDOT in accordance with the tonnage moved. The heaviest traveled corridors are designated as T-1 facilities with corresponding designations for lower-tonnage facilities down to T-5 facilities which are important for localized freight movement, like deliveries and refuse collection. There are no T-1 facilities (carrying more than 10 million tons per year) in Okanogan County but there are class T-2 (4 million to 10 million tons per year) and T-3 (300,000 to 4 million tons per year) facilities. US 97 is designated as a Truck Freight Economic Corridor. SR 20/US 97 is classified as a T-2 facility, while SR 155 is a T-3 facility.

A small portion of the freight mobility system in Okanogan County is designated as a "heavy haul truck corridor" and connects the Reman & Reload facility in Oroville to the Canadian border crossing via US 97.

This accommodates vehicles over the legal weight limit, allowing them to travel between the border crossing and the regionally significant intermodal terminal at the Cascade and Columbia River (CSCD) rail head. The CSCD railroad connects to the BNSF railroad in Wenatchee and provides essential freight mobility for the Reman & Reload Facility as well as the carbonate mine. It is designated as a Rail Freight Economic Corridor by WSDOT.

2.8 Railroad Service

The freight rail corridor operated by the Cascade and Columbia River (CSCD) short-line railroad is another integral part of the regional transportation system supporting freight mobility including mainline and industry track service in Omak. The alignment and destinations served by this railroad are shown in **Figure 9** and include a total of 145 miles of mainline trackage which is categorized by WSDOT as an R-4

Figure 9. Cascade and Columbia River Railroad

Source: Cascade and Columbia River Railroad website, April 21, 2023.

rail facility (carrying 100,000 to 500,000 tons per year). CSCD provides collector/distributor services for larger railroads such as BNSF in Wenatchee.

In Omak, the railroad line is parallel to Okanogan/Omak East Road with a spur track crossing the road and heading east to serve existing uses in the East Omak Industrial Site area. The existing track is in poor condition and has largely been removed. The mainline track crosses 8th Avenue East to the north of this spur line and then curves to the east along SR 155 and Highway 280 before curving north to follow the east bank of the Okanogan River to destinations further north. The track south of Omak has two load-restricted bridges that will not allow 286,000 pound cars.

In the study area, there are at-grade rail crossings on Okanogan/Omak East Road (spur track), 8th Avenue (mainline), and SR 155 (mainline). Both crossings are passive crossings with Crossbuck and Yield signage on both Okanogan/Omak East Road and 8th Avenue. **Figure 10** shows these crossings. There is a fully signalized and gated crossing on SR 155. Further south there is a grade-separated crossing of SR 20/US 97 between the Tribal Trails Truck stop and the Rodeo Track Road intersection.

Figure 10. Railroad Crossings in Study Area

Railroad Crossing on Okanogan/Omak East Road south of 8th Avenue

Railroad Crossing 8th Avenue Approaching Edmonds Street

According to the Federal Railroad Administration inventory track speed along this section is 25 mph and there are generally two trains per week. One train runs southbound to Wenatchee where the CSCD connects with the Burlington Northern track. Loads are transferred and continue either west toward Seattle or east toward the rest of the United States. Each train has approximately 20 to 30 cars each. Additionally, one train per week runs north to Oroville to a rail distribution center near the Canadian border.

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3 Future Traffic Conditions

This chapter focuses on understanding how the existing transportation system in the study area is anticipated to change over the long-term planning period to 2045. Included in the chapter is a discussion of current plans that will influence the growth of traffic volumes over time and the previously identified need for transportation system improvements. Analysis will identify planned or programmed transportation system improvements and will quantify and evaluate 2045 peak hour traffic projections for baseline conditions without the development of the East Omak Industrial Site.

3.1 Prior Planning Studies

Several prior planning studies provide context and guidance for understanding long-term transportation system needs. These studies include:

- *2011 Master Plan for Omak Business and Industrial Park*, Confederated Tribes of the Colville Reservation, Colville Tribal Enterprises Corporation, 2011
- *Okanogan County Comprehensive Plan, Transportation Element,* Okanogan County, *1996*
- *Omak Comprehensive Plan*, *Transportation Element*, City of Omak, 2013
- *2040 Regional Transportation Plan for the Okanogan Region*, Okanogan Council of Governments, 2017
- *National Tribal Transportation Facility Inventory Update and Long Range Transportation Plan,* Confederated Tribes of the Colville Reservation, 2019
- *Comprehensive Plan 2020-2040, Transportation Element,* Colville Confederated Tribes
- *Colville Clinic Traffic Impact Study,* 2021

Highlights of each plan or study are presented below with a focus on relevance to the development of the East Omak Industrial Site

3.1.1 2011 Master Plan for Omak Business and Industrial Park

This plan documented an analysis of development opportunities and layout concepts for a portion of the 386-acre industrial site located on the Colville Reservation in Omak. The Plan focused on vacant land located between the Colville Indian Plywood and Veneer Plant (CIPV) and the Tribal Trails Truck Stop and convenience store. Approximately 60 acres of this area were recommended for development as the Omak Business and Industrial Park.

The 2011 Master Plan included three elements related to the development of a business and industrial park on the property:

- Analysis of the local and regional market to identify potential demand, site pros and cons, and target businesses which could be attracted to the site.
- Identification of site physical development requirements.
- Preparation of a business plan for constructing, marketing, and managing the industrial park.

3.1.2 Okanogan County Comprehensive Plan, Transportation Element

In 1996, Okanogan County adopted its first transportation plan to coordinate growth and transportation system development in a coordinated manner between the County, the Confederated Tribes of the

Colville Reservation, the cities and towns in the county, and WSDOT. The plan includes documentation and an assessment of the existing transportation system, identification of constraints and opportunities particularly through an active public engagement process, establishment of Countywide Level of Service standards, as well as transportation goals, objectives, and policies, forecasts of future travel demand, identification of transportation deficiencies, and development of a transportation improvement program. This plan established standards and identified deficiencies in roadway operations and conditions. It also identifies some long-term improvement needs and opportunities, particularly based on public interest and input.

3.1.3 Omak Comprehensive Plan, Transportation Element

The Omak *Comprehensive Plan* was developed in 2013 and further updated in 2019. This plan establishes policy guidance for the development and maintenance of the city's multimodal transportation system. The plan lays out design standards for various street functional classifications and recommends that classifications be consistent with those adopted by WSDOT and the County. The Plan also establishes the level of service standards for roadway and intersection operations, noting that the RTPO (aka Okanogan Council of Governments) and/or WSDOT jointly establish standards for highways of statewide significance (SR 20/US 97) and regionally significant highways (SR 155). Standards for city streets are established by the Plan which recommends adoption of LOS D.

The Plan also includes recommended dimensions for sidewalks and pathways which vary by roadway functional classification, and identifies desired bike lane configurations based on AASHTO standards. Of particular relevance to the East Omak Industrial Site plan are the following recommended road improvements:

- New road connecting US 97 at the Tribal Trails Truck Stop with Rodeo Trails Road (Okanogan/Omak East Road)
- Extension of 8^{th} Avenue to connect with the Tribal Trails Truck Stop.

The Plan further recommends that bike lanes with a minimum width of five feet should be developed in conjunction with all new or substantial upgrades to state highways, community arterials, and collectors and that sidewalks and pedestrian ways be constructed within the right of way with a minimum width of five feet and be ADA accessible. Deficient or non-existent ADA facilities should be upgraded or included on all sidewalks following a prioritized implementation schedule. The Plan specifically recommends that:

- Sidewalks should be built along both sides of SR 155 from Granite Street to the east city limits
- Bike lanes should be built along both sides of SR 155 between Cedar Street and the east city limits.
- Bike lanes should also be built along Rodeo Trail Road from Omak to Okanogan and along the loop connection with SR 155 including Hanford Street, 5^{th} Avenue, Edmonds Street, 8^{th} Avenue, and Jackson Street.

3.1.4 2040 Regional Transportation Plan for the Okanogan Region

The 2040 Regional Transportation Plan (RTP) is the first such plan for the newly created Okanogan Council of Governments (OCOG) since it was designated a single-county Regional Transportation Planning Organization (RTPO) in 2017. A collective association of local governments, tribes, transit agencies, WSDOT, and others, OCOG adopted the RTP in 2017 to provide a coordinated voice on transportation issues that affect the region as a whole. The RTP:

- Establishes a regional transportation strategy for the region
- Presents a policy framework to guide consistency between local and state transportation
- Identifies priority long-range regional transportation needs and deficiencies, including critical transportation factors such as system preservation, safety, connectivity, and economic vitality
- Provides an inventory of the regional transportation system, establishes performance measures, and identifies regional priorities for system improvement
- Forecasts regional transportation revenues and expenditures

Particularly pertinent to the East Omak Industrial Site are regional growth expectations including Omak and its surroundings, future forecasts of travel demand, and adopted level of service standards for regionally significant transportation facilities.

3.1.5 National Tribal Transportation Facility Inventory Update and Long-Range Transportation Plan

Prepared in 2019, this report includes an updated road inventory and condition analysis, along with a discussion of future roadway system improvement needs to support tribal development plans. Included is a prioritized project list with construction cost estimates. This forms the basis for the CCT's short-range Transportation Improvement Program that will support future TTIP funding contracts. Of particular pertinence to the East Omak Industrial Site is the recommendation that:

- A detailed transportation master plan be prepared for the development of tribal properties to identify and prioritize necessary system improvements

- A comprehensive systemwide pedestrian and bicycle plan be prepared to serve the transportation needs of tribal members and to consider the development of recreational trails for the use and benefit of Tribal and non-Tribal local communities and the visiting public.

- Improvements to the parking lot as part of the Omak Industrial Park Economic Development Project and to the Omak Industrial Park Road including potential alignment and cost estimate.

- Replacement of the SR 155/Central Avenue Bridge in Omak in cooperation with WSDOT. This project has not yet been completed.

3.1.6 Colville Tribes Comprehensive Plan 2020-2040, Transportation Element

This plan is the first major update to the tribal Comprehensive Plan since 1988 and reflects the significant changes that have occurred in the planning process over the intervening years. This plan brings together the separate and independent planning processes that were underway in different disciplines and increases coordination with on-going planning in surrounding communities. The *Transportation Element* of the Plan focuses on information produced through the process of developing a tribal *Long Range Transportation Plan* (LRTP) and a *Tribal Transportation Improvement Program* (TTIP) and establishes broad community goals related to transportation system management and development. Beyond the road projects identified in the LRTP, recommendations that are particularly relevant for the East Omak Industrial Site include the following:

- The plan notes the existence of a rail spur line off the mainline in Omak that serves the area in which the Omak Industrial Park will be located. Some additional improvements will be needed to the spur line. The plan also notes public input on the need to set aside funding to improve railroad grade crossings, many of which do not have active protection. This would include the crossings on 8th Avenue and Okanogan/Omak East Road.
- The plan recommends providing or improving public transit to serve businesses such as the East Omak Industrial Park.

3.1.7 Colville Clinic Traffic Impact Study

This study evaluated the traffic impacts created by the development of a new health clinic and wellness center for the Colville Tribe opposite the intersection of SR 155 with Highway 280 where there was a previous lumber operations facility. Site development includes a 32,000 square foot clinic, a 6,000 square foot head start program facility, and a 54,000 square foot wellness center. All facilities would be open to the general public as well as tribal members. This study provides useful information about future traffic volume growth at two of the key study area intersections which will be incorporated into the future year traffic operations analysis.

3.2 Roadway Network Improvements

The City of Omak *Six Year Transportation Improvement Program* or TIP (2020-2025) identifies the following roadway improvement within the vicinity of the *East Omak Industrial Site* project:

- *SR 155 at Garfield Street* – install high visibility crosswalk for East Omak Elementary School.

The Okanogan County *Six Year Transportation Improvement Program* (2023-2028) and the Washington State *Transportation Improvement Program* (2023-2026) were both reviewed and no additional short-term roadway improvement projects in the vicinity of the site were identified.

3.3 Future Baseline Traffic Volumes

Traffic volume forecasts were prepared for AM and PM peak hour conditions for the 2045 horizon year. The future traffic volume forecast includes baseline traffic growth not related to the development of the East Omak Industrial site as well as “pipeline” development projects. For the baseline traffic growth, historical rates of traffic growth on SR 155 and SR 20 were evaluated. Based on this evaluation a 0.5 percent annual growth rate (non-compounded) was selected and applied to existing traffic counts for all intersection movements except north/south through trips on US 20. Historic through-traffic growth on SR 20 exhibited a rate of about 1.5 percent per year. This rate was applied to the north/south through movements at study area intersections on SR 20.

Traffic associated with the pending “pipeline” development of the Colville Clinic, Wellness Center, and Head Start program was added to the baseline traffic projections using the information provided in the project’s February 2021 *Traffic Impact Analysis*.

The projected 2045 AM peak hour baseline traffic volumes are shown in **Figure 11** while PM peak hour volumes are presented in **Figure 12.** The traffic volume calculations for the study intersections are included in **Appendix C**.

3.4 Existing and Future Baseline Traffic Operations Analysis

Traffic analyses were conducted to identify any deficiencies within the study area for the AM and PM peak hours in the 2023 base year and the 2045 horizon year.

3.4.1 Traffic Analysis Approach

The acknowledged source for determining overall capacity for arterial segments and independent intersections is the current edition of the *Highway Capacity Manual* (HCM) published by the Transportation Research Board (TRB).

Intersection analysis was performed using the Synchro software package. This software implements the methods of the 6th Edition HCM. Capacity analysis results are described in terms of Level of Service (LOS). LOS is a qualitative term describing operating conditions a driver will experience while traveling on a street or highway during a specific time interval. LOS ranges from A (very little delay) to F (long delays and congestion).

For intersections under minor street stop-sign control, the LOS of the most difficult movement (typically the minor street left turn) represents the intersection level of service. **Table 3** shows the full range of Level of Service criteria for stop-controlled and signalized intersections.

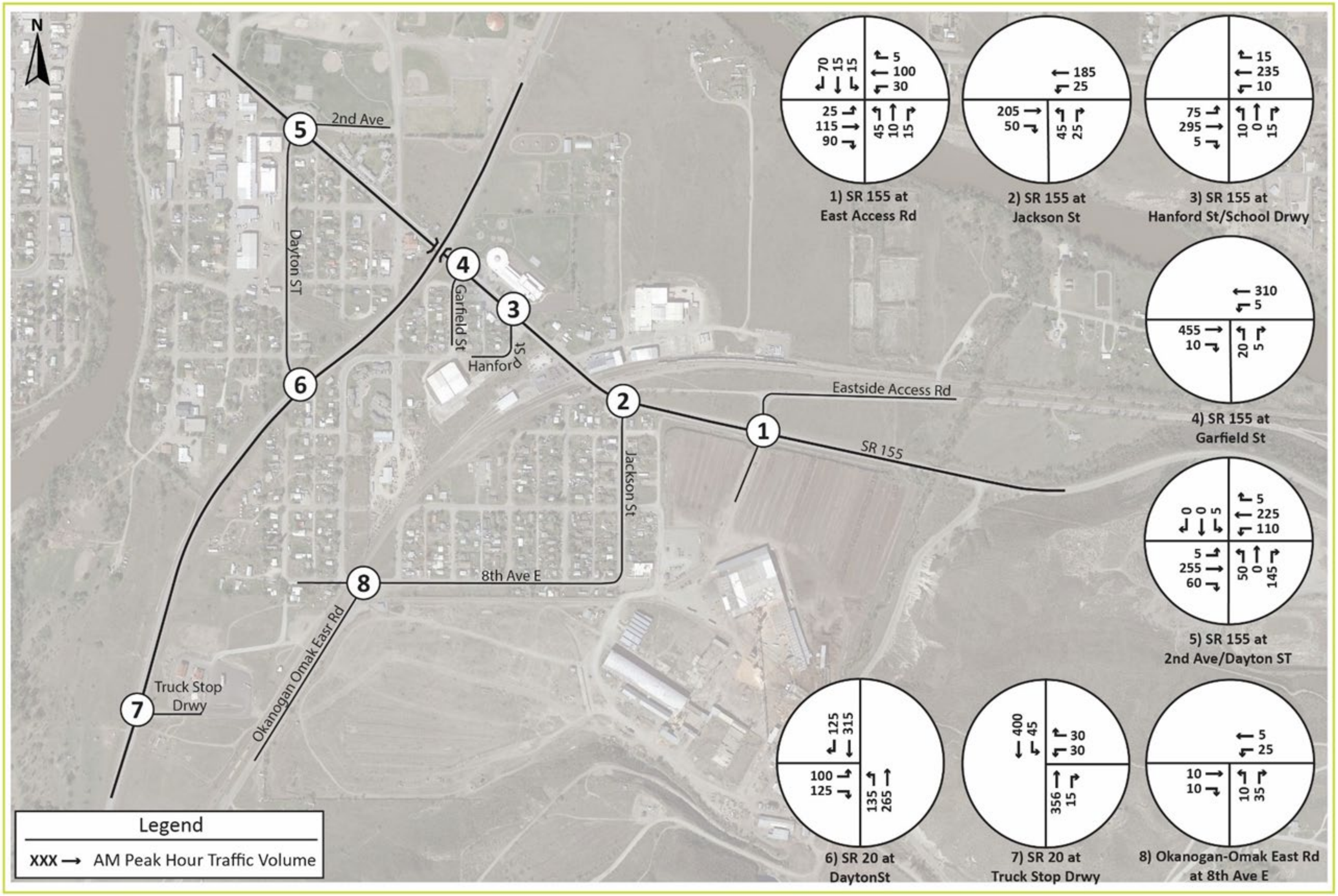
Table 3. Level of Service Criteria for Intersections

Level of Service	Stop-Controlled Intersection Average Control Delay (seconds/vehicle)	Signalized Intersection Average Control Delay (seconds/vehicle)
A	≤ 10	≤ 10
B	> 10-15	> 10-20
C	> 15-25	> 20-35
D	> 25-35	> 35-55
E	> 35-50	> 55-80
F	> 50	> 80

3.4.2 Level of Service Standards

The Okanogan Regional Transportation Planning Organization (RTPO) is charged by the State with the responsibility for specifying the LOS standards that are established for state highways. In its *Regional Transportation Plan* adopted in 2017, the Okanogan RTPO establishes LOS D for highways within Omak and Okanogan and LOS C everywhere else. This is consistent with state highway standards in other non-metropolitan places. It means that at unsignalized intersections vehicles may have to wait 15-25 seconds (LOS C) or 25-35 seconds (LOS D) during peak periods to proceed; at signalized intersections, this increases to 20-35 seconds (LOS C) and 35-55 seconds (LOS D).

The City of Omak has identified LOS D for city streets.



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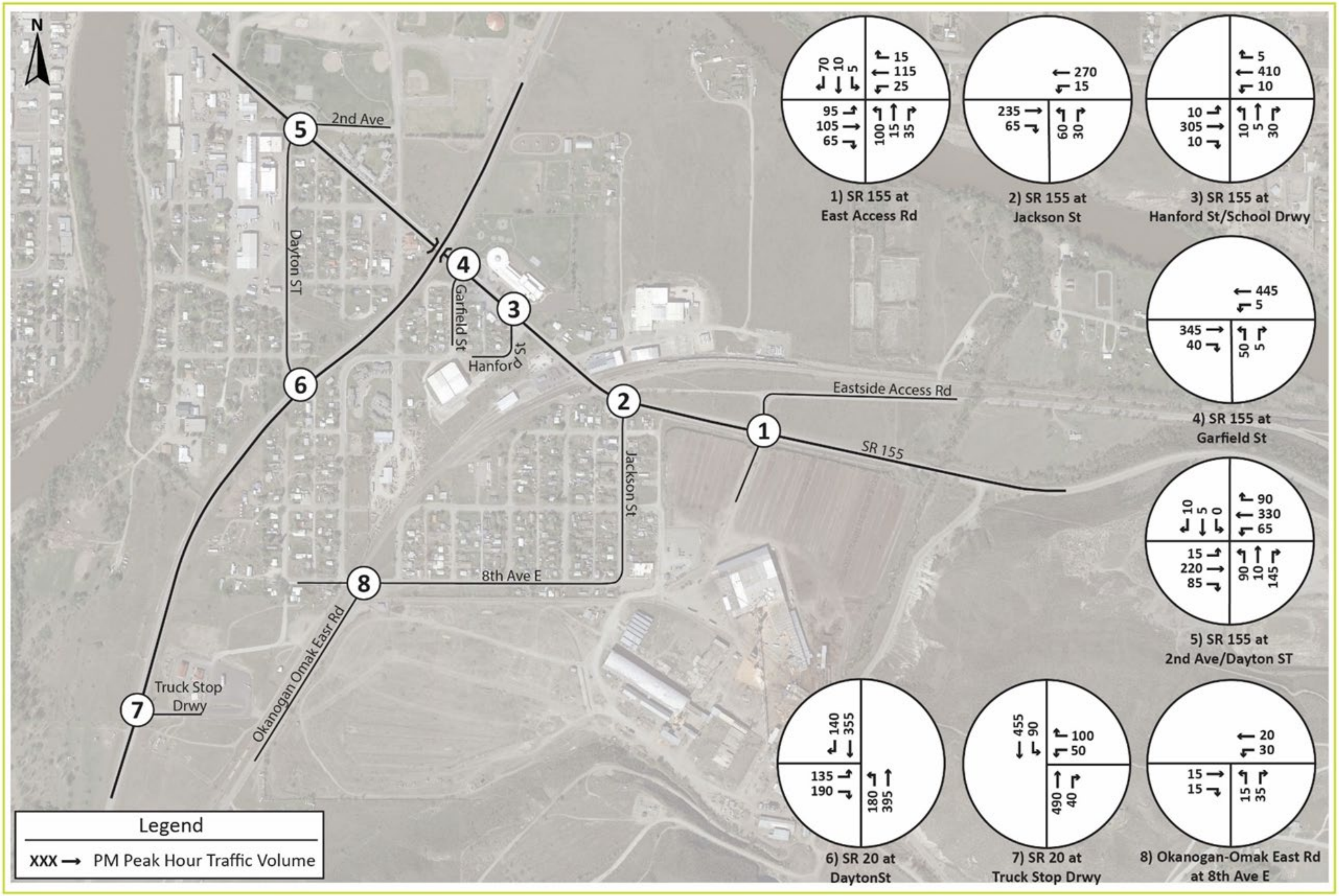
Omak Industrial Park
Omak, Washington

Figure 11
Projected 2045 AM Peak Hour Traffic Volumes



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ENGINEERING AND PLANNING SERVICES

Omak Industrial Park
Omak, Washington

Figure 12
Projected 2045 PM Peak Hour Traffic Volumes

3.4.3 Intersection Operations Analysis

The analysis was conducted for the following scenarios:

- Existing 2023 AM and PM peak hour traffic volumes
- Projected 2045 AM and PM peak hour baseline traffic volumes

The operational analysis results of the study intersections for the AM and PM peak hours are provided in **Table 4.** The LOS analysis worksheets are included in **Appendix D.**

Table 4. Intersection Level of Service Results

		Existing 2023		Baseline 2045	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	Control Type	LOS (Delay)[2]	LOS (Delay)[2]	LOS (Delay)[2]	LOS (Delay)[2]
SR 155 at Highway 280	TWSC[1]	B (10.3)	B (12.8)	B (13.6)	C (20.1)
	Roundabout	--	--	A (5.7)	A (6.6)
SR 155 at Jackson Street	TWSC[1]	B (10.2)	B (10.8)	B (11.9)	B (13.7)
SR 155 at Hanford Street	TWSC[1]	B (11.8)	B (10.7)	B (13.5)	B (12.1)
SR 155 at Garfield Street	TWSC[1]	B (13.5)	C (15.9)	C (17.2)	C (20.4)
SR 155 at Dayton Street	TWSC[1]	C (18.4)	C (23.3)	C (24.6)	**F (72.3)**
SR 20/US 97 at Dayton Street	Signal	A (9.8)	B (10.8)	B (12.5)	B (15.8)
SR 20/US 97 at Tribal Truck Stop	TWSC[1]	B (12.5)	B (14.4)	B (14.8)	C (18.5)
Okanogan/Omak East Road at 8th Avenue E	TWSC[1]	A (8.6)	A (8.9)	A (8.7)	A (8.9)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

As shown in the table, all study area intersections are currently operating at LOS C or better during the AM and PM peak hours. By 2045 with baseline traffic growth, all intersections continue to operate at LOS D or better except for the 2045 PM peak hour at the intersection of SR 155 with Dayton Street. This intersection is expected to drop to LOS F resulting in unacceptable delays for side street traffic on Dayton Street. This finding indicates that improvements at this intersection will need to be considered in the longer-term future. The table also shows the operation effect of adding a roundabout at the intersection of SR 155 with Highway 280 as is currently proposed by WSDOT. This improvement would provide added capacity to accommodate long-term growth but may be more beneficial from the standpoint of reducing travel speeds as vehicles enter the community.

4 Development of Land Use and Transportation Alternatives

This chapter focuses on the development of land use and transportation alternatives to evaluate the likely traffic impacts and transportation infrastructure requirements associated with the development of the East Omak Industrial Site. The development of alternatives was based on both the recommendations of the *2011 Master Plan* prepared for the site, and a market assessment update focusing on response to the economic changes that have occurred since 2011. The planning horizon year for these alternatives is 2045. Alternatives to be evaluated include the following:

- *Preferred Land Development Alternative* – includes build-out of the project site which will also require the development of a wastewater treatment facility and a reservoir. Land development is assumed to be primarily industrial including warehousing, flex and craft industrial, prefabricated housing, and rail-reliant industrial. Some retail commercial development is also anticipated along the SR 20 corridor adjacent to the existing Tribal Truck Stoop. It is expected that the plan will include a full buildout of the East Omak Industrial Site as indicated in **Figure 13**.

Transportation Alternatives that will be evaluated in conjunction with the Preferred Land Use Alternative will include:

- *Alternative 1 - Minimum Transportation Alternative:* this alternative would be developed to support initial development on the site and would provide access only from the intersection of Jackson Street at 8th Avenue and from a new east/west road that would intersect Omak-Okanogan Road south of 8th Avenue. This concept is shown in **Figure 14.**
- *Alternative 2 - 2011 Master Plan Transportation Alternative:* this alternative adds to the initial roadway development serving the site by connecting the two ends of the access roads constructed under Alternative 1. Figure 14 illustrates the component elements of this alternative.
- *Alternative 3 - Maximized Transportation Alternative*: this alternative would further build on Alternative 2 and incorporate additional connections to link the project area directly to SR 20/US97 across the railroad tracks and to provide service into other development areas beyond the East Omak Industrial Site. Figure 14 also illustrates the component elements of this alternative.

4.1 Preferred Land Use Alternative

This section presents a short summary of the assumed land uses that would be developed on the site based on the analysis conducted during a site marketing evaluation study. A preliminary site plan for the project is presented in Figure 13.

4.1.1 Land Use Assumptions

Based on the market analysis, there were several land uses or businesses that rose to the top as having potential for development in the industrial site. These land use types and the potential magnitude of development are described in **Table 5**. It should be noted that the site will also include the development of a wastewater treatment plant and a reservoir/water tank to provide fresh water on the site.

Figure 13. East Omak Industrial Site Plan Concept

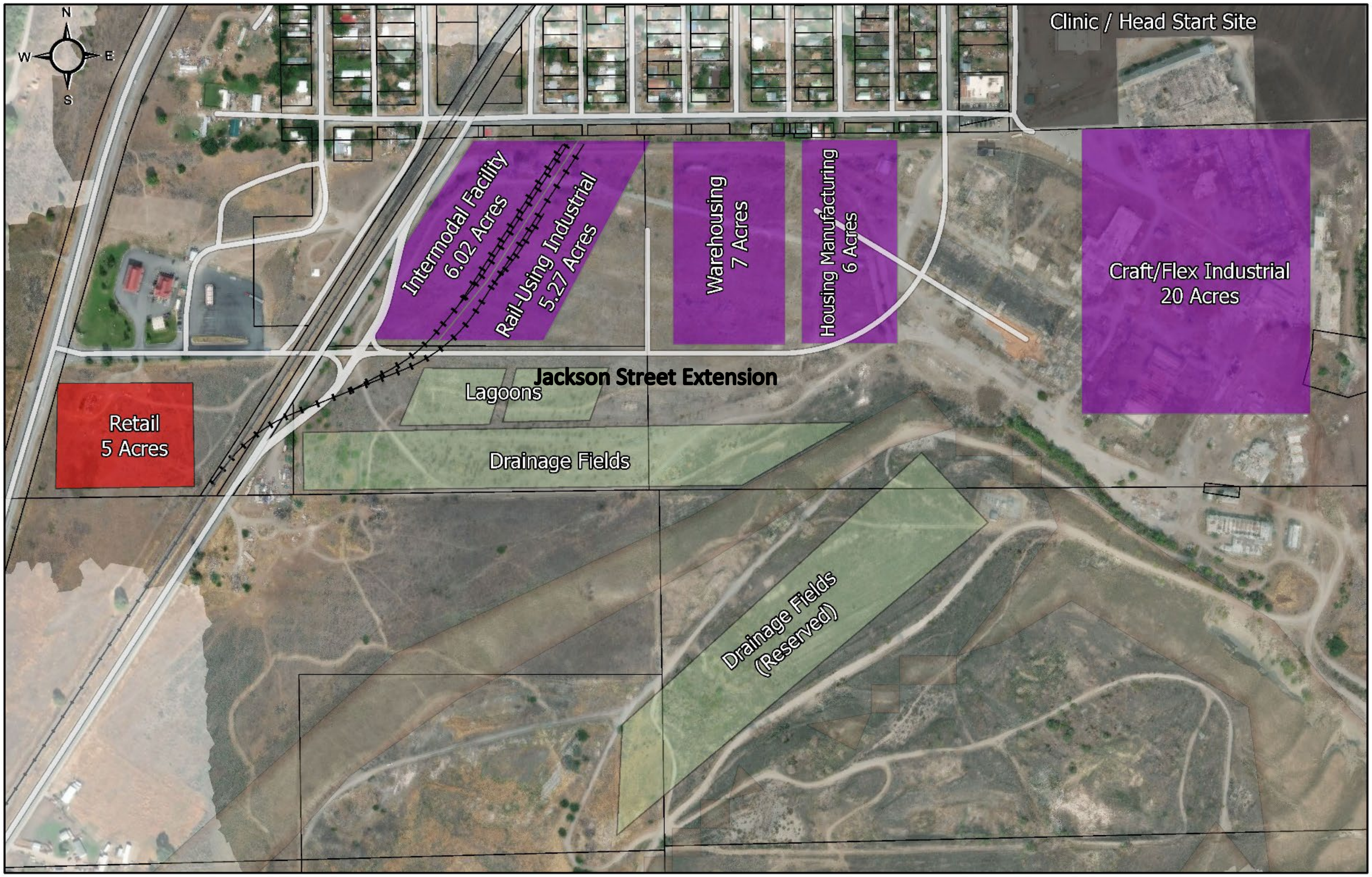
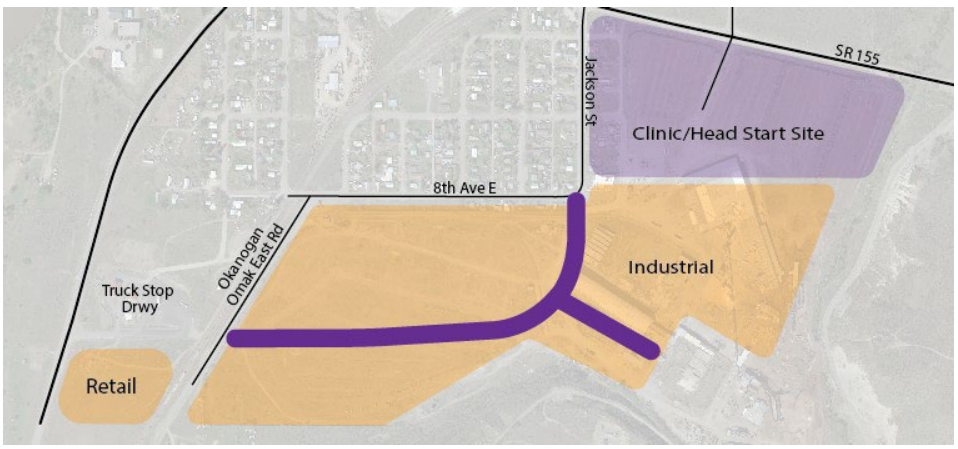


Figure 14. East Omak Industrial Site Access and Circulation Alternatives

Transportation Alternative #1



Transportation Alternative #2

Transportation Alternative #3

Table 5. Preferred Land Use Alternative

Land Use Category	Size/Employment
Prefabricated Housing Manufacturing	122,000 sq ft
Intermodal Facility	26 employees
Industrial Flex Space	12,000 sq ft
Craft Industrial	35,000 sq ft
Rail-using Industrial	40,000 sq ft
Warehousing	100,000 sq ft
Retail Commercial	25,000 sq ft

4.1.2 Traffic Volume Estimates

The project-related characteristics having the most effect on area traffic conditions are peak hour trip generation and the directional distribution of traffic volumes on the surrounding roadway network.

Daily, AM, and PM peak hour trip vehicle trip generation were estimated using the trip generation rates contained in the 11th edition of the *Trip Generation Manual* by the Institute of Transportation Engineers (ITE). The trip generation process and trip generation assumptions related to the East Omak Industrial site are described in the section that follows.

4.1.2.1 Trip Generation

Trip estimates were generated using ITE Land Use Codes for various industrial and/or retail commercial uses that could be expected to develop on the site. The trip generation rates that have been used are presented in **Table 6.**

Table 6. Trip Generation Rates

			Daily	AM Peak Hour			PM Peak Hour		
Land Uses	ITE Code	Unit	Trip Rate	Trip Rate	% Enter	% Exit	Trip Rate	% Enter	% Exit
Prefabricated Housing	140	KSF	5.43	0.99	76%	24%	0.73	31%	69%
Intermodal Facility	30	Employees	6.90	0.84	47%	53%	0.69	52%	48%
Industrial Flex Space	110	KSF	7.97	1.00	88%	12%	0.73	14%	86%
Craft Industrial	110	KSF	5.20	0.79	88%	12%	0.54	14%	86%
Rail-using Industrial	140	KSF	8.82	0.85	76%	24%	0.43	31%	69%
Warehousing	150	KSF	1.96	0.36	77%	23%	0.38	28%	72%
Retail Commercial	822	KSF	54.45	2.36	60%	40%	5.97	50%	50%

Note: KSF means thousand square feet of development.

Table 7 applies the trip generation rates to the various land uses and assumed development potential to derive an estimate of total traffic that could be generated by the East Omak Industrial site during the long-term planning horizon year of 2045. Trip estimates were prepared for daily conditions and during the AM and PM peak of the adjacent street system.

Table 7. Preferred Land Use Alternative Trip Generation

Land Uses	Size	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
			Enter	Exit	Total	Enter	Exit	Total
Prefabricated Housing	122.0 KSF	629	89	28	117	26	58	84
Intermodal Facility	26 employees	171	10	11	21	9	8	17
Industrial Flex Space	12.0 KSF	91	10	1	11	1	8	9
Craft Industrial	35.0 KSF	173	24	3	27	3	15	18
Rail-using Industrial	40.0 KSF	336	24	8	32	5	12	17
Warehousing	100.0 KSF	186	27	8	35	10	26	36
Retail Commercial	25.0 KSF	760	17	12	29	42	42	84
TOTALS		**2,346**	**201**	**71**	**272**	**96**	**169**	**265**

As shown in the table, the preferred land use alternative is expected to generate approximately 2,350 daily trips with 272 occurring during the AM peak hour and 265 during the PM peak hour. For purposes of this report, the land use assumptions would remain constant for all transportation alternative scenarios.

4.2 Alternative 1: Minimum Transportation Alternative

The analysis in this section documents both the assumed directional distribution and volume of project-related trips to the surrounding street system for Transportation Alternative #1. To develop these forecasted volumes the trips generated by the Preferred Land Use Alternative were assigned to the surrounding street system. This assignment was then used to derive estimated AM and PM peak hour project-related traffic volumes at study area intersections.

The trip distribution and assignment assumptions were based on engineering judgment and were developed in consultation with CCT. Site-related traffic distribution reflects the path each vehicle will take traveling to and from the site and is related to where customers would come from and where products would be shipped to. Vehicle directional trip distribution and assignment to and from the site will be influenced by:

- Current travel patterns on the area roadways as evidenced by existing intersection turning movement patterns;
- The locations of residential areas (for workers) and other commercial or industrial centers; and
- The proposed access system for the project

4.2.1 Description of the Alternative

This scenario is largely based on the existing transportation network with the addition of direct access to industrial properties at the east and west end of the study area via either 8th Avenue near Jackson Street or a new access road that connects directly to Okanogan/Omak East Road. No internal connection across the East Omak Industrial Site would be provided with this alternative. The two access locations are described below.

4.2.1.1 8th Avenue and Jackson Street Intersection

This existing three-legged Tee intersection would be modified by the addition of a fourth leg that would approach from the south. Development of the intersection would require sufficient intersection at-grade sight distance in both directions for traffic heading up Jackson Street to the state highway. Both 8th Avenue and Jackson Street have straight horizontal alignments with virtually no vertical deviations (they are essentially level roadways), which would minimize intersection at-grade sight distance concerns. The former rail spur at this location has been removed and is not expected to be replaced at this location to serve future rail-oriented development on the site.

This new connection into the proposed industrial area would direct traffic north to the intersection of SR 155 with Jackson Street. Since SR 155 is a Managed Access facility, the use and potential improvement of this existing intersection will be evaluated and necessary mitigation identified.

4.2.1.2 Okanogan/Omak East Road and New Site Access Road Intersection

A new intersection would be developed on Okanogan/Omak East Road south of its existing intersection with 8th Street East. As noted in the 2011 Master Plan for the site *"sufficient intersection at grade sight distance in either direction would be required. The posted speed for the road is currently 50 mph, which translates to an intersection at-grade sight distance requirement of approximately 800 linear feet. A downward adjustment in the posted speed may be recommended at a later date, as development details become known."*

In the future it may be possible to provide a fourth, western leg at this intersection to provide access across the railroad tracks, linking up with SR 20/US 97 at the existing Tribal Truck Stop intersection. This would provide a more direct, high-quality connection to the north/south state highway to better facilitate freight mobility and worker access to the *East Omak Industrial Site*. Without this connection, traffic entering and existing the site onto Okanogan/Omak East Road will need to travel south to the intersection of SR 20 with the Tribal Casino to reach the regional transportation network.

4.2.2 Trip Distribution and Assignment

The basic site access and circulation provided by Transportation Alternative #1, its regional traffic distribution percentages, and its assigned trips for the AM peak hours are illustrated in **Figure 15**, while the PM peak hour is shown in **Figure 16.**

4.3 Alternative 2: 2011 Master Plan Transportation Alternative

This scenario builds on the existing transportation network and Alternative #1 by adding to the transportation network as described in the *2011 Master Plan.* This concept would complete the connection between two ends of the access roads in Alternative #1 into the site from 8th Avenue through to Okanogan/Omak East Road.

4.3.1 Trip Distribution and Assignment

The basic site access and circulation provided by Alternative #2, its trip distribution percentages, and its assigned trips for the AM peak hour are illustrated in **Figure 17**, while PM peak hour projections are included in **Figure 18.**

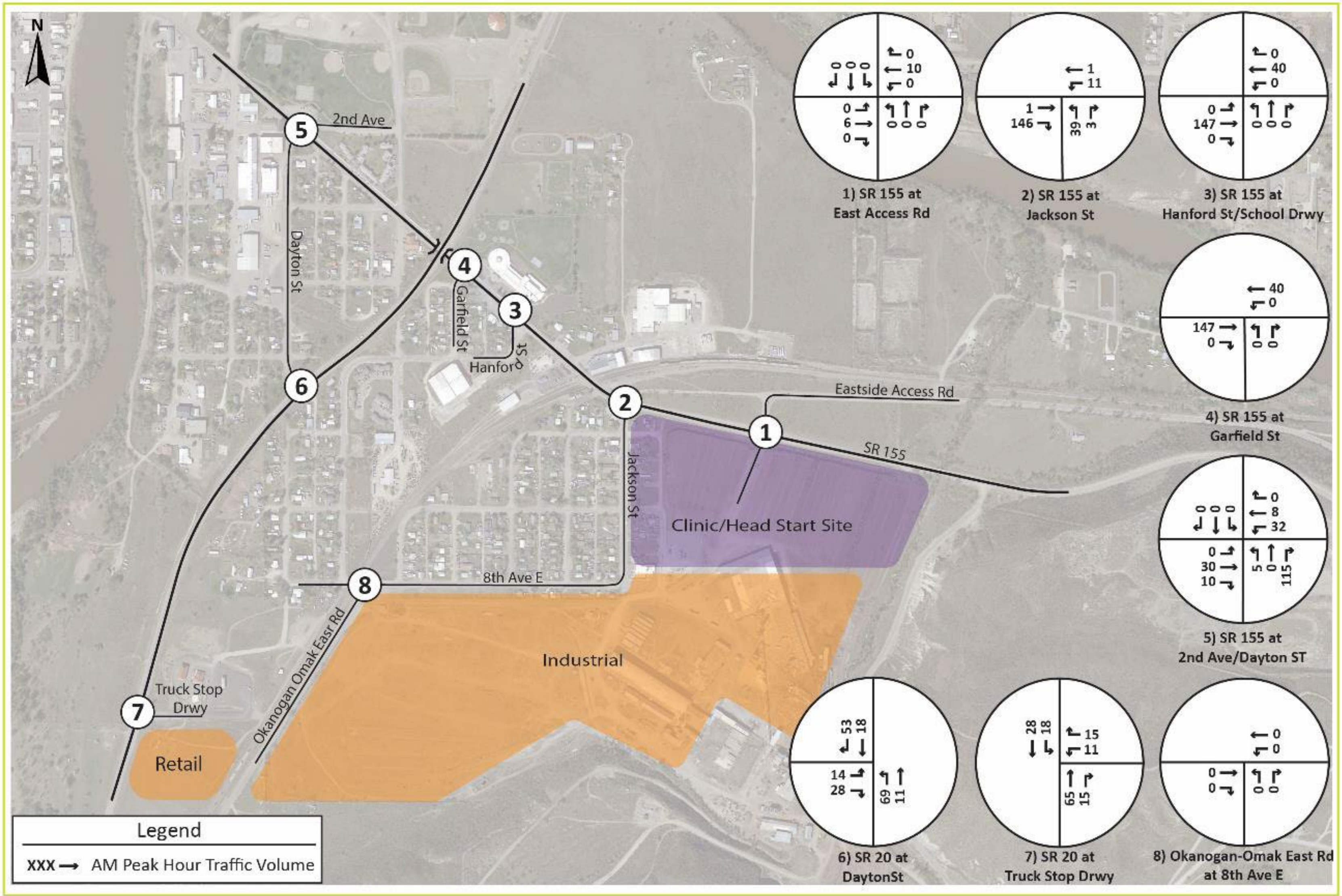


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Figure 15
Site Generated AM Peak Hour Traffic Volumes - Alternative 1

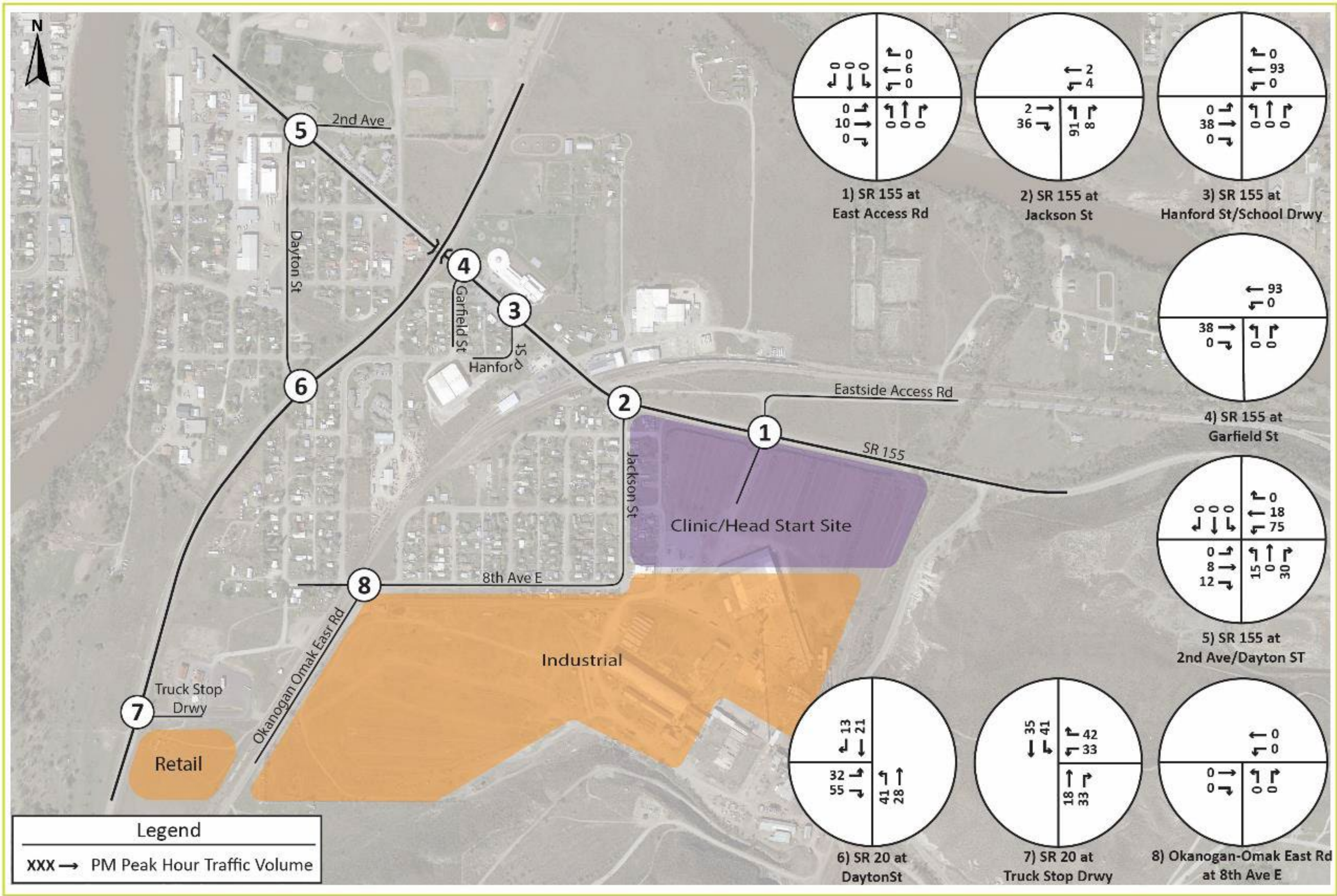

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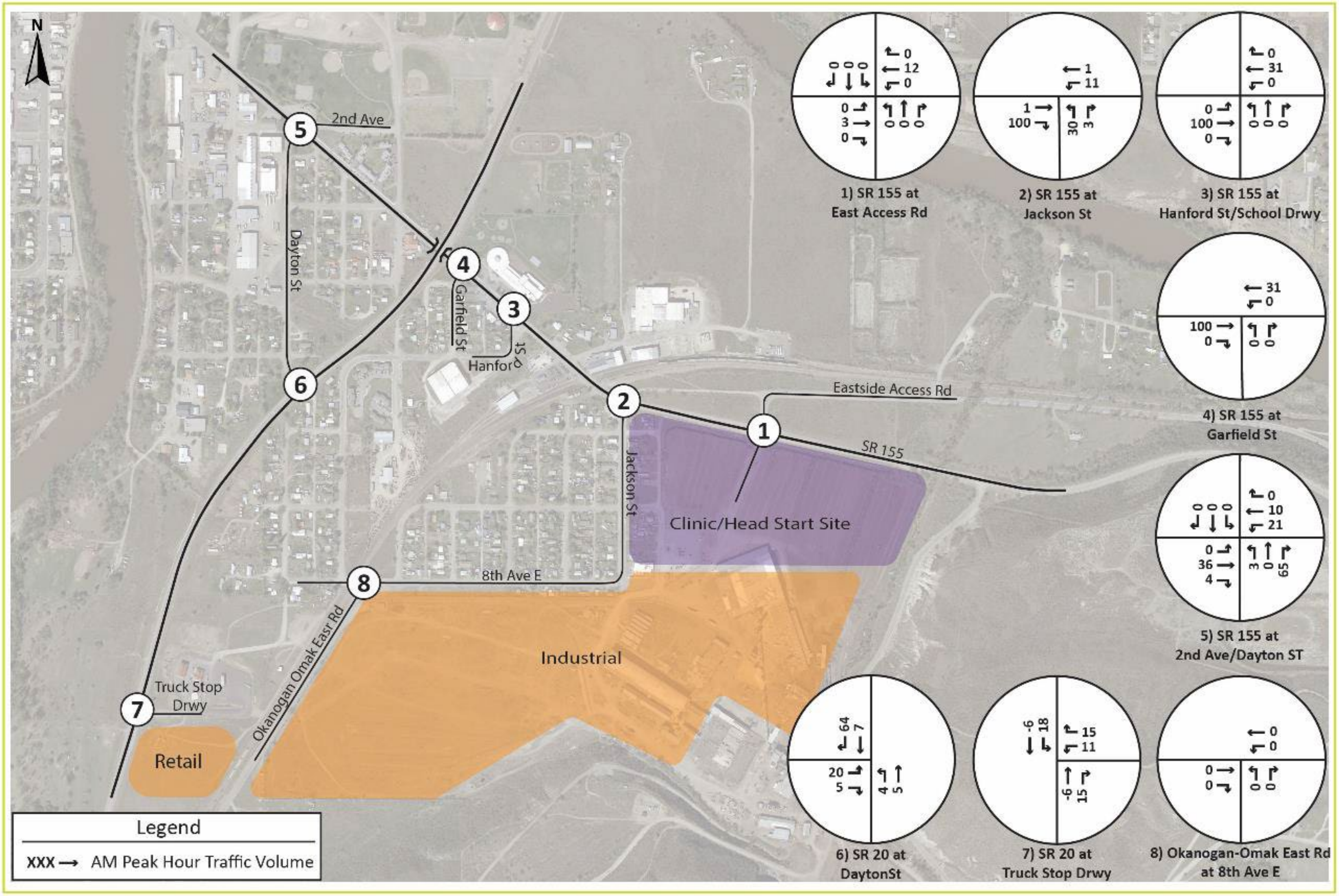
Figure 16
Site Generated PM Peak Hour Traffic Volumes - Alternative 1



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Omak, Washington

Figure 17
Site Generated AM Peak Hour
Traffic Volumes - Alternative 2

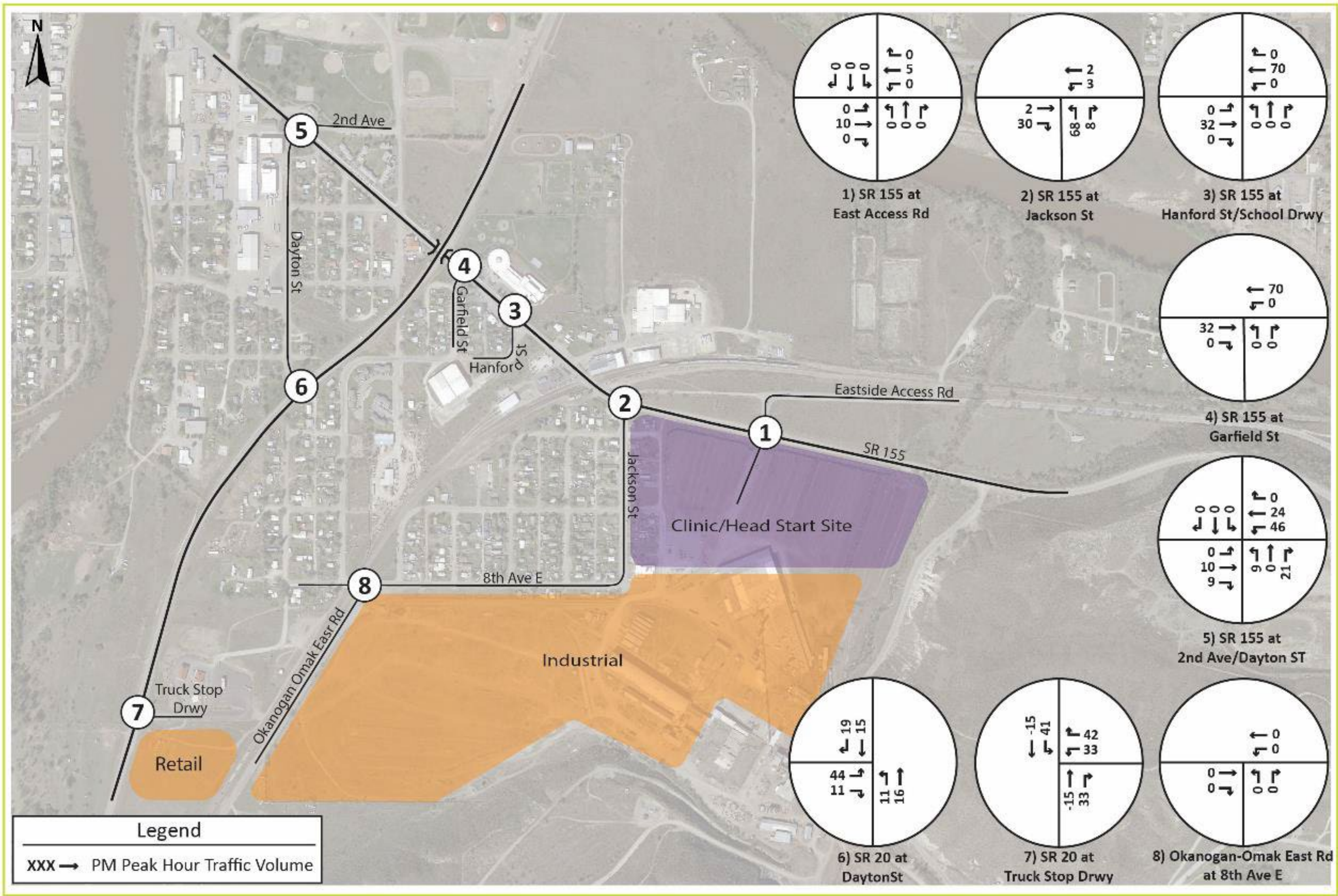

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Figure 18
Site Generated PM Peak Hour Traffic Volumes - Alternative 2

4.4 Alternative 3: Maximized Transportation Alternative

This alternative builds on the roadway system developed for the two previous alternatives by adding a direct roadway connection between the site access intersection on Okanogan/Omak East Road across the railroad tracks to link with the internal east/west road at the Tribal Truck Stop. This roadway connection would then access SR 20/US 97 at the Truck Stop intersection. As indicated above, this direct connection to the major north/south state highway would provide better access for freight mobility and workers traveling between the corridor and the *East Omak Industrial Site*. Development of a new at-grade railroad crossing would need to be negotiated with the Cascade and Columbia River Railroad to ensure that the operational and safety needs of both travel modes are met.

4.4.1 Trip Distribution and Assignment

The basic site access and circulation provided by the Minimum Transportation Alternative, its regional traffic distribution percentages, and its assigned trips for the AM peak hour are illustrated in **Figure 19**, while PM peak hour projections are included in **Figure 20.**

4.5 Comparison of Project Traffic Volumes

Table 8 presents a summary comparison of project-related traffic volumes along key segments of state highways in the vicinity of the East Omak Industrial Site and on streets internal to the site. This data will help facilitate a better understanding of the implications of project development along various transportation corridors and can be assessed for consistency with CCT aspirations for the site.

Table 8. Comparison of Project-Related Traffic

	2045 PM Peak Hour Volumes (2-Way)			
Roadway Segment	**Baseline**	**Alternative 1**	**Alternative 2**	**Alternative 3**
SR 155 east of Jackson Street	550	565	565	565
SR 155 west of Jackson Street	630	760	730	660
SR 155 west of Dayton Street	750	805	805	800
SR 20 south of Dayton Street	1,115	1,260	1,170	1,220
SR 20 north of Dayton Street	1,020	1,115	1,115	1,110
SR 20 south of Tribal Truck Stop	1,030	1,150	1,070	1,145
Jackson Street Extension east of Okanogan/Omak East Road	0	25	80	135
Jackson Street Extension south of SR 155	170	310	280	220
Jackson Street Extension east of SR 20	275	425	425	545

As noted in Table 8, 2045 PM peak hour traffic volumes on study area state highways would all increase with the addition of traffic generated by the preferred land use alternative. However, in all instances, the increase in traffic volumes would be less than 200 vehicles traveling in both directions. More significant increases would be expected in the internal roads within the project site. The most significant increase is expected on the internal truck stop road approaching SR 20 which could increase from about 275 two-way PM peak hour trips to near 550. However, it is anticipated that the existing channelization and traffic control could accommodate this increase.

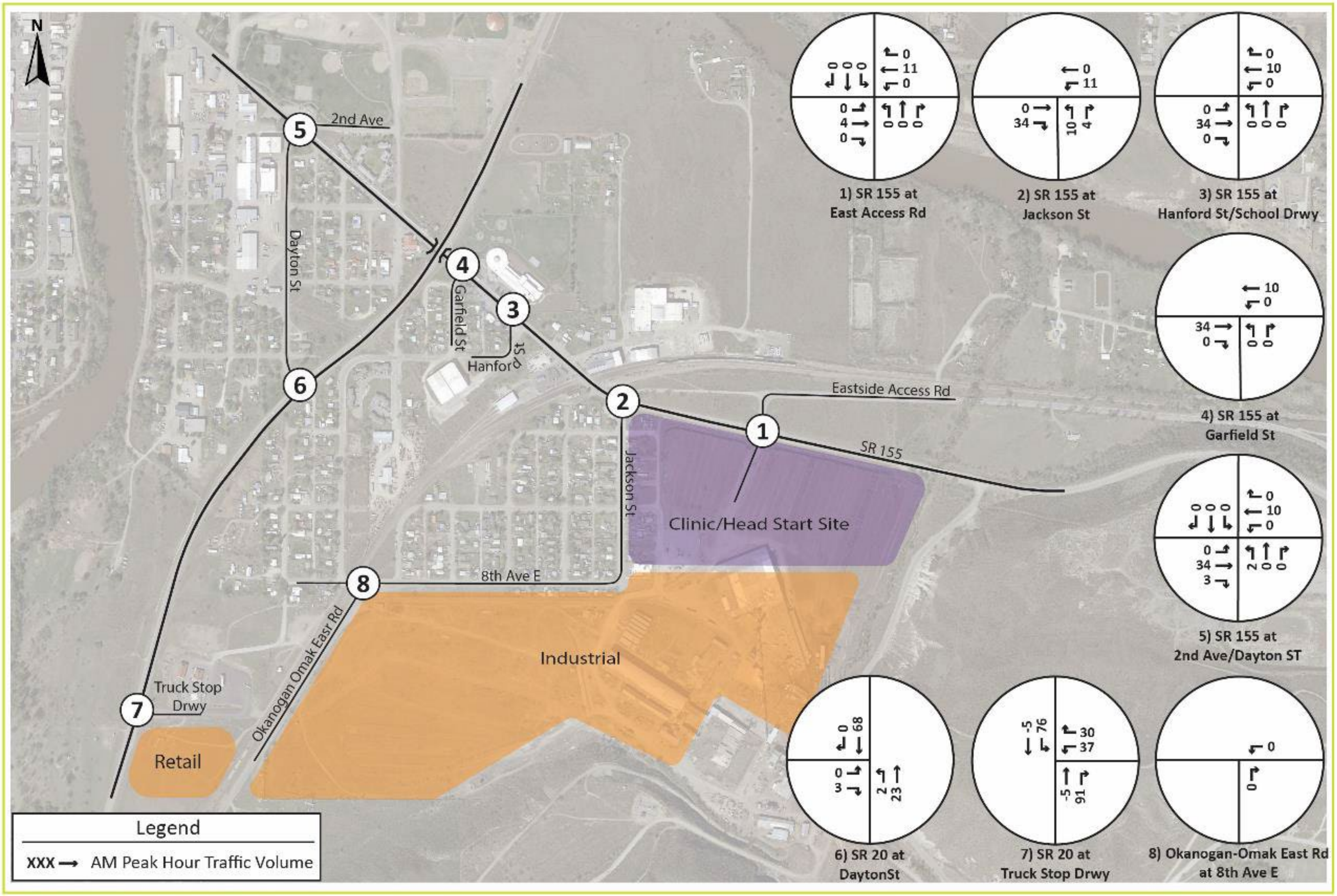

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Figure 19
Site Generated AM Peak Hour Traffic Volumes - Alternative 3

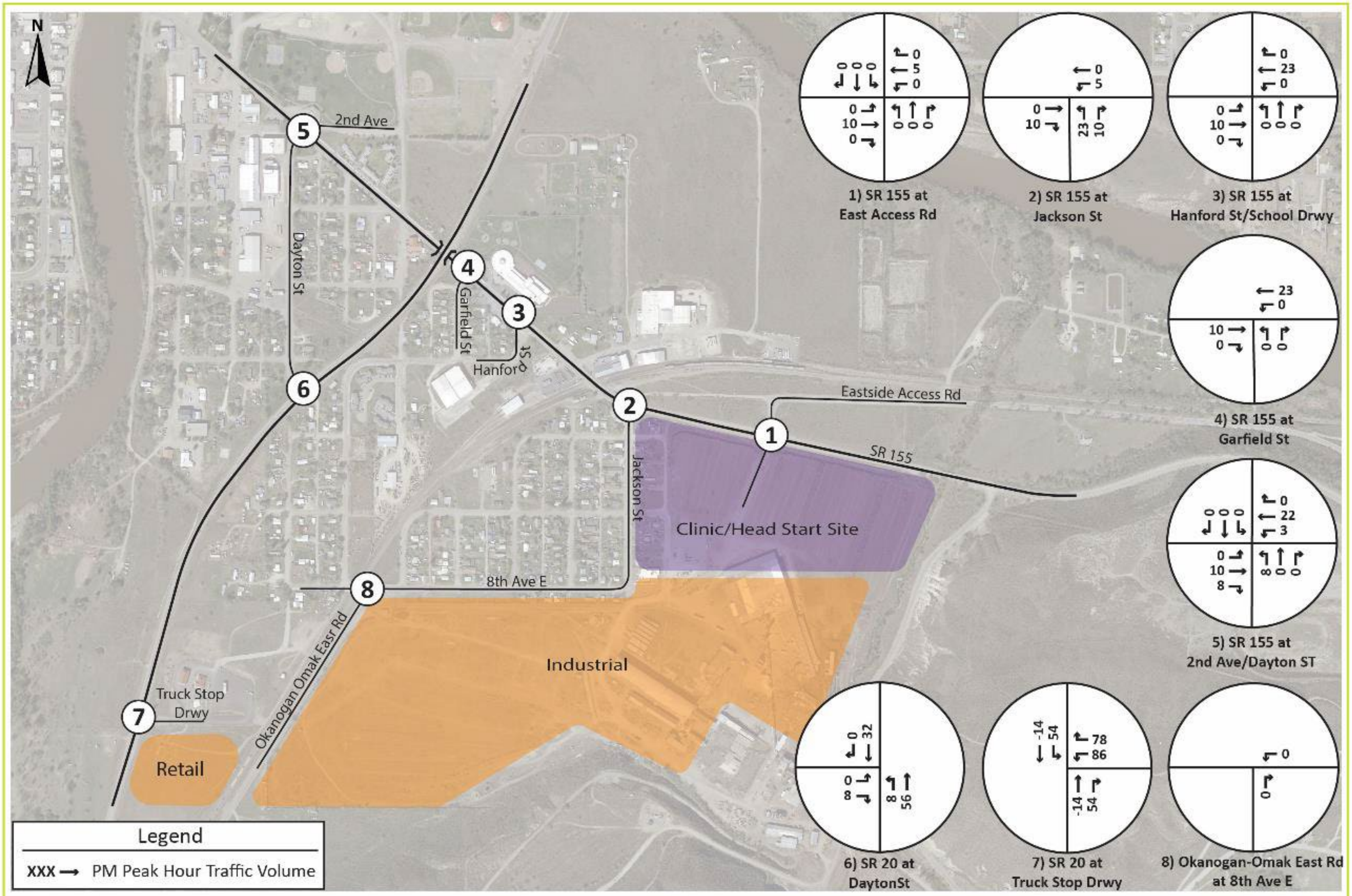

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Figure 20
Site Generated PM Peak Hour Traffic Volumes - Alternative 3

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5 Traffic Analysis of Transportation Alternatives

Based on the project-related traffic forecasts for the three transportation alternatives described in Chapter 4, this chapter documents the analysis of traffic operational conditions at study area intersections that would result from each scenario. As noted in Chapter 4, the land use assumptions would remain consistent with each alternative and represent a full build-out of the *East Omak Industrial Site*. The analysis in this chapter focuses on operational performance within the study area for the 2045 AM and PM peak hours. Expected deficiencies will be identified and the need for potential road and/or intersection improvements will be determined. Analysis will also address freight circulation, safety, and walkability within the site and in its vicinity.

5.1 Alternative 1: Minimum Transportation Alternative

5.1.1 2045 Peak Hour Traffic Projections

The projected site-related traffic volumes identified in Figures 15 and 16 have been added to the 2045 AM and PM peak hour projections depicted in Figures 11 and 12 to derive future hourly traffic projections for each study area intersection with Alternative #1. 2045 AM volumes for transportation Alternative 1 are shown in **Figure 21**, while PM peak hour volumes are presented in **Figure 22**.

5.1.2 Intersection Traffic Analysis

The operational analysis results of the study intersections for the AM peak hour are provided in **Table 9**, while **Table 10** presents the results for the PM peak hour**.** The LOS analysis worksheets are included in **Appendix D.**

As shown in Table 9, all study area intersections would operate at an acceptable Level of Service (LOS) D or better during the AM peak hour except for the intersection of SR 155 with Dayton Street. Traffic turning left onto SR 155 (Omak Avenue E) from Dayton Street would experience LOS E conditions with Transportation Alternative 1.

Table 10 summarized intersection operations analysis results during the 2045 PM peak hour. As shown, all study area intersections are expected to operate at LOS D or better except for the intersection of SR 155 with Dayton Street. During the 2045 PM peak hour, the northbound movement is expected to fail with both the baseline (non-project) condition as well as with Alternative #1. This alternative is expected to operate at LOS F with significant delays for the northbound left turn. This problem is largely due to the circuitous routing necessary to travel between SR 155 and SR 20 which increases traffic at this location. Potential mitigation options to address this expected congestion problem are discussed in Chapter 6.

5.2 Alternative 2: 2011 Master Plan Transportation Alternative

5.2.1 2045 Peak Hour Traffic Projections

The projected site-related traffic volumes identified in Figures 17 and 18 have been added to the 2045 AM and PM peak hour projections depicted in Figures 11 and 12 to derive future hourly traffic projections for each study area intersection. 2045 AM peak hour volumes for transportation Alternative 2 are shown in **Figure 23**, while PM peak hour volumes are presented in **Figure 24**.

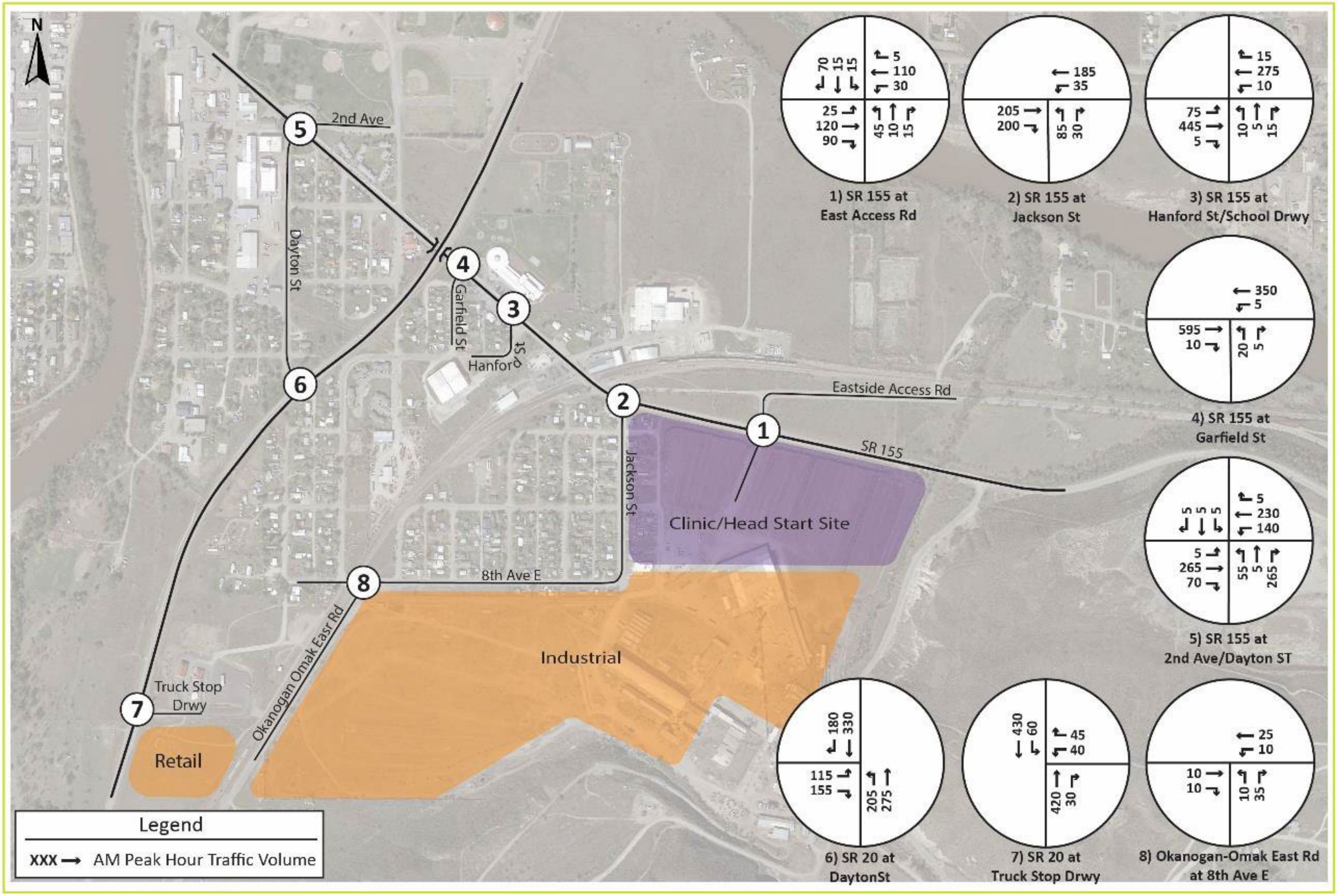

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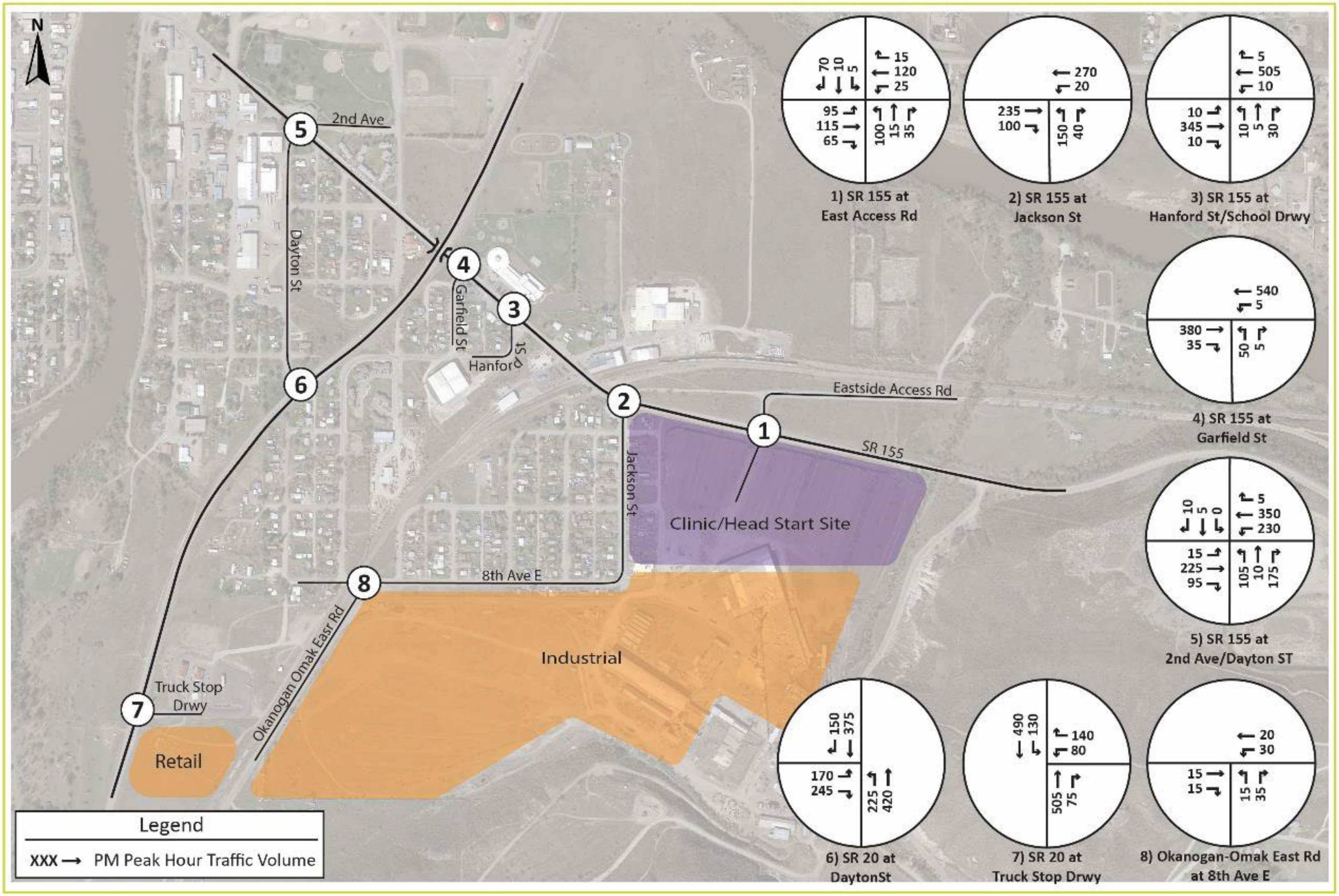
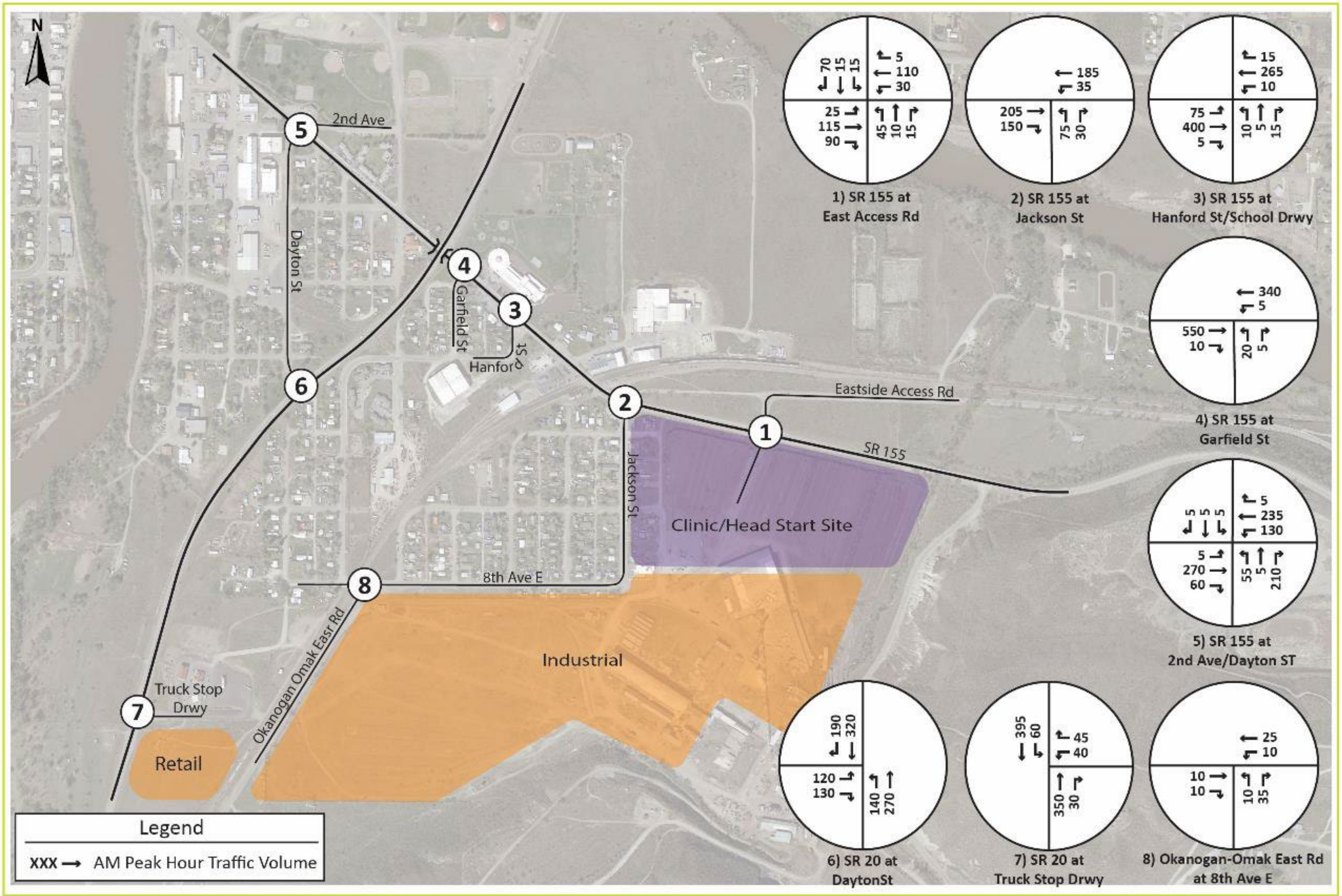
Figure 21
Projected 2045 AM Peak Hour Traffic Volumes With Alternative 1



Omak Industrial Park
Omak, Washington

Figure 22
Projected 2045 PM Peak Hour
Traffic Volumes With Alternative 1



Omak Industrial Park
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Figure 23
Projected 2045 AM Peak Hour Traffic Volumes With Alternative 2

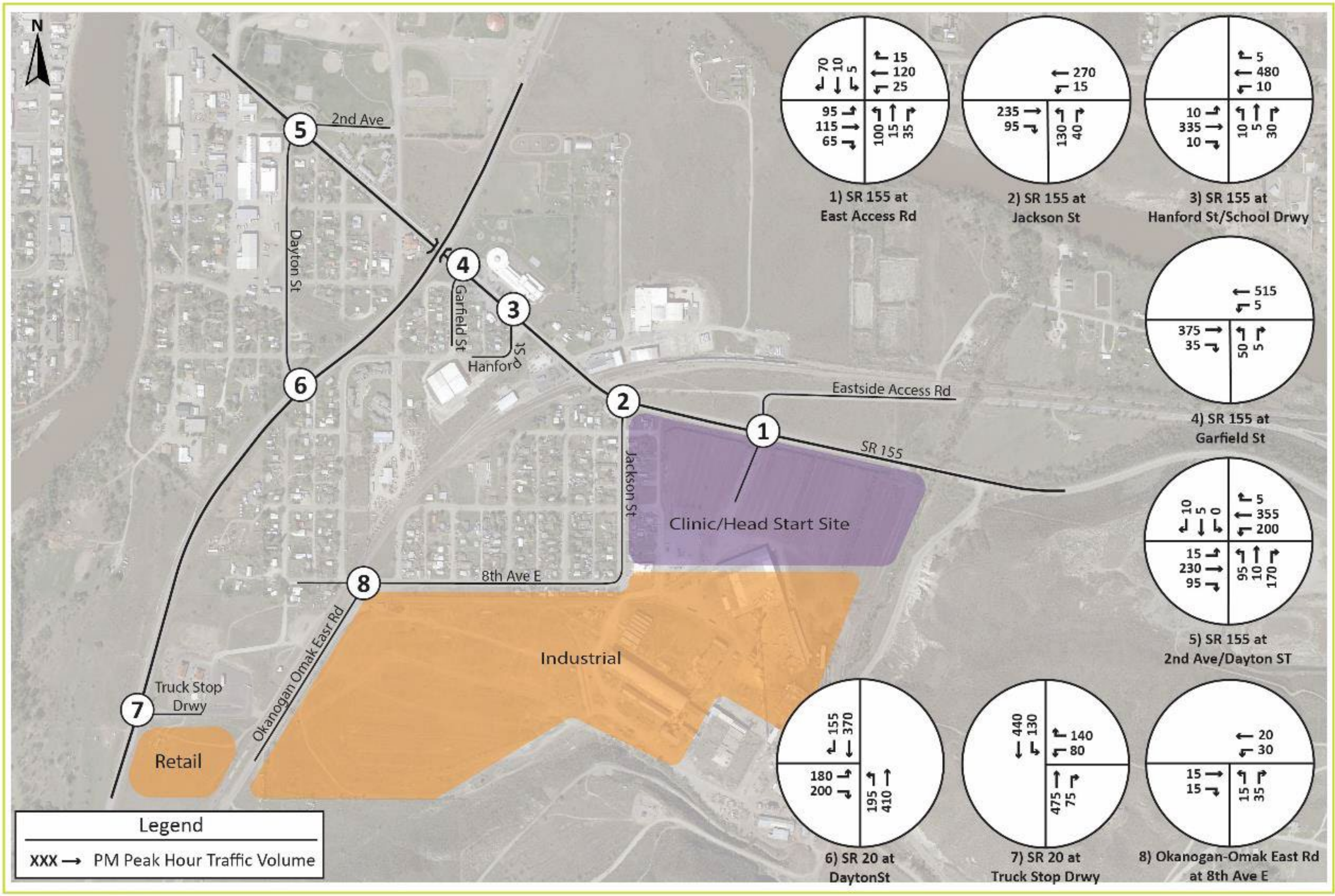

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Figure 24
Projected 2045 PM Peak Hour Traffic Volumes With Alternative 2

5.2.2 Intersection Traffic Analysis

The operational analysis results of the study intersections for the AM peak hour are provided in **Table 9**, while **Table 10** presents the results for the PM peak hour**.** The LOS analysis worksheets are included in **Appendix D.**

As shown in Table 9, all study area intersections would operate at an acceptable Level of Service (LOS) D or better during the AM peak hour.

Table 10 summarizes intersection operations analysis results during the 2045 PM peak hour. As shown, all study area intersections are expected to operate at LOS D or better except for the intersection of SR 155 with Dayton Street. During the 2045 PM peak hour, the northbound left turning movement is expected to operate at LOS F with this alternative, but the magnitude of delay is expected to be less than with Alternative 1. This would occur due to the through roadway connection on the site which would allow more traffic destined to/from the south on SR 20 to use Omak-Okanogan Road rather than the circuitous route via SR 155. This would reduce the level of traffic expected to use SR 155, particularly at the Dayton Street intersection.

Table 9. 2045 AM Peak Hour Intersection Level of Service Results for Transportation Alternatives

		Baseline Alternative	Alternative 1	Alternative 2	Alternative 3
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Highway 280	TWSC[1]	B (13.6)	B (13.9)	B (13.8)	B (13.9)
	Roundabout	A (5.7)	A (5.7)	A (5.7)	A (5.7)
SR 155 at Jackson Street	TWSC[1]	B (11.9)	B (13.4)	B (13.1)	B (12.4)
SR 155 at Hanford Street	TWSC[1]	B (13.5)	C (16.5)	C (15.6)	B (14.1)
SR 155 at Garfield Street	TWSC[1]	C (17.2)	C (21.7)	C (20.2)	C (18.1)
SR 155 at Dayton Street	TWSC[1]	C (24.6)	E (41.8)	D (34.3)	D (26.5)
SR 20/US 97 at Dayton Street	Signal	B (12.5)	C (21.7)	B (13.5)	B (13.7)
SR 20/US 97 at Truck Stop	TWSC[1]	B (14.8)	C (16.6)	C (15.4)	C (19.0)
Okanogan/Omak East Road at 8th Avenue E	TWSC[1]	A (8.7)	A (8.7)	A (8.7)	--

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

Table 10. 2045 PM Peak Hour Intersection Level of Service Results for Transportation Alternatives

		Baseline Alternative	Alternative 1	Alternative 2	Alternative 3
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Highway 280	TWSC[1]	C (20.1)	C (20.8)	C (20.8)	C (20.8)
	Roundabout	A (6.6)	A (6.6)	A (6.6)	A (6.6)
SR 155 at Jackson Street	TWSC[1]	B (13.7)	C (18.5)	C (16.9)	B (14.9)
SR 155 at Hanford Street	TWSC[1]	B (12.1)	B (13.1)	B (12.8)	B (12.4)
SR 155 at Garfield Street	TWSC[1]	C (20.4)	D (25.0)	C (23.7)	C (21.2)
SR 155 at Dayton Street	TWSC[1]	**F (72.3)**	**F (281.6)**	**F (177.6)**	**F (94.8)**
SR 20/US 97 at Dayton Street	Signal	B (15.8)	C (32.0)	C (21.3)	B (17.7)
SR 20/US 97 at Truck Stop	TWSC[1]	C (18.5)	C (24.0)	C (22.2)	D (29.6)
Okanogan/Omak East Road at 8th Avenue E	TWSC[1]	A (8.9)	A (8.9)	A (8.9)	--

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

5.3 Alternative 3: Maximized Transportation Alternative

5.3.1 2045 Peak Hour Traffic Projections

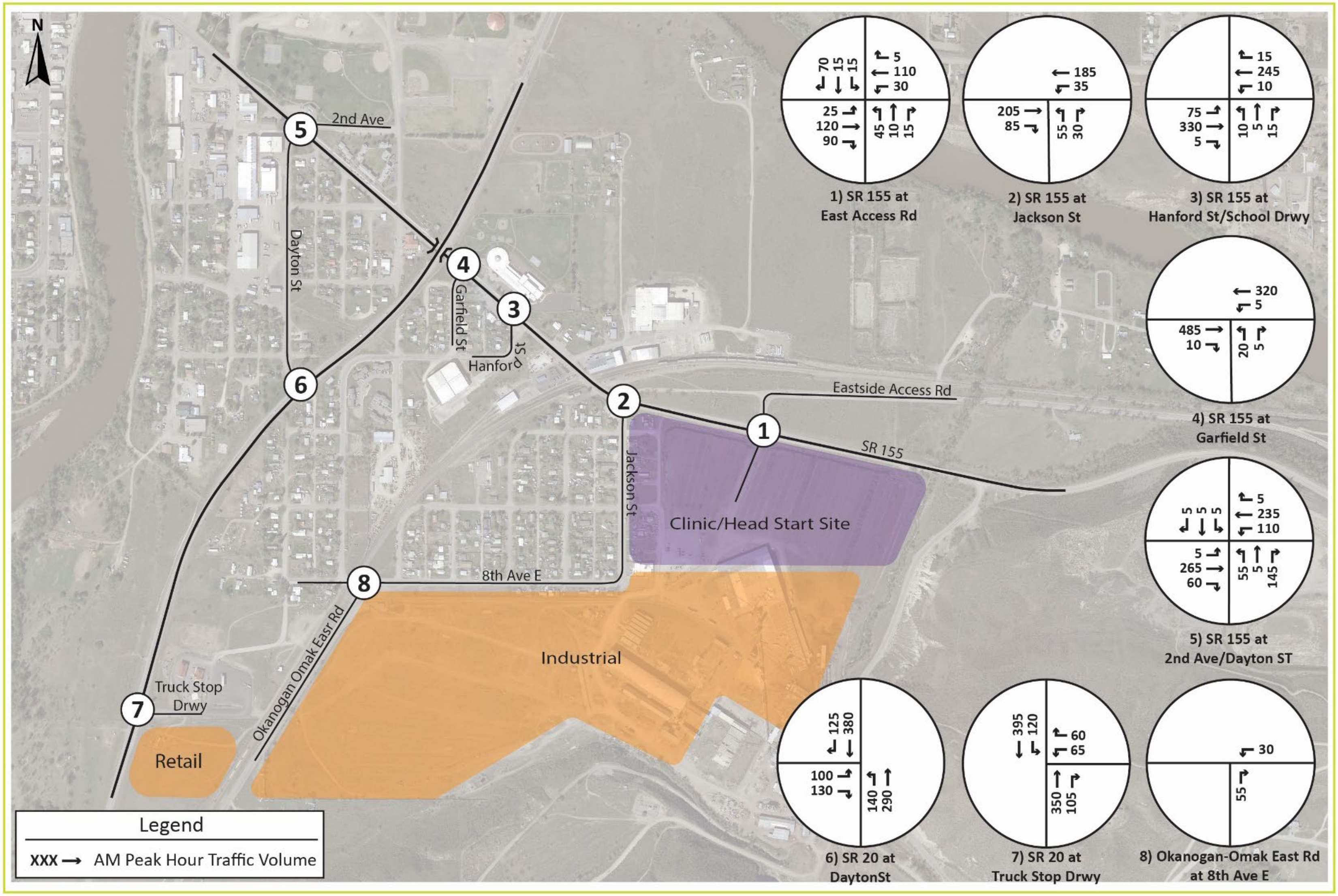
The projected site-related traffic volumes identified in Figures 19 and 20 have been added to the 2045 AM and PM peak hour projections depicted in Figures 11 and 12 to derive future hourly traffic projections for each study area intersection. These volumes for transportation Alternative 3 are shown in **Figure 25** for the AM peak hour and **Figure 26** for the PM peak hour.

5.3.2 Intersection Traffic Analysis

The operational analysis results of the study intersections for the AM peak hour are provided in **Table 9**, while **Table 10** presents the results for the PM peak hour**.** The LOS analysis worksheets are included in **Appendix D.**

As shown in Table 9, all study area intersections would operate at an acceptable Level of Service (LOS) D or better during the AM peak hour.

Table 10 summarizes intersection operations analysis results during the 2045 PM peak hour. As shown, all study area intersections are expected to operate at LOS D or better except for the intersection of SR 155 with Dayton Street. During the 2045 PM peak hour, the northbound left turning movement is expected to operate at LOS F with this alternative, but with less delay that Alternatives #1 and #2. This would occur due to the through-roadway connection from all parts of the site directly to SR 20 via the Tribal Truck stop intersection which would reduce the level of traffic expected to use SR 155, particularly at the Dayton Street intersection.



Omak Industrial Park
Omak, Washington

Figure 25
Projected 2045 AM Peak Hour Traffic Volumes With Alternative 3

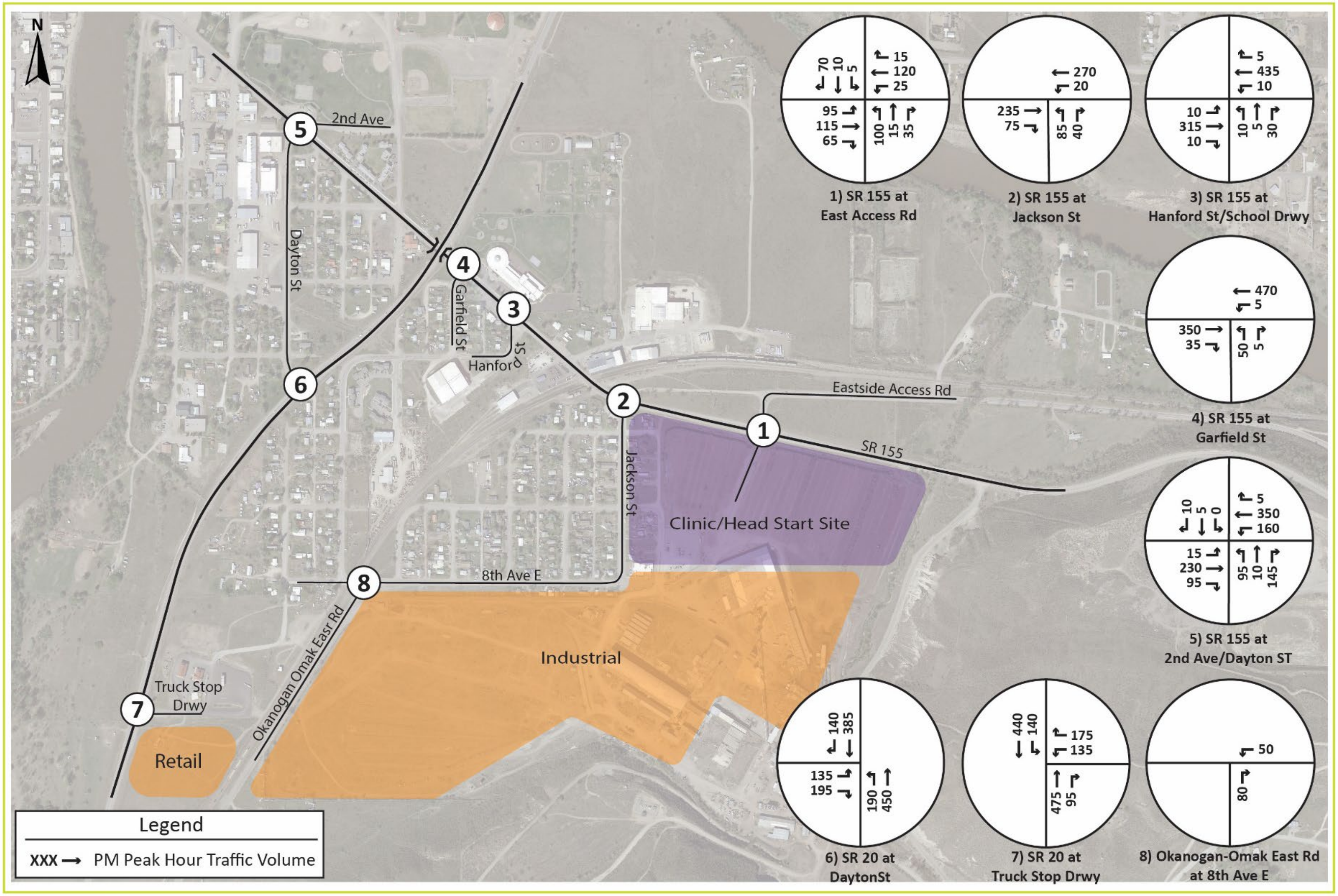


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Figure 26
Projected 2045 PM Peak Hour
Traffic Volumes With Alternative 3

5.4 Sensitivity Analysis of Potential Cut-Through Traffic

For the sake of thoroughness, a sensitivity analysis was conducted of Alternative #3 to assess the potential that some amount of "cut-through" traffic might use the Jackson Street Extension through the industrial site to travel largely between SR 155 to the east and SR 20 to the south. Because there is no interchange at the location where SR 20 and SR 155 intersect, traffic traveling between these two roads must take a circuitous route to make this connection.

With the addition of the Jackson Street Extension, a more direct connection between these two roads, particularly on the east and south sides of town would become available. This analysis was conducted for the 2045 PM peak hour only and focused on the following intersections:

- SR 155 at Jackson Street
- SR 155 at Dayton Street
- SR 20 at Dayton Street
- SR 20 at Tribal Truck Stop

The analysis process included the following steps:

1. Estimate the volume of 2045 PM peak hour traffic that could divert from the SR 155/Dayton Street and SR 20/Dayton intersections and would reroute to the intersections of SR 155/Jackson Street and SR 20 at the Tribal Trails Truck stop. The development of traffic volume diversion estimates was prepared in both directions.
2. To estimate westbound-to-southbound diversion, the magnitude of projected westbound left turns at SR 155/Dayton Street and eastbound right turns at SR 20/Dayton Street was considered as a starting point. A total of 95 vehicles are estimated to make both of these movements and, thus, were considered to be the maximum volume of traffic that could reasonably divert. However, when also considering the traffic-generating potential of land uses along the route between SR 155/Jackson and SR 20/Dayton, a more conservative estimate for a potential cut-through (diverted) traffic would be about 50 PM peak hour vehicles in the westbound-to-southbound direction.
3. To estimate northbound-to-eastbound diversion, northbound right turns at SR 155/Dayton and northbound left turns at SR 20/Dayton were considered. A total of 85 vehicles were estimated to make both of these movements. However, similar to the westbound-to-southbound calculation, when allowance is made for potential traffic generated by intervening land uses, a reasonable traffic diversion potential of about 50 vehicles was estimated for this direction.
4. The 2045 PM peak hour traffic projections for Alternative #3 were modified by 50 in each direction at the intersections listed above, and a new operations analysis was conducted. The results of this analysis are summarized in **Table 11**.

As presented in Table 11, no adverse impacts would be expected as a result of the potential cut-through traffic on the new Jackson Street Extension between 8th Avenue and SR 20. In comparison with the information included in Table 10 for the intersection of SR 155/Dayton, a significant improvement in traffic operations could be realized. While still expected to operate at LOS F, the average vehicle delay would improve from about 95 seconds to just over 50 seconds. It should be noted that 50 seconds of average delay at an unsignalized intersection is very close to LOS E.

Table 11. 2045 PM Peak Hour Sensitivity Analysis of Potential Site Cut-Through Traffic

		Alternative 3
Intersection	**Control Type**	**LOS (Delay) [2]**
SR 155 at Jackson Street	TWSC[1]	C (15.0)
SR 155 at Dayton Street	TWSC[1]	**F (50.1)**
SR 20/US 97 at Dayton Street	Signal	B (12.8)
SR 20/US 97 at Tribal Truck Stop	TWSC[1]	D (34.8)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

It should also be noted that, while the intersection of SR 20 with the Tribal Truck Stop is expected to operate at LOS D, the estimated amount of vehicular delay would put operations very close to LOS E. If Alternative 3 is implemented, traffic volumes at the SR 20/Truck Stop intersection should be monitored as the East Omak Industrial site develops to ensure that acceptable and safe traffic operations are maintained.

5.5 Summary of Intersection Deficiencies and Improvement Needs

Based on the analysis included in Chapter 5, this section presents a summary of identified roadway deficiencies and improvements that are needed to ensure high-quality and safe multimodal access and circulation for the industrial site. Improvement needs would include the following:

1. Monitor traffic at the intersection of SR 155 (Omak Avenue) with Dayton Street and implement mitigation when appropriate as the industrial site develops.
2. Provide or improve facilities to accommodate the multimodal needs of walkers and bicyclists including:
    - Develop a system of pathways along project site roadways that accommodate bicycles and pedestrians. For purposes of this report, it is recommended that there be 12-foot shared-use paths along both sides of the street with a landscaped buffer area.
    - Consider adding sidewalks along Jackson Street between SR 155 and 8th Avenue to provide safer pedestrian mobility, particularly with any increase in large truck activity along this street resulting from industrial development.
    - Consider enhancements to improve safety for existing pedestrian crossings of SR 155 at the East Omak Elementary School such as proposed in the City's *Six Year Transportation Improvement Program* (TIP). These improvements could include installation of more visible pedestrian crossing devices such as Rectangular Rapid Flashing Beacons (RRFBs) and/or school speed zoning when children are present. This may be particularly important as truck traffic to/from the industrial area increases. There is currently a project in the City of Omak's *Six Year Transportation Improvement Program* (2020-2025) that would install a high visibility crosswalk at the intersection of SR 155 with Garfield Street.

3. Monitor traffic at the intersection of SR 20 with the Tribal Truck Stop. As noted above, traffic operations with some level of cut-through traffic could approach LOS E and may require additional improvements such as the development of a roundabout or a traffic signal.

6 Analysis of Improvement Needs and Recommendations

Based on the analysis described in Chapter 5, the following improvements would be needed for each of the Transportation Alternatives within the long-term planning horizon year of 2045. It should be noted that adverse traffic impacts and improvement needs are unlikely in the near-term, but traffic volumes at key intersections should be monitored over time as development expands to identify when future improvements are needed.

6.1 Transportation Alternative 1

6.1.1 Intersection Improvement Needs

Table 12 presents a summary of 2045 AM and PM peak hour traffic operations for various improvement options at the intersection of SR 155 with Dayton Street. As noted in Chapter 5, this intersection would be adversely impacted by the development of industrial and/or commercial retail uses on the East Omak Industrial site.

Table 12. Intersection Improvement Needs for Transportation Alternative 1

		2045 Baseline		2045 Alternative 1	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	Control Type	LOS (Delay)[2]	LOS (Delay)[2]	LOS (Delay)[2]	LOS (Delay)[2]
SR 155 at Dayton Street	Existing TWSC[1]	C (24.6)	**F (72.3)**	**E (41.8)**	**F (281.6)**
	Signal	A (9.1)	A (9.8)	B (12.2)	B (11.6)
	Roundabout	A (6.0)	A (6.6)	A (6.3)	A (7.3)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

As shown in the table, the anticipated future operational problem at the intersection of SR 155 with Dayton Street can be resolved successfully through either installation of a traffic signal or a roundabout. Intersection operations analysis worksheets are included in **Appendix E**.

6.1.2 Signal Warrant Analysis

To support the installation of a traffic signal at the intersection of SR 155 with Dayton Street, an assessment of peak hour warrants was conducted. This analysis is documented in **Appendix F** and shows that a signal would be warranted based on projected 2045 PM peak hour volumes.

6.1.3 Safety Considerations

As part of the analysis of the existing transportation system documented in Chapter 2, an analysis was conducted of existing crash experiences at study area intersections. No significant traffic safety problems were identified and no safety improvements to address existing problems are needed. Consideration of transportation safety as part of the East Omak Industrial site development focused on enhancing the multimodal network as described below.

6.1.4 Recommended Roadway Improvements

As described earlier in this report and illustrated in Figure 14, the internal site roadway improvements would be limited to the provision of access into the site from both the 8th Avenue/Jackson Street intersection on the north and from a new intersection on Okanogan/Omak East Road on the west. These roadways would include a 28-foot curb-to-curb width, and 12-foot shared-use pathways along both sides with a 4-foot buffer. This buffer could be fully landscaped including street trees to enhance the overall appearance of the industrial site and, when fully mature, could provide needed shade and reduction in the heat load associated with roadway pavement. A total of 1,400 linear feet of roadway would be developed with this alternative.

A planning level cost estimate has been prepared for this alternative which is documented in greater detail in **Appendix G**. The cost of these roadways segments is estimated to be $2,995,700 with street trees and landscaping and $2,989,300 without the street trees.

6.2 Transportation Alternative 2

6.2.1 Intersection Improvement Needs

Table 13 presents a summary of 2045 AM and PM peak hour traffic operations for various improvement options at the intersection of SR 155 with Dayton Street. As noted in Chapter 5, this intersection would be adversely impacted by the development of industrial and/or commercial retail uses on the East Omak Industrial site.

Table 13. Intersection Improvements for Transportation Alternative 2

		2045 Baseline		2045 Alternative 2	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	**Control Type**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**	**LOS (Delay)[2]**
SR 155 at Dayton Street	Existing TWSC[1]	C (24.6)	**F (72.3)**	D (34.3)	**F (177.6)**
	Signal	A (9.1)	A (9.8)	B (11.0)	B (10.8)
	Roundabout	A (6.0)	A (6.6)	A (6.2)	A (7.0)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

As shown in the table, the anticipated future operational problem at the intersection of SR 155 with Dayton Street can be resolved successfully through either installation of a traffic signal or a roundabout. Intersection operations analysis worksheets are included in **Appendix E**.

6.2.2 Signal Warrant Analysis

To support the installation of a traffic signal at the intersection of SR 155 with Dayton Street, an assessment of peak hour warrants was conducted. This analysis is documented in **Appendix F** and shows that a signal would be warranted based on projected 2045 PM peak hour volumes.

6.2.3 Safety Considerations

As noted under the discussion of Alternative 1, no significant safety problems were identified at study area intersections and no safety improvements to address existing problems are needed. Consideration of transportation safety related to the project focused on the multimodal network.

6.2.4 Recommended Roadway Improvements

As described earlier in this report and illustrated in Figure 14, the internal site roadway improvements would provide a complete connection through the site from the 8th Avenue/Jackson Street intersection on the north to a new intersection on Okanogan/Omak East Road on the west. As described under Alternative #1, these roadways would include a 28-foot curb-to-curb width, and 12-foot shared-use pathways along both sides with a 4-foot buffer. A total of 2,840 additional linear feet of roadway would be developed with this alternative.

A planning level cost estimate has been prepared for this alternative which is documented in greater detail in **Appendix G**. The cost of the additional roadway segments between the two dead-end roads in Alternative 1 is estimated to be $6,222,100 with street trees and landscaping and $6,100,500 without the street trees. The total cost of improvements with both Alternative #1 and #2 would be $9,217,800 with street trees and $9,089,800 without.

6.3 Transportation Alternative 3

6.3.1 Intersection Improvements

Table 14 presents a summary of 2045 AM and PM peak hour traffic operations for various improvement options at the intersection of SR 155 with Dayton Street. As noted in Chapter 5, this intersection would be adversely impacted by the development of industrial and/or commercial retail uses on the East Omak Industrial site.

As shown in the table, the anticipated future operational problem at the intersection of SR 155 with Dayton Street can be resolved successfully through either installation of a traffic signal or a roundabout. Intersection operations analysis worksheets are included in **Appendix E**.

Table 14. Intersection Improvements for Transportation Alternative 3

		2045 Baseline		2045 Alternative 3	
		AM Peak	PM Peak	AM Peak	PM Peak
Intersection	Control Type	LOS (Delay)^2	LOS (Delay)^2	LOS (Delay)^2	LOS (Delay)^2
SR 155 at Dayton Street	Existing TWSC[1]	C (24.6)	F (72.3)	D (26.5)	F (94.8)
	Signal	A (9.1)	A (9.8)	A (9.5)	B (10.0)
	Roundabout	A (6.0)	A (6.6)	A (6.0)	A (6.7)

1. Two-Way Stop-Control
2. Worst movement at unsignalized intersections.

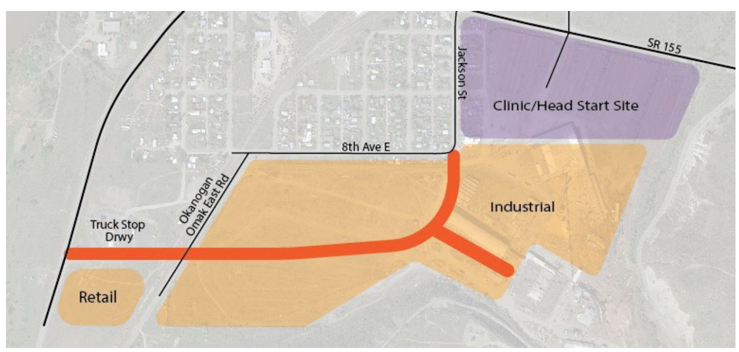
6.3.2 Signal Warrant Analysis

To support the installation of a traffic signal at the intersection of SR 155 with Dayton Street, an assessment of peak hour warrants was conducted. This analysis is documented in **Appendix F** and shows that a signal would be warranted based on projected 2045 PM peak hour volumes.

6.3.3 Safety Considerations

As noted under the discussion of Alternative 1, no significant safety problems were identified at study area intersections and no safety improvements to address existing problems are needed. Consideration of transportation safety related to the project focused on the multimodal network.

6.3.4 Recommended Roadway Improvements



As described earlier in this report and illustrated in Figure 14, the internal site roadway improvements would provide a complete connection across the site from the 8th Avenue/Jackson Street intersection on the north to a new intersection on Okanogan/Omak East Road on the west and would continue west across the existing railroad tracks to connect directly with SR 20. These roadways would include a 28-foot curb-to-curb width, and 12-foot shared-use pathways along both sides with a 4-foot buffer. A total of 1,625 additional linear feet of roadway would be developed with this alternative. This improvement would also include an at-grade crossing of the railroad with appropriate gates and signals and a 66-foot level area at the crossing to accommodate large trucks.

A planning level cost estimate has been prepared for this alternative which is documented in greater detail in **Appendix G**. The added cost of these roadways segments is estimated to be $2,362,700 without street trees and landscaping. The total cost of improvements with Alternatives #1, #2, and #3 would be $11,580,500 with street trees and $11,452,500 without.

6.4 Off-Site Transportation Improvements

6.4.1 Intersections

As noted above, the project would add traffic to and adversely affect the intersection of SR 155 (Omak Avenue) with Dayton Street. Cost estimates prepared for improvement options at this location include:

- Installation of a traffic signal - $1,000,000
- Installation of a roundabout - $2,100,000 (this improvement may require additional right of way acquisition which would be determined based on greater engineering design detail. See graphic in Appendix G for draft illustration)

It should be noted that this intersection is expected to drop to LOS F operations for side street traffic without the development of the East Omak Industrial site, so the project should not be fully responsible for improving this location. It should also be noted that these improvements would include pedestrian enhancements that would improve non-motorized safety for travel between the community south of SR 155 and the park to the north. The need for and timing of this improvement should be reconfirmed over time as the project site develops through project-specific traffic impact analyses.

6.4.2 Multimodal Improvements

To enhance multimodal access and circulation for the East Omak Industrial site, the following improvements are recommended:

- Installation of improved pedestrian crossings on SR 155 at Garfield and Hanford Streets to serve the East Omak Elementary School. Improvements would include RRFBs at both crossings and high reflective striping for the crossings. The planning level cost of these improvements is estimated to be $146,100 This improvement is currently included for Garfield Street in the City's Six Year TIP. Consideration could also be given to speed zoning with appropriate signage.

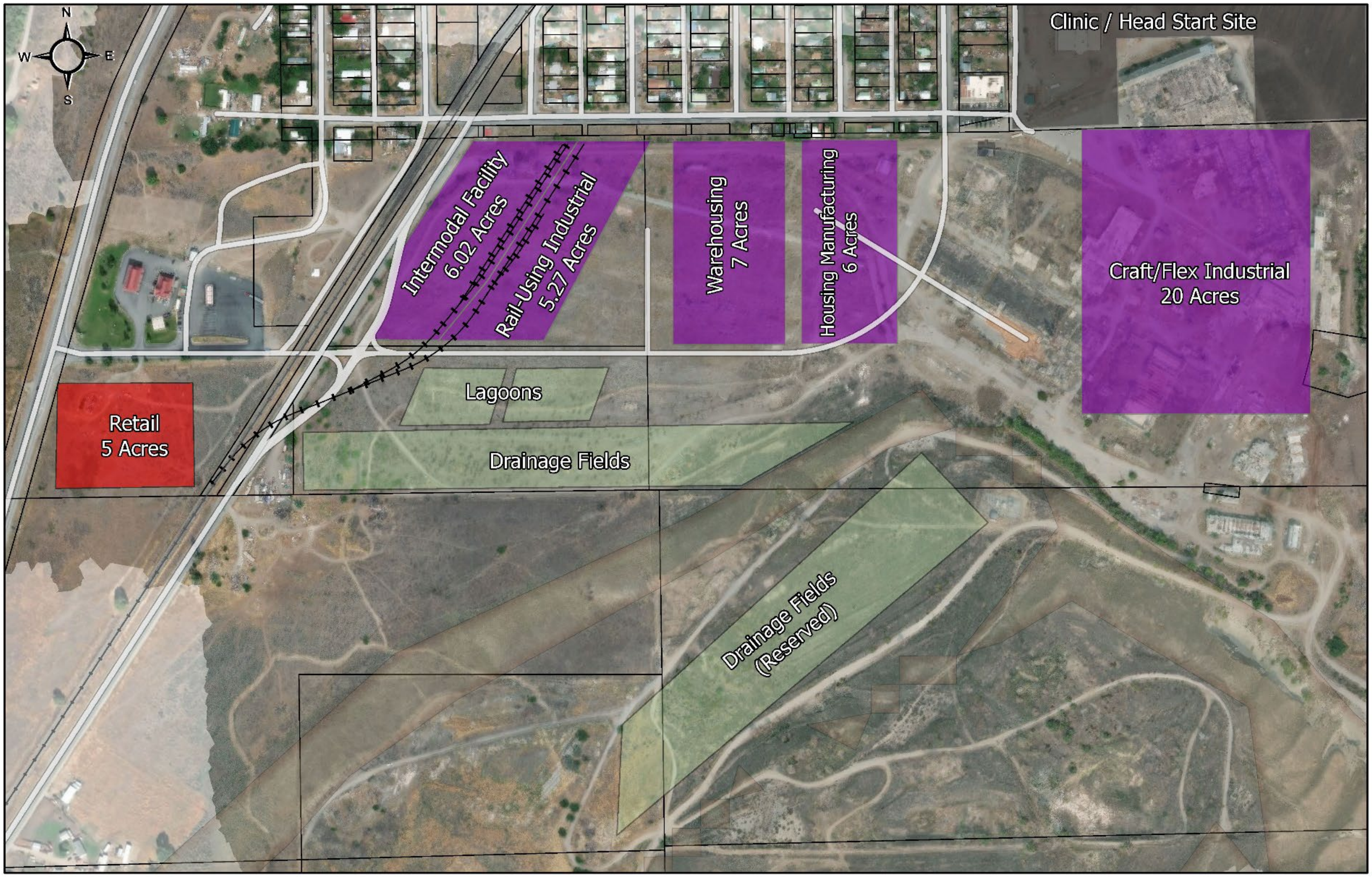
- Installation of 5-foot sidewalks on both sides on both sides of Jackson Street where they presently do not exist between SR 155 and 8th Avenue. The estimated planning level cost for this improvement would be $1,576,600

6.5 Rail System Improvements

Section 2.8 in Chapter 2 describes the existing rail system serving Omak and the East Omak Industrial site. The Cascade and Columbia River (CSCD) short-line railroad operates out of the Omak yard to the north of the project site to build up the train going south. The former mill track industrial spur connects with the CSCD just south of 8th Avenue off a Right-Hand turnout and drops several feet to intersect with Okanogan/Omak East Road. East of the road, the mill track has largely been removed but formerly followed the northern portion of the site rising to the east at a 1.6% grade. The site in general follows this same 1.6% rise. This configuration allowed the railroad to pull cars from the site and shove north across 8th Avenue into the yard.

The proposed rail concept for the East Omak Industrial site is illustrated in **Figure 27**. The concept would place two rail-served industries (an intermodal yard and a rail-industrial use) on the west side of the site to the north of the proposed east/west site access road (Jackson Street Extension). On-site rail would be located between these two uses, and would generally follow the existing north/south-oriented site

Figure 27. East Omak Industrial Site and Transportation Network



contours. This location requires the least track elevation raise from the main line and aligns the tracks with the contours to allow for minimal site grading. The two industrial uses would be located adjacent to each other with the rail configured such that the track crossings are merged into a single double-track road crossing of the internal site road. A turnout was placed off the CSCD main south of the new access road (Jackson Street Extension) that intersects the Okanogan/Omak East Road in the far southwest corner of the property. The rail alignment would then parallel Okanogan/Omak East Road as it curves up to the two industrial uses. This reduces the impact on the usable footprint of the overall site. The existing spur worked well as a lead-up to the old mill, but it would be difficult to place spurs and facilities on a 1.6% grade. Additionally, it would vastly increase the amount of site grading to replace a rail track along the former track alignment to serve an intermodal facility and/or rail industrial use.

As the two industrial uses would be located close together, this would allow for a single lead for the majority of the distance. In addition, the ability to extend a future lead could be provided to the east for future development if rail access is required. The two industrial uses are placed around 13 feet above the existing CSCD main lead elevation. The CSCD main is running at about a 0.33% grade. The lead would need to rise about 13 feet over approximately 830 feet at a 1.5% grade before crossing the road. This configuration minimizes site grading and places the rail in opportunistic locations for facility development. The design utilizes a 136RE, No. 11 turnout from the mainline with 115RE No. 9 turnouts within the facility. The rail through the mainline crossing would be 136RE and the facility rail would be 115RE rail. The mainline crossing and No. 11 turnout would be constructed by a contractor selected by the CSCD and involve a separate design contract from the facility that would include the crossing signal design. This would need both a Preliminary Engineering Agreement and a Construction and Maintenance Agreement to fund the CSCD efforts.

The first rail-dependent land use on the western side of the property would place two tracks at 15-foot spacing for an intermodal facility. The property provides about 250 feet of storage space and access roads west of the tracks. The track capacity is 740 feet of clear distance on both tracks which provides for 28 53-foot container cars. The concept would utilize reach stackers to access both tracks. It's also possible to use gantry cranes, although it may be easier to store and stack on a small footprint with the reach stackers. The site grading is minimized by the tracks running parallel to the contours.

The second rail-dependent use would be just east of the intermodal facility and would be served by a single spur along the west side of the property. The intent is to place the spur along the back side of an industrial facility such that either box cars can be unloaded from a raised dock or bulk materials can be removed by piping or pits. This spur could also serve multiple buildings by providing additional spurs parallel to the primary.

The CSCD would pull cars south out of the Omak yard and shove them onto the new lead setting them on the specific industry spur. The CSCD would have the ability to pull cars for both facilities and shove them onto the site. This would temporarily block the main facility road (Jackson Street Extension) as the switching move is performed. For instance, the CSCD would shove a string of cars onto one of the intermodal tracks and then pull the train back to shove the remainder on the other track. This switching move would most likely block the road for 15-20 minutes once or twice a week. Outbound trains would be similar in that the CSCD would pull a string from one track and shove it back onto the other to form a single string of cars. They would then pull them south onto the mainline and shove them into the Omak yard. The blockages should occur only a couple of times a week and be minor and short in duration. With alternate access to the industrial park via Jackson Street, this shouldn't be a significant issue.

The CSCD mainline would have a new 28-foot wide at-grade road crossing with multi-use paths on both sides of the road. This would be constructed using twelve 9-foot HD concrete panels to span to the outside of the paths. The paths would be configured to provide a crossing perpendicular but slightly skewed to the track. We would recommend an active crossing be installed utilizing automated gates with flashing lights. The multi-use paths would utilize tactile strips warning of the upcoming crossing and signage involving a MUTCD reduced size crossbucks, yield, and look signs per MUTCD Figure 9B-1.

The lead track and internal spur crossings would have passive crossings utilizing concrete panels and crossbucks and yield signs. This is because the train length is short, will be operating at a slow speed, and will involve CSCD personnel to flag the train across the roadway. All crossings would provide Advance Warning Signs and Advance Warning Pavement Markers on the road approaches.

The CSCD would be interested in additional shipping in the Omak area, and permitting would be fairly straightforward. The process would involve the preparation of a concept master plan that would be reviewed with the regional Manager of Maintenance and the national Director of Engineering. Following this review, the specific design would be developed for each industry and each plan submitted to the CSCD and their parent railroad Genesee & Wyoming Railroad (GWRR). The project would follow GWRR industrial track guidelines and be adjusted per the review comments from the GWRR. The crossings would need Washington State PUD approvals.

7 Summary and Conclusions

The chapter presents an overview and summary of the transportation infrastructure needs associated with the East Omak Industrial site. Included in the discussion are both on-site improvements that can be constructed in stages as funding is available, and off-site investments to address potential future mitigation.

Table 15 presents each proposed project including the project location (or name), project limits, a description of the activities to be undertaken, the relationship of the project to the timing of site development, and estimated costs. Details related to cost estimation are included in **Appendix G.** Key assumptions in the development of the cost estimates include:

- All costs are presented in 2023 dollars.
- Contingency is estimated at 30 percent to reflect the extent of unknowns at the planning level. This contingency could cover any changes in stormwater design or other project elements such as additional signage, roadway delineation, driveways, etc.
- Stormwater piping is based on the length of the roadway. Catch basin type 1 is assumed every 150 feet and catch basin type 2 every 500 feet.
- Bioretention would occur in the planter strip
- Rail cost estimates assume prevailing wages for the construction of the CSCD track elements while the industrial trackage does not include this.

As shown in the table, the total cost of needed on-site transportation infrastructure would be about $17,393,400 in 2023 dollars. This breaks down into discrete projects including three potential phases of internal site roadways and internal site rail (including a spur track from the existing north/south Cascade and Columbia River railroad and trackage associated with a proposed intermodal terminal). The total cost of on-site internal roads is $11,580,500 and $5,812,900 for internal rail.

The table also includes costs for various off-site transportation improvements to address potential congestion or safety issues associated with project development. These include improvements to address congestion at the intersection of SR 155 (Omak Avenue) with Dayton Street and safety projects on SR 155 at Garfield and Hanford Streets and along Jackson Avenue. The total cost of the off-site improvements could range from a low of $2,723,000 to a high of $3,823,000, depending on whether a traffic signal or a roundabout is installed at the intersection of SR 155 with Dayton Street. It should be noted that the project does not bear sole responsibility for the expected future congestion at this intersection as it would see poor levels of service even without the project. Additionally, it should be noted that the City of Omak is currently planning to make school safety improvements at the intersection of SR 155 at Garfield Street. The project could further enhance school safety by making similar improvements at the Hanford Street intersection.

Table 15. Transportation Infrastructure Improvements

Location	Limits	Description	Timing	Estimated Cost
Internal Street System				
Jackson Street Extension	East of Okanogan/ Omak East Road, and south of 8th Avenue	Construct a total of 1,400 LF of the new industrial road with shared-use paths, but no street trees	To serve initial development activity on the west and east ends of the project site	$ 2,995,700
		Without street trees		$ 2,989,300
Jackson Street Thoroughfare	Between two segments of the Jackson Street Extension	Construct an additional 2,840 LF of the new industrial road with shared-use paths to connect initial roadway extension access to east and west portions of the site, no street trees	To serve later development stages more central to the site, or to provide a complete connection for the entire site	$ 6,222,100
		Without street trees		$ 6,100,500
SR 20 Connection	SR 20 to Okanogan/Omak East Road	Construct an additional 1,625 LF of new industrial roadway with shared-use paths to connect the project site with SR 20. Includes at-grade railroad crossing but no street trees	To serve later stages as the project site develops to enhance access to/from the regional transportation network	$ 2,362,700
			ON-SITE TOTALS (with street trees)	**$11,580,500**
Off-Site Improvements				
SR 155 at Dayton Street	Intersection	Install a traffic signal and enhance pedestrian crossings	To address traffic operational impacts	$ 1,000,000
		Install a roundabout and enhance pedestrian crossings	To address traffic operational impacts	$ 2,100,000
Jackson Street	SR 155 to the project site	Install 2,125 LF of 5-foot wide sidewalks to enhance pedestrian safety on this site truck access route	To serve the initial development stage as truck traffic increases	$ 1,576,600
SR 155 at Garfield and Hanford Streets	Intersections serving East Omak Elementary School	RRFBs at the crossings with Garfield and restriping the crosswalks	To serve the initial development stage as truck traffic increases. Coordinate with City TIP project.	$ 146,100
			RANGE FOR OFF-SITE TOTALS	**$2,723,000 to $3,823,000**
Railroad Spur	Mainline to the project site	Install 3,600 LF of new rail trackage to serve the proposed intermodal facility and rail-industrial site including crossing protection	Develop as opportunities arise for intermodal transfers and the need for rail access occurs	$ 5,812,900

RANGE FOR GRAND TOTALS	**$20,116,000 to $21,216,000**

Appendix A

Traffic Volume Counts

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

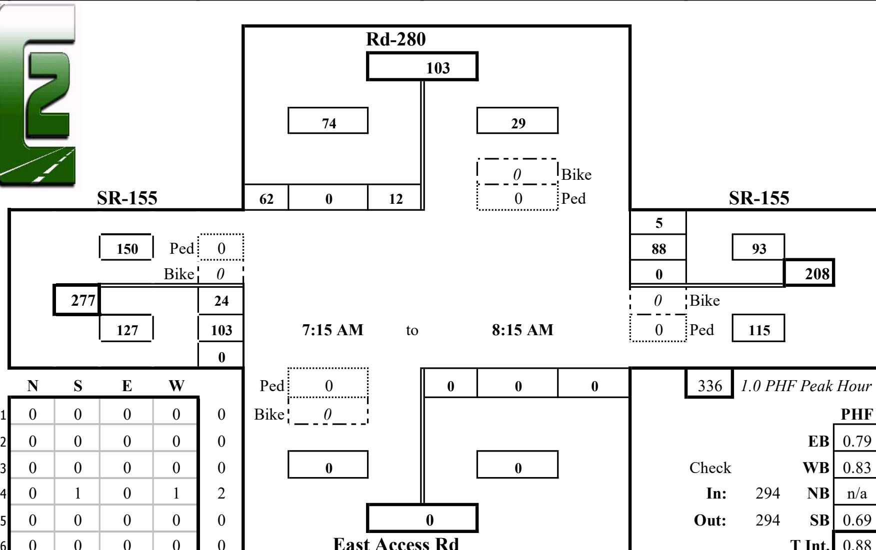
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Rd-280/East Access Rd & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) Rd-280				From South on (NB) East Access Rd				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:15 A	0	5	1	9	0	0	1	1	2	0	6	0	0	4	17	0	44
6:30 A	0	3	0	5	0	0	0	0	1	0	9	0	2	6	26	0	49
6:45 A	0	4	0	11	0	0	0	0	0	0	10	0	0	6	17	0	48
7:00 A	0	4	0	8	0	0	0	0	0	0	8	0	1	4	23	0	47
7:15 A	1	0	0	17	0	0	0	0	0	0	9	1	1	2	27	0	56
7:30 A	2	7	0	20	0	0	0	0	2	0	17	0	3	2	38	0	84
7:45 A	1	0	0	18	0	0	0	0	0	0	22	2	3	7	30	0	79
8:00 A	0	4	0	14	0	0	0	0	1	0	26	2	0	7	13	0	66
8:15 A	0	1	0	10	0	0	0	0	2	0	23	1	0	8	22	0	65
8:30 A	0	0	0	14	0	0	0	0	1	0	20	0	1	10	16	0	60
8:45 A	0	1	0	12	0	0	0	0	0	0	12	2	0	7	18	0	52
9:00 A	0	1	0	11	0	0	0	0	0	0	19	2	1	9	12	0	54
Total Survey	4	30	1	149	0	0	1	1	9	0	181	10	12	72	259	0	704
	Peak Hour: 7:15 AM to 8:15 AM																
Total	3	12	0	62	0	0	0	0	5	0	88	5	6	24	103	0	294
Approach	74				0				93				127				294
%HV	4.1%				n/a				5.4%				4.7%				4.8%
PHF	0.69				n/a				0.83				0.79				0.88



336 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.79	4.7%
WB	0.83	5.4%
NB	n/a	n/a
SB	0.69	4.1%
T Int.	0.88	4.8%

Check
In: 294
Out: 294

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	1	0	1	2
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	1	0	0	1
INT 12	0	0	0	0	0
	0	2	0	1	3

Bicycles From:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Special Notes

Prepared for: **SCJ Alliance**

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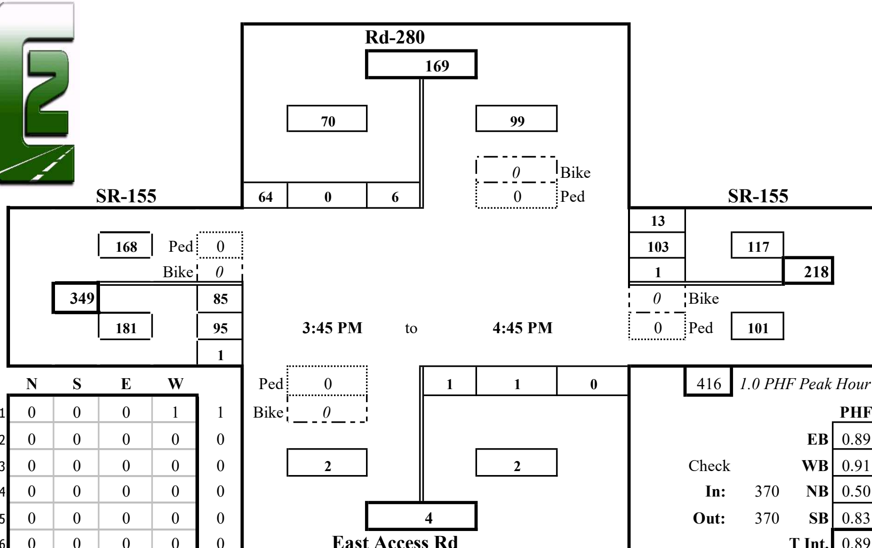
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
2:15 P	0	4	0	19	0	0	0	0	1	0	19	2	1	11	34	0	89
2:30 P	0	1	0	14	0	0	0	1	2	0	24	2	0	17	16	1	76
2:45 P	0	2	0	13	0	0	0	0	4	0	30	2	0	18	11	0	76
3:00 P	0	3	0	17	0	0	0	0	0	0	15	3	0	16	17	0	71
3:15 P	0	3	0	21	0	2	0	0	3	0	28	2	3	25	20	1	102
3:30 P	0	2	0	15	0	0	0	0	3	0	29	4	0	15	17	0	82
3:45 P	0	3	0	18	0	0	0	0	0	0	24	1	3	19	21	0	86
4:00 P	1	4	0	15	0	0	0	0	1	0	23	1	1	21	20	0	84
4:15 P	1	0	0	21	0	0	0	0	1	0	26	6	0	25	26	0	104
4:30 P	0	1	0	20	0	1	0	0	0	1	27	3	2	14	23	1	91
4:45 P	0	1	0	8	0	0	1	0	2	0	27	3	1	25	26	0	91
5:00 P	0	0	0	19	0	0	0	0	0	0	33	2	0	11	16	0	81
Total Survey	2	24	0	200	0	3	1	1	17	1	305	31	11	217	247	3	1033
Peak Hour: 3:45 PM to 4:45 PM																	
Total	2	6	0	64	0	1	1	0	4	1	103	13	4	85	95	1	370
Approach	70				2				117				181				370
%HV	2.9%				n/a				3.4%				2.2%				2.7%
PHF	0.83				0.50				0.91				0.89				0.89



416 *1.0 PHF Peak Hour Volume*

PEDs Across:	N	S	E	W	
INT 01	0	0	0	1	1
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	0	0	1	1

Special Notes

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

		PHF	%HV
	EB	0.89	2.2%
Check	WB	0.91	3.4%
In: 370	NB	0.50	n/a
Out: 370	SB	0.83	2.9%
	T Int.	0.89	2.7%

Conditions:

Prepared for: **SCJ Alliance**

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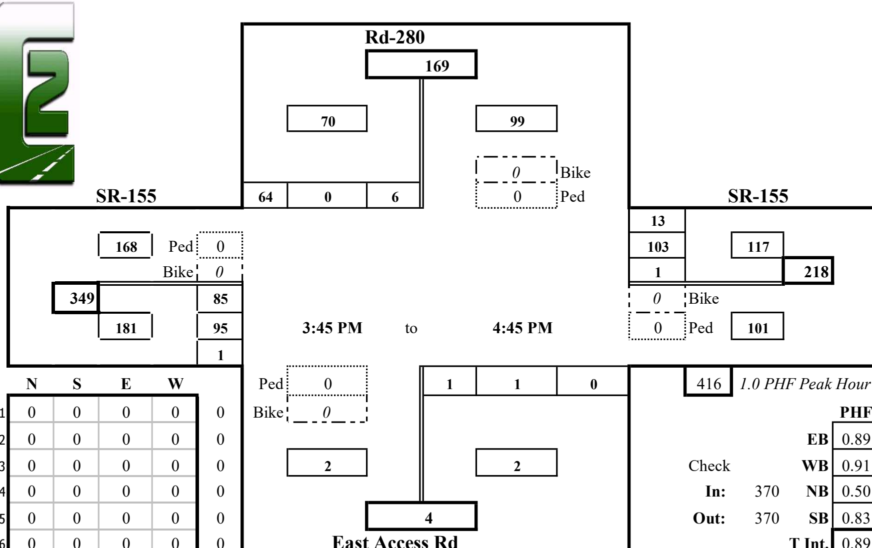
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:15 P	0	3	0	21	0	2	0	0	3	0	28	2	3	25	20	1	102
3:30 P	0	2	0	15	0	0	0	0	3	0	29	4	0	15	17	0	82
3:45 P	0	3	0	18	0	0	0	0	3	0	24	1	3	19	21	0	86
4:00 P	1	4	0	15	0	0	0	0	0	0	23	1	1	21	20	0	84
4:15 P	1	0	0	21	0	0	0	0	1	0	26	6	0	25	26	0	104
4:30 P	0	1	0	20	0	1	0	0	1	1	27	3	2	14	23	1	91
4:45 P	0	1	0	8	0	0	1	0	0	0	27	3	1	25	26	0	91
5:00 P	0	0	0	19	0	0	0	0	2	0	33	2	0	11	16	0	81
5:15 P	1	1	0	19	0	0	0	0	1	0	27	4	2	14	26	0	91
5:30 P	1	4	0	18	0	0	0	0	0	0	30	5	2	15	17	0	89
5:45 P	0	0	0	21	0	0	0	0	1	0	35	6	0	20	17	0	99
6:00 P	0	0	0	24	0	0	0	0	0	0	23	0	2	12	14	0	73
Total Survey	4	19	0	219	0	3	1	0	15	1	332	37	16	216	243	2	1073
	Peak Hour: 3:45 PM to 4:45 PM																
Total	2	6	0	64	0	1	1	0	2	1	103	13	4	85	95	1	370
Approach	70				2				117				181				370
%HV	2.9%				n/a				1.7%				2.2%				2.2%
PHF	0.83				0.50				0.91				0.89				0.89



416 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.89	2.2%
WB	0.91	1.7%
NB	0.50	n/a
SB	0.83	2.9%
T Int.	0.89	2.2%

Check
In: 370
Out: 370

Conditions:

PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	2	0	0	2
INT 12	0	0	0	0	0
	0	2	0	0	2

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Special Notes

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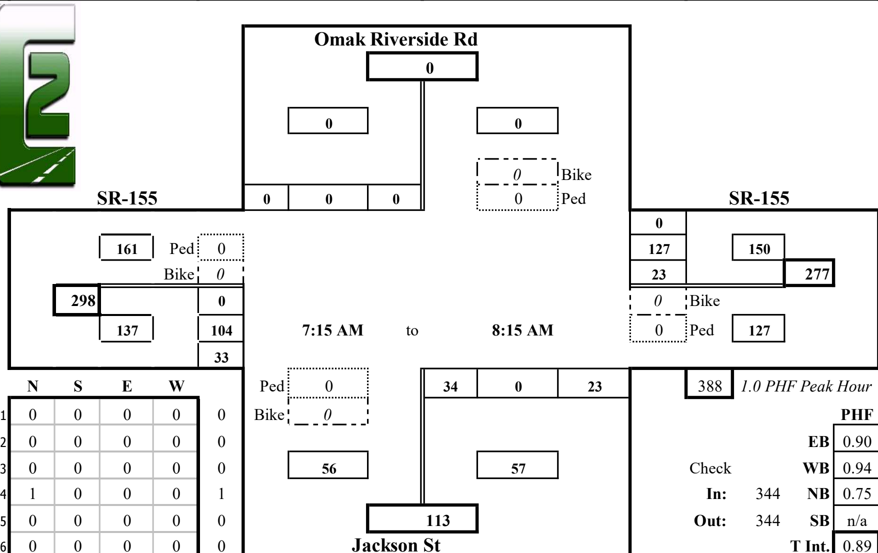
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Omak Riverside Eastside Rd/Jackson St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) Omak Riverside Rd				From South on (NB) Jackson St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:15 A	0	0	0	0	0	1	0	4	1	3	12	0	0	0	17	4	41
6:30 A	0	0	0	0	0	0	0	3	1	2	12	0	2	0	29	2	48
6:45 A	0	0	0	0	0	3	0	3	1	4	17	0	0	0	20	5	52
7:00 A	0	0	0	0	1	7	0	4	0	2	14	0	0	0	23	4	54
7:15 A	0	0	0	0	0	4	0	5	1	2	24	0	3	0	24	3	62
7:30 A	0	0	0	0	1	9	0	7	3	3	34	0	4	0	33	5	91
7:45 A	0	0	0	0	0	12	0	7	1	8	32	0	3	0	30	8	97
8:00 A	0	0	0	0	0	9	0	5	1	9	31	0	0	0	15	11	80
8:15 A	0	0	0	0	0	4	0	4	2	3	30	0	0	0	26	9	76
8:30 A	0	0	0	0	0	6	0	3	1	6	28	0	1	0	23	4	70
8:45 A	0	0	0	0	0	9	0	4	0	6	18	0	0	0	21	7	65
9:00 A	0	0	0	0	0	5	0	4	0	3	27	0	1	0	17	5	61
Total Survey	0	0	0	0	2	69	0	53	12	51	279	0	14	0	278	67	797
Peak Hour: 7:15 AM to 8:15 AM																	
Total	0	0	0	0	1	34	0	23	7	23	127	0	7	0	104	33	344
Approach	0				57				150				137				344
%HV	n/a				1.8%				4.7%				5.1%				4.4%
PHF	n/a				0.75				0.94				0.90				0.89



388 *1.0 PHF Peak Hour Volume*

PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	1	0	0	0	1
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	1	0	0	0	1
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	2	0	0	0	2

Special Notes

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

	PHF	%HV
EB	0.90	5.1%
WB	0.94	4.7%
NB	0.75	1.8%
SB	n/a	n/a
T Int.	0.89	4.4%

Check
In: 344
Out: 344

Conditions:

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

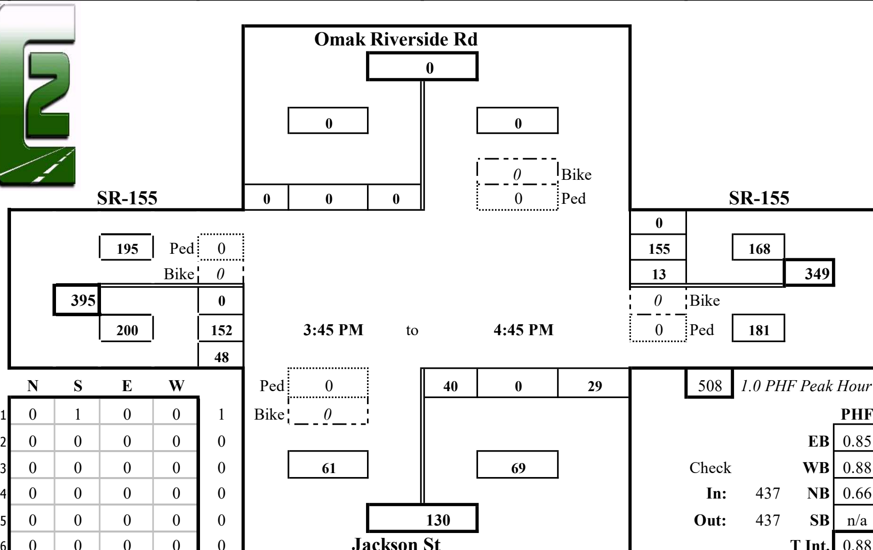
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Omak Riverside Eastside Rd/Jackson St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) Omak Riverside Rd				From South on (NB) Jackson St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
2:15 P	0	0	0	0	0	3	0	6	1	7	31	0	1	0	39	10	96
2:30 P	0	0	0	0	0	9	0	5	2	3	35	0	0	0	29	10	91
2:45 P	0	0	0	0	0	9	0	9	4	5	38	0	0	0	20	11	92
3:00 P	0	0	0	0	0	12	0	6	0	4	28	0	0	0	27	5	82
3:15 P	0	0	0	0	1	14	0	7	3	5	46	0	3	0	39	16	127
3:30 P	0	0	0	0	0	14	0	3	1	6	38	0	1	0	30	15	106
3:45 P	0	0	0	0	3	14	0	6	3	5	37	0	1	0	34	7	103
4:00 P	0	0	0	0	0	7	0	8	1	4	34	0	1	0	33	11	97
4:15 P	0	0	0	0	1	12	0	14	2	5	42	0	1	0	37	14	124
4:30 P	0	0	0	0	0	12	0	2	1	2	46	0	2	0	36	10	108
4:45 P	0	0	0	0	2	9	0	5	0	2	33	0	0	0	46	13	108
5:00 P	0	0	0	0	0	3	0	4	2	10	42	0	0	0	23	8	90
Total Survey	0	0	0	0	7	118	0	75	20	58	450	0	10	0	393	130	1224
	Peak Hour: 3:45 PM to 4:45 PM																
Total	0	0	0	0	3	40	0	29	4	13	155	0	4	0	152	48	437
Approach	0				69				168				200				437
%HV	n/a				4.3%				2.4%				2.0%				2.5%
PHF	n/a				0.66				0.88				0.85				0.88



508 *1.0 PHF Peak Hour Volume*

PEDs Across:	N	S	E	W	
INT 01	0	1	0	0	1
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	1	0	0	1

Special Notes

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	1	1
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	0	0	1	1

Check			PHF	%HV
		EB	0.85	2.0%
		WB	0.88	2.4%
In:	437	NB	0.66	4.3%
Out:	437	SB	n/a	n/a
		T Int.	0.88	2.5%

Conditions:

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

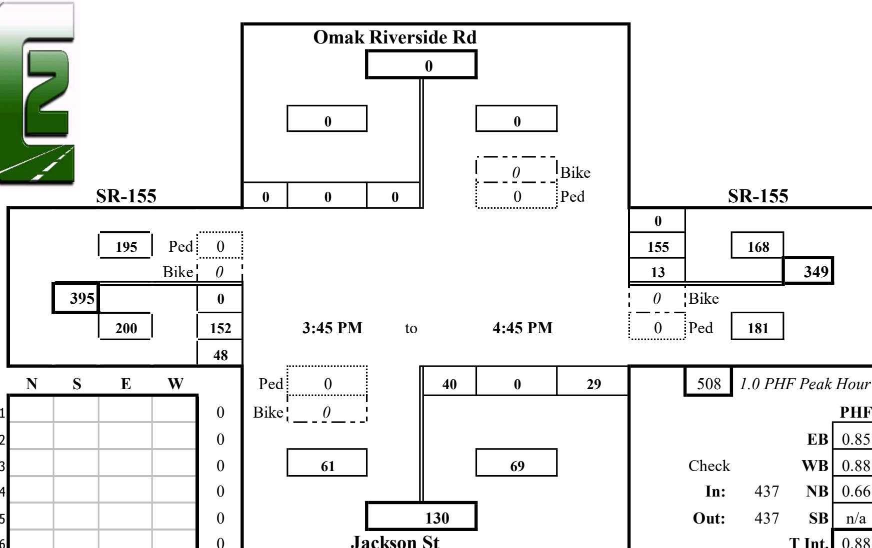
WBE/DBE

Intersection: Omak Riverside Eastside Rd/Jackson St & SR-155
Location: Omak, Washington
Date of Count: Thu 04/13/2023
Checked By: Jen

Time Interval Ending at	From North on (SB) Omak Riverside Rd				From South on (NB) Jackson St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:15 P	0	0	0	0	0	14	0	7	3	5	46	0	3	0	39	16	127
3:30 P	0	0	0	0	1	14	0	3	1	6	38	0	1	0	30	15	106
3:45 P	0	0	0	0	0	14	0	6	3	5	37	0	1	0	34	7	103
4:00 P	0	0	0	0	3	7	0	8	1	4	34	0	1	0	33	11	97
4:15 P	0	0	0	0	0	12	0	14	2	5	42	0	1	0	37	14	124
4:30 P	0	0	0	0	1	12	0	2	1	2	46	0	2	0	36	10	108
4:45 P	0	0	0	0	0	9	0	5	0	2	33	0	0	0	46	13	108
5:00 P	0	0	0	0	2	3	0	4	2	10	42	0	0	0	23	8	90
5:15 P	0	0	0	0	2	5	0	7	2	6	40	0	2	0	33	7	98
5:30 P	0	0	0	0	0	8	0	3	0	9	39	0	2	0	29	7	95
5:45 P	0	0	0	0	0	10	0	10	0	3	53	0	0	0	27	9	112
6:00 P	0	0	0	0	0	13	0	3	0	4	44	0	2	0	23	6	93
Total Survey	0	0	0	0	9	121	0	72	15	61	494	0	15	0	390	123	1261

Peak Hour: 3:45 PM to 4:45 PM

	SB T	SB L	SB S	SB R	NB T	NB L	NB S	NB R	WB T	WB L	WB S	WB R	EB T	EB L	EB S	EB R	Interval Total
Total	0	0	0	0	4	40	0	29	4	13	155	0	4	0	152	48	437
Approach	0				69				168				200				437
%HV	n/a				5.8%				2.4%				2.0%				2.7%
PHF	n/a				0.66				0.88				0.85				0.88



	PHF	%HV
EB	0.85	2.0%
WB	0.88	2.4%
NB	0.66	5.8%
SB	n/a	n/a
T Int.	0.88	2.7%

Check
In: 437
Out: 437

Conditions:

PEDs Across:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Special Notes

Bicycles From:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	1	1
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	0	0	1	1

Prepared for: **SCJ Alliance**

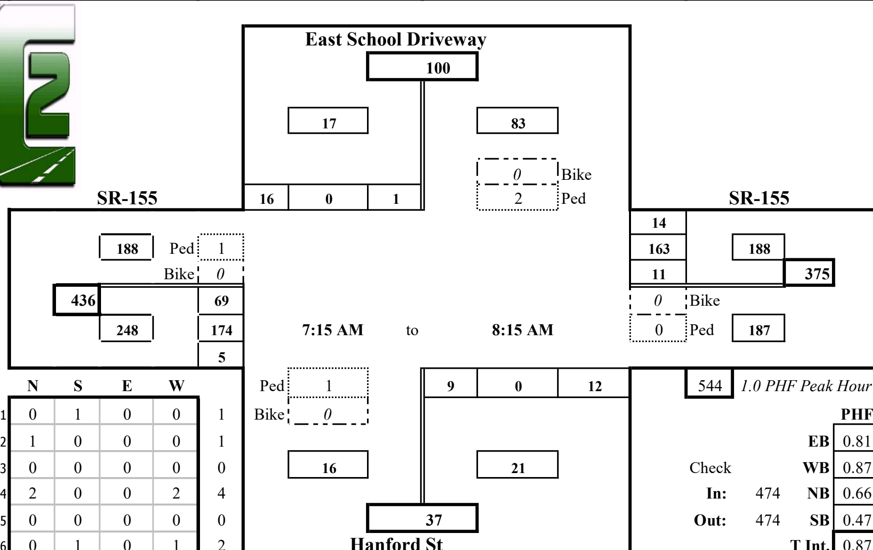
Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: East School Driveway/Hanford St & SR-155 **Date of Count:** Thu 04/13/2023
Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) East School Driveway T	L	S	R	From South on (NB) Hanford St T	L	S	R	From East on (WB) SR-155 T	L	S	R	From West on (EB) SR-155 T	L	S	R	Interval Total
6:15 A	0	0	0	0	0	0	0	5	1	1	13	0	0	0	18	0	37
6:30 A	0	0	0	0	0	2	0	3	1	1	10	0	2	1	30	3	50
6:45 A	0	0	0	1	0	0	0	5	0	4	18	0	0	8	27	2	65
7:00 A	0	0	0	0	0	0	0	4	0	3	19	0	0	1	28	1	56
7:15 A	0	0	0	0	0	1	1	7	0	4	25	0	3	6	33	1	78
7:30 A	0	0	0	1	2	1	0	7	3	3	36	4	6	17	41	2	112
7:45 A	8	0	0	9	0	3	0	3	1	2	37	5	8	23	53	1	136
8:00 A	3	1	0	5	1	4	0	0	1	3	46	5	5	19	41	2	126
8:15 A	0	0	0	1	0	1	0	2	2	3	44	0	2	10	39	0	100
8:30 A	0	0	0	0	0	0	0	3	2	2	41	2	1	1	22	1	72
8:45 A	0	0	0	0	1	1	0	3	1	3	33	0	3	1	28	3	72
9:00 A	1	0	0	1	0	2	0	4	2	2	38	0	1	1	22	3	73
Total Survey	12	1	0	18	4	15	1	46	14	31	360	16	31	88	382	19	977
	Peak Hour: 7:15 AM to 8:15 AM																
Total	11	1	0	16	3	9	0	12	7	11	163	14	21	69	174	5	474
Approach	17				21				188				248				474
%HV	64.7%				14.3%				3.7%				8.5%				8.9%
PHF	0.47				0.66				0.87				0.81				0.87



544 *1.0 PHF Peak Hour Volume*

PEDs Across:	N	S	E	W	
INT 01	0	1	0	0	1
INT 02	1	0	0	0	1
INT 03	0	0	0	0	0
INT 04	2	0	0	2	4
INT 05	0	0	0	0	0
INT 06	0	1	0	1	2
INT 07	0	0	0	0	0
INT 08	2	0	0	0	2
INT 09	0	0	0	0	0
INT 10	1	1	0	1	3
INT 11	0	0	0	0	0
INT 12	0	1	0	0	1
	6	4	0	4	**14**

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

		PHF	%HV
	EB	0.81	8.5%
Check	WB	0.87	3.7%
In: 474	NB	0.66	14.3%
Out: 474	SB	0.47	64.7%
	T Int.	0.87	8.9%

Conditions:

Special Notes

SCJ23038TM_03A

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

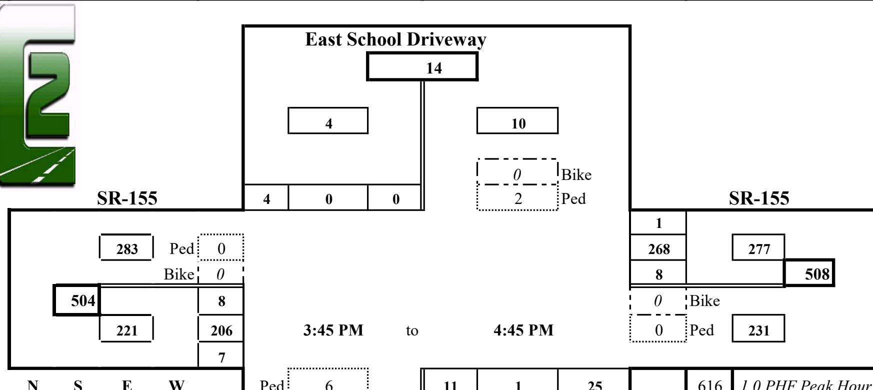
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: East School Driveway/Hanford St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) East School Driveway				From South on (NB) Hanford St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
2:15 P	0	0	0	2	0	0	0	2	2	3	30	0	2	1	51	1	90
2:30 P	0	0	0	1	0	3	0	5	2	2	42	0	0	2	46	3	104
2:45 P	0	0	0	1	1	6	1	6	4	3	56	2	0	7	30	0	112
3:00 P	0	0	0	2	0	4	0	5	0	1	43	1	9	2	36	2	96
3:15 P	10	3	0	16	0	1	0	3	3	4	61	2	6	6	56	2	154
3:30 P	1	3	0	2	0	2	0	8	2	5	53	0	1	3	46	0	122
3:45 P	0	0	0	4	1	3	0	5	5	2	46	0	1	1	51	1	113
4:00 P	0	0	0	1	0	4	0	5	2	4	67	0	1	1	49	2	133
4:15 P	0	0	0	1	0	0	0	5	2	3	80	1	3	1	51	3	145
4:30 P	0	0	0	0	0	5	1	8	1	1	65	0	2	3	49	1	133
4:45 P	2	0	0	2	0	2	0	7	1	0	56	0	3	3	57	1	128
5:00 P	0	0	0	3	0	4	0	3	1	0	48	0	0	0	31	1	90
Total Survey	13	6	0	35	2	34	2	62	25	28	647	6	28	30	553	17	1420
	Peak Hour: 3:45 PM to 4:45 PM																
Total	2	0	0	4	0	11	1	25	6	8	268	1	9	8	206	7	539
Approach	4				37				277				221				539
%HV	50.0%				n/a				2.2%				4.1%				3.2%
PHF	0.50				0.66				0.82				0.91				0.93



PEDs Across:	N	S	E	W	
INT 01	0	1	0	0	1
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	1	1	0	4	6
INT 06	0	3	1	4	8
INT 07	1	0	0	0	1
INT 08	2	3	0	0	5
INT 09	0	0	0	0	0
INT 10	0	1	0	0	1
INT 11	0	2	0	0	2
INT 12	1	2	0	0	3
	5	13	1	8	27

	PHF	%HV
EB	0.91	4.1%
WB	0.82	2.2%
NB	0.66	n/a
SB	0.50	50.0%
T Int.	0.93	3.2%

Check

In: 539

Out: 539

Conditions:

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	1	0	0	1
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	1	0	0	1

Special Notes

Prepared for: **SCJ Alliance**

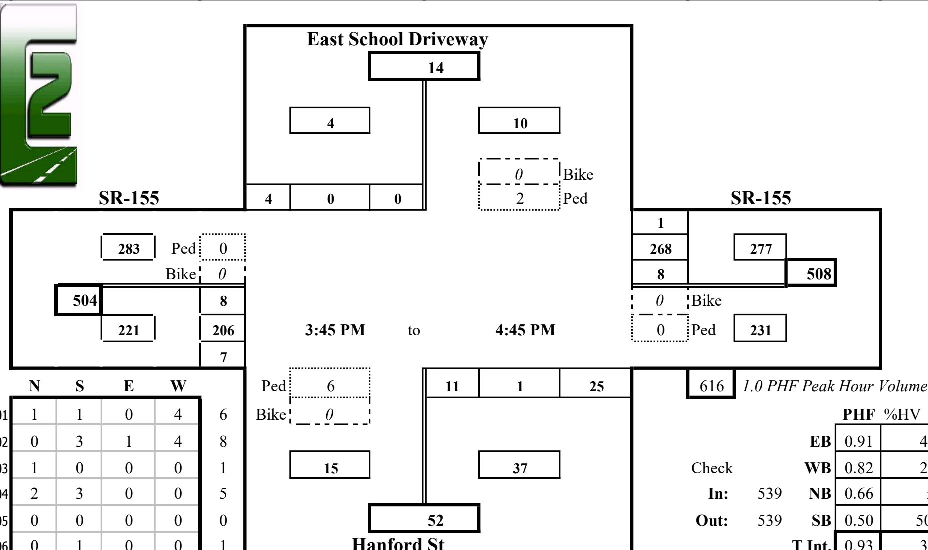
Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: East School Driveway/Hanford St & SR-155 **Date of Count:** Thu 04/13/2023
Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) East School Driveway				From South on (NB) Hanford St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:15 P	10	3	0	16	0	1	0	3	3	4	61	2	6	6	56	2	154
3:30 P	1	3	0	2	0	2	0	8	2	5	53	0	1	3	46	0	122
3:45 P	0	0	0	4	1	3	0	5	5	2	46	0	1	1	51	1	113
4:00 P	0	0	0	1	0	4	0	5	2	4	67	0	1	1	49	2	133
4:15 P	0	0	0	1	0	0	0	5	2	3	80	1	3	1	51	3	145
4:30 P	0	0	0	0	0	5	1	8	1	1	65	0	2	3	49	1	133
4:45 P	2	0	0	2	0	2	0	7	1	0	56	0	3	3	57	1	128
5:00 P	0	0	0	3	0	4	0	3	1	0	48	0	0	0	31	1	90
5:15 P	0	0	0	0	1	2	0	4	3	2	51	0	1	0	41	3	103
5:30 P	0	0	0	0	0	3	0	4	0	2	50	0	1	0	33	1	93
5:45 P	0	0	0	0	0	0	0	3	1	1	64	0	0	0	34	2	104
6:00 P	0	0	0	0	0	0	0	5	0	0	58	0	2	1	26	0	90
Total Survey	13	6	0	29	2	26	1	60	21	24	699	3	21	19	524	17	1408
	Peak Hour: 3:45 PM to 4:45 PM																
Total	2	0	0	4	0	11	1	25	6	8	268	1	9	8	206	7	539
Approach	4				37				277				221				539
%HV	50.0%				n/a				2.2%				4.1%				3.2%
PHF	0.50				0.66				0.82				0.91				0.93



PEDs Across:	N	S	E	W	
INT 01	1	1	0	4	6
INT 02	0	3	1	4	8
INT 03	1	0	0	0	1
INT 04	2	3	0	0	5
INT 05	0	0	0	0	0
INT 06	0	1	0	0	1
INT 07	0	2	0	0	2
INT 08	1	2	0	0	3
INT 09	0	1	0	0	1
INT 10	0	0	0	0	0
INT 11	0	1	0	0	1
INT 12	1	0	0	0	1
	6	14	1	8	29

Bicycles From:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	1	0	0	1
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	1	0	0	1

	PHF	%HV
EB	0.91	4.1%
WB	0.82	2.2%
NB	0.66	n/a
SB	0.50	50.0%
T Int.	0.93	3.2%

Check
In: 539
Out: 539

Conditions:

Special Notes

SCJ23038TM
Omak, Washington
Thu 04/13/2023
"Jaywalking" Pedestrian Observations
Between School Driveways on SR-155

AM	NB	SB
6:00:00 AM	0	0
6:15:00 AM	0	0
6:30:00 AM	0	0
6:45:00 AM	0	0
7:00:00 AM	0	0
7:15:00 AM	0	0
7:30:00 AM	0	0
7:45:00 AM	0	0
8:00:00 AM	0	0
8:15:00 AM	0	0
8:30:00 AM	0	0
8:45:00 AM	0	0
Totals	**0**	**0**

PM	NB	SB
2:00:00 PM	0	0
2:15:00 PM	0	0
2:30:00 PM	0	0
2:45:00 PM	0	0
3:00:00 PM	0	0
3:15:00 PM	0	0
3:30:00 PM	0	0
3:45:00 PM	5	2
4:00:00 PM	0	0
4:15:00 PM	0	0
4:30:00 PM	0	0
4:45:00 PM	0	0
5:00:00 PM	0	0
5:15:00 PM	2	0
5:30:00 PM	0	0
5:45:00 PM	0	0
Totals	**7**	**2**

Please note that the individuals that "Jaywalked" did not appear to be school aged children. They appeared to be teens to adults in age/size.

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

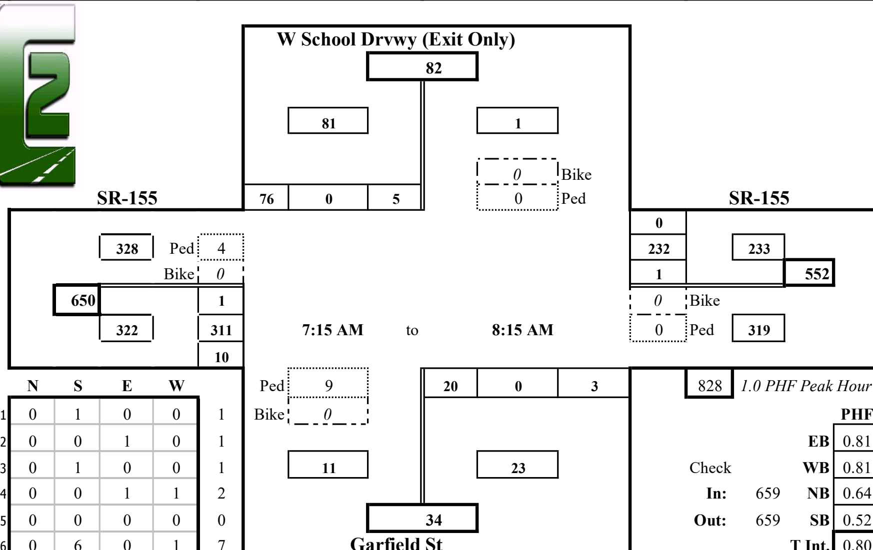
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: West School Driveway (Exit Only)/Garfield St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) W School Drvwy (Exit Only)				From South on (NB) Garfield St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:15 A	0	0	0	0	0	1	0	0	2	0	12	0	1	0	21	1	35
6:30 A	0	0	0	1	0	1	0	0	1	0	11	0	2	1	33	2	49
6:45 A	0	0	0	0	1	2	0	0	0	0	21	0	0	1	35	2	61
7:00 A	0	0	0	0	0	2	0	1	0	1	19	0	0	3	35	3	64
7:15 A	0	0	0	0	1	4	0	0	0	1	28	0	4	0	49	2	84
7:30 A	0	1	0	7	2	8	0	1	1	0	38	0	6	1	78	1	135
7:45 A	0	2	0	29	0	4	0	1	11	0	72	0	10	0	96	3	207
8:00 A	0	2	0	37	1	5	0	0	8	0	68	0	5	0	89	4	205
8:15 A	0	0	0	3	0	3	0	1	4	1	54	0	2	0	48	2	112
8:30 A	0	0	0	0	0	6	0	0	2	0	50	0	1	0	28	2	86
8:45 A	0	0	0	0	0	4	0	1	0	2	34	2	3	0	37	3	83
9:00 A	0	0	0	0	0	5	0	0	6	0	44	0	3	0	26	5	80
Total Survey	0	5	0	77	5	45	0	5	35	5	451	2	37	6	575	30	1201
Peak Hour: 7:15 AM to 8:15 AM																	
Total	0	5	0	76	3	20	0	3	24	1	232	0	23	1	311	10	659
Approach	81				23				233				322				659
%HV	n/a				13.0%				10.3%				7.1%				7.6%
PHF	0.52				0.64				0.81				0.81				0.80



828 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.81	7.1%
WB	0.81	10.3%
NB	0.64	13.0%
SB	0.52	n/a
T Int.	0.80	7.6%

Check **In:** 659 **Out:** 659

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	1	0	0	1
INT 02	0	0	1	0	1
INT 03	0	1	0	0	1
INT 04	0	0	1	1	2
INT 05	0	0	0	0	0
INT 06	0	6	0	1	7
INT 07	0	0	0	1	1
INT 08	0	0	0	0	0
INT 09	0	3	0	2	5
INT 10	0	0	0	1	1
INT 11	0	0	1	0	1
INT 12	0	2	1	0	3
	0	13	4	6	23

Special Notes

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

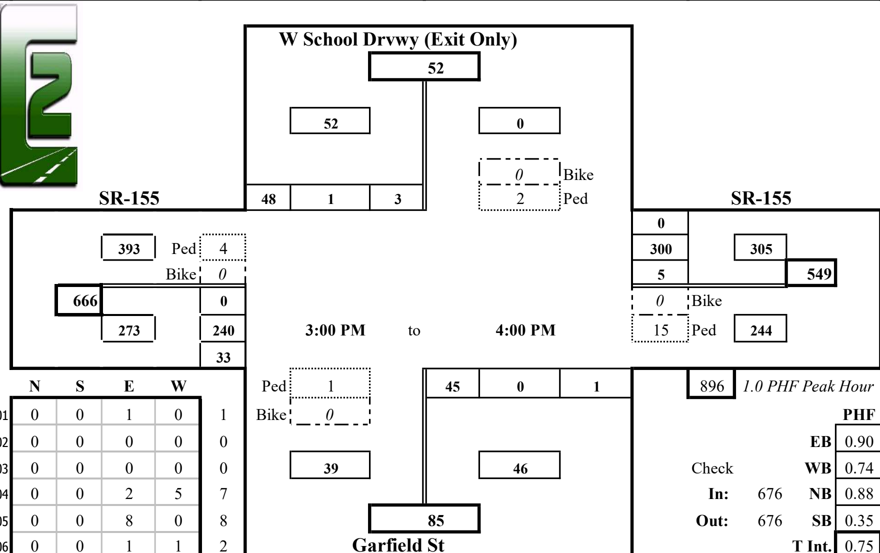
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: West School Driveway (Exit Only)/Garfield St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) W School Drvwy (Exit Only)				From South on (NB) Garfield St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
2:15 P	0	1	0	1	0	6	0	1	4	0	34	0	4	0	58	8	109
2:30 P	0	0	0	0	0	9	0	1	2	2	45	0	0	0	55	6	118
2:45 P	0	2	0	1	0	6	0	2	6	2	61	0	3	0	48	6	128
3:00 P	0	0	0	3	0	4	0	1	1	0	48	0	10	1	76	2	135
3:15 P	3	2	0	35	0	7	0	1	14	0	103	0	6	0	72	4	224
3:30 P	0	0	1	5	0	13	0	0	3	1	60	0	1	0	48	4	132
3:45 P	0	1	0	5	0	13	0	0	5	1	66	0	3	0	62	9	157
4:00 P	1	0	0	3	0	12	0	0	2	3	71	0	4	0	58	16	163
4:15 P	0	0	0	3	0	11	0	0	4	2	83	0	6	0	58	6	163
4:30 P	0	1	0	3	0	9	0	0	1	0	68	0	2	0	55	5	141
4:45 P	0	0	0	0	0	6	0	0	4	2	61	0	2	0	69	11	149
5:00 P	0	0	0	1	0	12	0	0	1	2	57	0	0	0	42	8	122
Total Survey	4	7	1	60	0	108	0	6	47	15	757	0	41	1	701	85	1741
Peak Hour: 3:00 PM to 4:00 PM																	
Total	4	3	1	48	0	45	0	1	24	5	300	0	14	0	240	33	676
Approach	52				46				305				273				676
%HV	7.7%				n/a				7.9%				5.1%				6.2%
PHF	0.35				0.88				0.74				0.90				0.75



896 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.90	5.1%
WB	0.74	7.9%
NB	0.88	n/a
SB	0.35	7.7%
T Int.	0.75	6.2%

Check

In: 676

Out: 676

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	1	0	1
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	2	5	7
INT 05	0	0	8	0	8
INT 06	0	0	1	1	2
INT 07	0	0	4	0	4
INT 08	2	1	2	3	8
INT 09	0	0	1	6	7
INT 10	0	0	0	2	2
INT 11	0	1	2	1	4
INT 12	0	0	2	2	4
	2	2	23	20	47

Special Notes

Bicycles From:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

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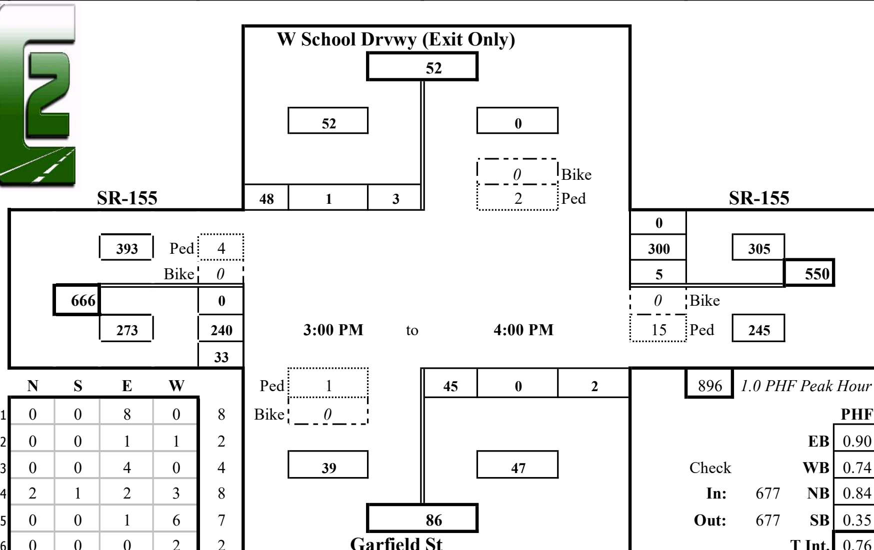
WBE/DBE

Intersection: West School Driveway (Exit Only)/Garfield St & SR-155 **Date of Count:** Thu 04/13/2023
Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) W School Drvwy (Exit Only)				From South on (NB) Garfield St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:15 P	3	2	0	35	0	7	0	1	14	0	103	0	6	0	72	4	224
3:30 P	0	0	1	5	0	13	0	1	3	1	60	0	1	0	48	4	133
3:45 P	0	1	0	5	0	13	0	0	5	1	66	0	3	0	62	9	157
4:00 P	0	0	0	3	0	12	0	0	2	3	71	0	4	0	58	16	163
4:15 P	1	0	0	3	0	11	0	0	4	2	83	0	6	0	58	6	163
4:30 P	0	1	0	3	0	9	0	0	1	0	68	0	2	0	55	5	141
4:45 P	0	0	0	0	0	6	0	0	4	2	61	0	2	0	69	11	149
5:00 P	0	0	0	1	0	12	0	0	1	2	57	0	0	0	42	8	122
5:15 P	0	0	0	0	0	10	0	0	4	0	52	1	2	0	45	6	114
5:30 P	0	0	0	0	0	4	0	0	1	0	56	0	1	0	35	11	106
5:45 P	0	0	0	0	0	8	0	0	1	1	65	0	0	0	42	7	123
6:00 P	0	0	0	0	0	8	0	2	0	1	63	0	2	0	31	4	109
Total Survey	4	4	1	55	0	113	0	4	40	13	805	1	29	0	617	91	1704
Peak Hour: 3:00 PM to 4:00 PM																	
Total	3	3	1	48	0	45	0	2	24	5	300	0	14	0	240	33	677
Approach	52				47				305				273				677
%HV	5.8%				n/a				7.9%				5.1%				6.1%
PHF	0.35				0.84				0.74				0.90				0.76



896 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.90	5.1%
WB	0.74	7.9%
NB	0.84	n/a
SB	0.35	5.8%
T Int.	0.76	6.1%

Check
In: 677
Out: 677

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	8	0	8
INT 02	0	0	1	1	2
INT 03	0	0	4	0	4
INT 04	2	1	2	3	8
INT 05	0	0	1	6	7
INT 06	0	0	0	2	2
INT 07	0	1	2	1	4
INT 08	0	0	2	2	4
INT 09	0	0	0	2	2
INT 10	0	0	4	0	4
INT 11	0	2	0	4	6
INT 12	2	0	0	3	5
	4	4	24	24	56

Special Notes

Bicycles From:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

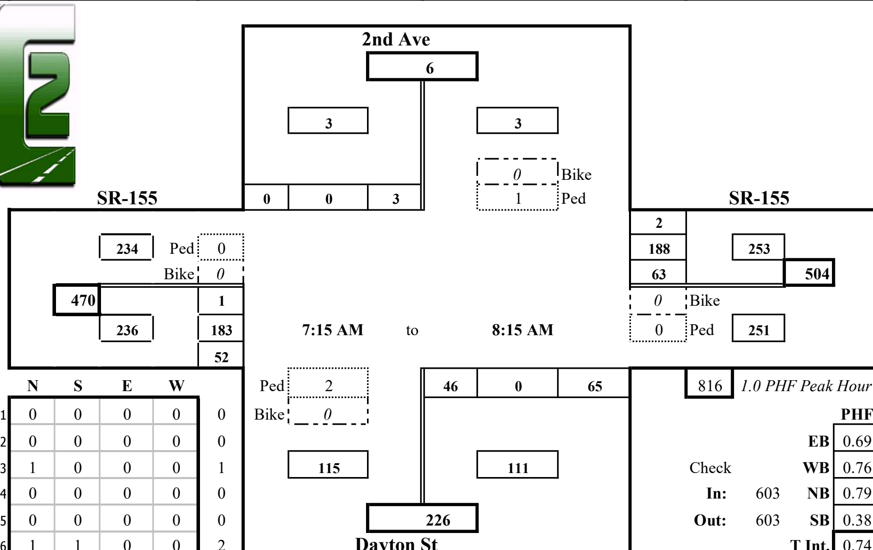
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: 2nd Ave/Dayton St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) 2nd Ave T	L	S	R	From South on (NB) Dayton St T	L	S	R	From East on (WB) SR-155 T	L	S	R	From West on (EB) SR-155 T	L	S	R	Interval Total
6:15 A	0	0	0	0	1	6	1	12	3	7	6	0	2	0	10	7	49
6:30 A	0	0	1	0	1	6	0	11	1	7	7	0	1	0	19	7	58
6:45 A	0	0	0	0	0	5	0	13	0	6	10	0	1	0	22	5	61
7:00 A	0	0	0	0	1	6	0	16	1	9	11	0	0	0	20	8	70
7:15 A	0	0	0	1	1	2	0	19	1	12	16	0	3	1	23	10	84
7:30 A	0	2	0	0	3	6	0	17	2	14	30	2	2	0	49	13	133
7:45 A	1	1	0	0	3	11	0	24	7	15	67	0	3	1	69	16	204
8:00 A	0	0	0	0	2	8	0	14	3	22	61	0	1	0	43	11	159
8:15 A	0	0	0	0	5	21	0	10	1	12	30	0	1	0	22	12	107
8:30 A	0	0	0	0	0	11	1	6	2	19	19	0	1	0	13	11	80
8:45 A	0	0	0	2	2	5	0	11	1	9	26	1	1	1	10	8	73
9:00 A	0	0	1	0	1	6	1	10	3	10	23	0	0	0	12	6	69
Total Survey	1	3	2	3	20	93	3	163	25	142	306	3	16	3	312	114	1147
	Peak Hour: 7:15 AM to 8:15 AM																
Total	1	3	0	0	13	46	0	65	13	63	188	2	7	1	183	52	603
Approach	3				111				253				236				603
%HV	33.3%				11.7%				5.1%				3.0%				5.6%
PHF	0.38				0.79				0.76				0.69				0.74



816 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.69	3.0%
WB	0.76	5.1%
NB	0.79	11.7%
SB	0.38	33.3%
T Int.	0.74	5.6%

Check
In: 603
Out: 603

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	1	0	0	0	1
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	1	1	0	0	2
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	1	0	0	1
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	2	2	0	0	4

Special Notes

Bicycles From:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	1	0	0	1
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	1	0	0	1

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

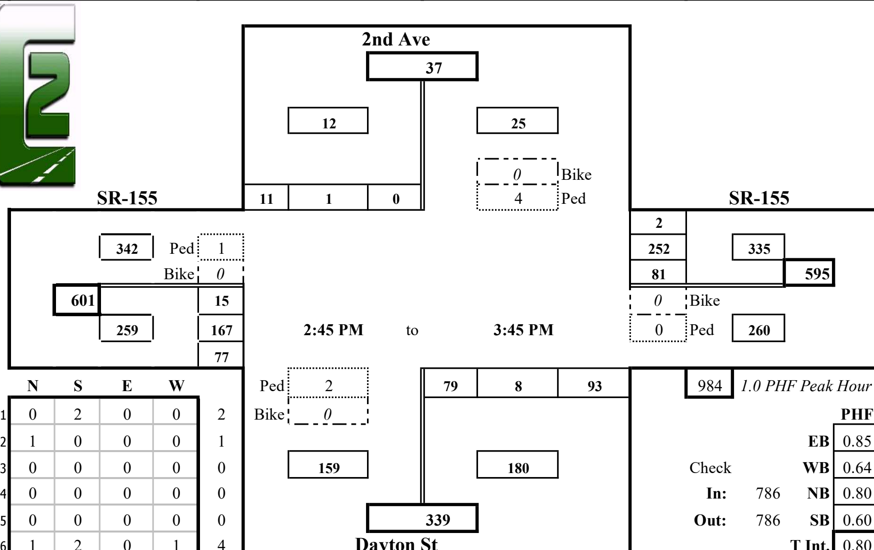
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: 2nd Ave/Dayton St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) 2nd Ave T	L	S	R	From South on (NB) Dayton St T	L	S	R	From East on (WB) SR-155 T	L	S	R	From West on (EB) SR-155 T	L	S	R	Interval Total
2:15 P	0	1	0	0	2	13	0	27	1	14	30	1	2	0	25	20	131
2:30 P	0	1	0	0	0	13	0	27	2	11	39	0	0	0	30	13	134
2:45 P	0	0	0	0	1	11	0	23	4	20	39	0	0	0	29	17	139
3:00 P	0	0	0	0	11	10	3	25	0	16	38	1	1	2	56	18	169
3:15 P	0	0	0	5	3	18	0	25	13	27	103	0	2	4	41	23	246
3:30 P	1	0	1	3	2	17	5	21	2	17	54	1	1	2	26	17	164
3:45 P	0	0	0	3	1	34	0	22	7	21	57	0	4	7	44	19	207
4:00 P	0	0	1	2	1	12	2	17	0	29	42	1	1	3	42	13	164
4:15 P	0	1	0	2	3	13	2	16	3	24	52	1	2	4	31	25	171
4:30 P	0	0	0	0	3	19	3	14	0	12	51	1	0	3	33	24	160
4:45 P	0	1	1	2	1	25	2	20	1	11	35	0	0	5	35	16	153
5:00 P	0	0	1	1	0	17	2	12	1	18	16	1	0	4	25	14	111
Total Survey	1	4	4	18	28	202	19	249	34	220	556	7	13	34	417	219	1949
Peak Hour: 2:45 PM to 3:45 PM																	
Total	1	0	1	11	17	79	8	93	22	81	252	2	8	15	167	77	786
Approach	12				180				335				259				786
%HV	8.3%				9.4%				6.6%				3.1%				6.1%
PHF	0.60				0.80				0.64				0.85				0.80



984 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.85	3.1%
WB	0.64	6.6%
NB	0.80	9.4%
SB	0.60	8.3%
T Int.	0.80	6.1%

Check
In: 786
Out: 786

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	2	0	0	2
INT 02	1	0	0	0	1
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	1	2	0	1	4
INT 07	3	0	0	0	3
INT 08	0	0	0	0	0
INT 09	3	0	0	0	3
INT 10	0	0	0	0	0
INT 11	1	0	0	0	1
INT 12	0	1	0	0	1
	9	5	0	1	15

Special Notes

Bicycles From:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

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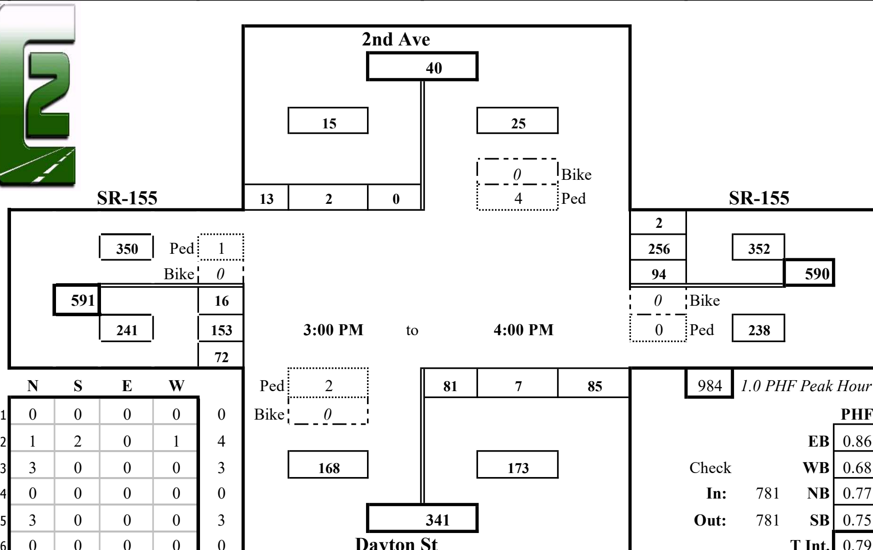
WBE/DBE

Intersection: 2nd Ave/Dayton St & SR-155 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval	From North on (SB) 2nd Ave				From South on (NB) Dayton St				From East on (WB) SR-155				From West on (EB) SR-155				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:15 P	0	0	0	5	3	18	0	25	13	27	103	0	2	4	41	23	246
3:30 P	1	0	1	3	2	17	5	21	2	17	54	1	1	2	26	17	164
3:45 P	0	0	0	3	1	34	0	22	7	21	57	0	4	7	44	19	207
4:00 P	0	0	1	2	1	12	2	17	0	29	42	1	1	3	42	13	164
4:15 P	0	1	0	2	3	13	2	16	3	24	52	1	2	4	31	25	171
4:30 P	0	0	0	0	3	19	3	14	0	12	51	1	0	3	33	24	160
4:45 P	0	1	1	2	1	25	2	20	1	11	35	0	0	5	35	16	153
5:00 P	0	0	1	1	0	17	2	12	1	18	16	1	0	4	25	14	111
5:15 P	0	0	0	3	2	15	3	20	1	10	28	0	2	10	27	26	142
5:30 P	0	0	1	3	0	7	3	17	1	14	42	0	1	6	16	7	116
5:45 P	0	0	1	1	0	12	6	11	2	17	31	0	1	3	20	19	121
6:00 P	0	0	0	1	1	16	9	12	0	15	34	2	0	6	12	20	127
Total Survey	1	2	6	26	17	205	37	207	31	215	545	7	14	57	352	223	1882
	Peak Hour: 3:00 PM to 4:00 PM																
Total	1	0	2	13	7	81	7	85	22	94	256	2	8	16	153	72	781
Approach	15				173				352				241				781
%HV	6.7%				4.0%				6.3%				3.3%				4.9%
PHF	0.75				0.77				0.68				0.86				0.79



984 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	0.86	3.3%
WB	0.68	6.3%
NB	0.77	4.0%
SB	0.75	6.7%
T Int.	0.79	4.9%

Check
In: 781
Out: 781

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	1	2	0	1	4
INT 03	3	0	0	0	3
INT 04	0	0	0	0	0
INT 05	3	0	0	0	3
INT 06	0	0	0	0	0
INT 07	1	0	0	0	1
INT 08	0	1	0	0	1
INT 09	2	2	0	0	4
INT 10	3	1	0	0	4
INT 11	0	0	0	0	0
INT 12	1	0	0	0	1
	14	6	0	1	**21**

Special Notes

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

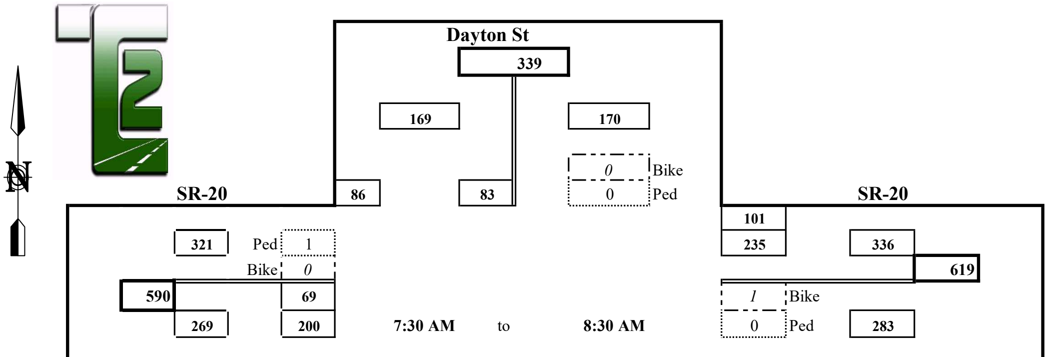
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Dayton St & SR-20 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval	From North on (SB) Dayton St				From South on (NB) 0				From East on (WB) SR-20				From West on (EB) SR-20				Interval Total
Ending at	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:15 A	7	4	0	13	0	0	0	0	1	0	24	17	0	0	13	0	71
6:30 A	1	7	0	11	0	0	0	0	1	0	14	14	4	12	24	0	82
6:45 A	1	5	0	9	0	0	0	0	3	0	37	9	2	15	31	0	106
7:00 A	2	6	0	13	0	0	0	0	5	0	42	18	6	12	49	0	140
7:15 A	1	12	0	20	0	0	0	0	7	0	45	18	1	12	33	0	140
7:30 A	1	15	0	12	0	0	0	0	5	0	42	19	5	10	34	0	132
7:45 A	2	12	0	29	0	0	0	0	3	0	69	26	3	19	42	0	197
8:00 A	3	30	0	18	0	0	0	0	3	0	65	33	2	12	62	0	220
8:15 A	0	20	0	22	0	0	0	0	7	0	54	25	8	21	59	0	201
8:30 A	3	21	0	17	0	0	0	0	3	0	47	17	4	17	37	0	156
8:45 A	1	9	0	14	0	0	0	0	8	0	50	20	5	15	49	0	157
9:00 A	3	18	0	14	0	0	0	0	6	0	47	21	6	12	52	0	164
Total Survey	25	159	0	192	0	0	0	0	52	0	536	237	46	157	485	0	1766
Peak Hour: 7:30 AM to 8:30 AM																	
Total	8	83	0	86	0	0	0	0	16	0	235	101	17	69	200	0	774
Approach	169				0				336				269				774
%HV	4.7%				n/a				4.8%				6.3%				5.3%
PHF	0.88				n/a				0.86				0.84				0.88



880 *1.0 PHF Peak Hour Volume*

PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	1	1
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	0	0	1	**1**

Special Notes

Bicycles From:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	1	0	1
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	0	1	0	1

Check

In: 774

Out: 774

	PHF	%HV
EB	0.84	6.3%
WB	0.86	4.8%
NB	n/a	n/a
SB	0.88	4.7%
T Int.	0.88	5.3%

Conditions:

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

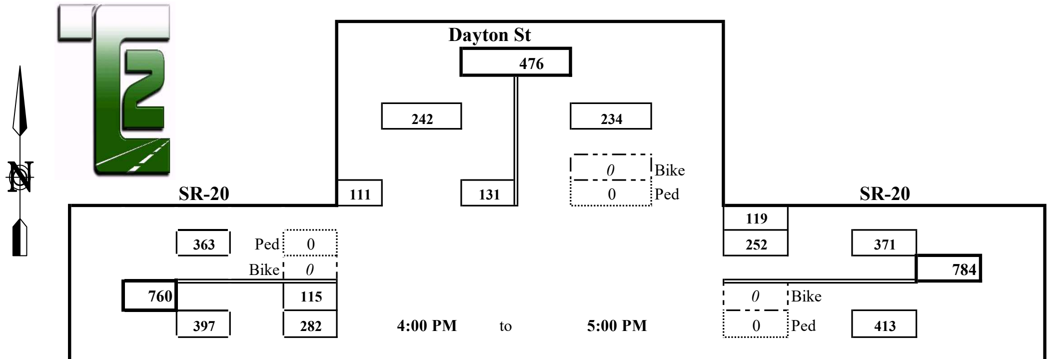
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Dayton St & SR-20 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) Dayton St				From South on (NB) 0				From East on (WB) SR-20				From West on (EB) SR-20				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
2:15 P	1	22	0	16	0	0	0	0	1	0	50	29	3	15	57	0	189
2:30 P	3	17	0	21	0	0	0	0	1	0	48	32	1	22	53	0	193
2:45 P	5	16	0	30	0	0	0	0	4	0	66	25	4	20	43	0	200
3:00 P	1	26	0	23	0	0	0	0	14	0	79	32	7	15	62	0	237
3:15 P	4	48	0	25	0	0	0	0	7	0	69	36	3	22	54	0	254
3:30 P	0	28	0	24	0	0	0	0	1	0	62	26	2	21	63	0	224
3:45 P	6	33	0	22	0	0	0	0	3	0	63	29	3	33	67	0	247
4:00 P	4	29	0	29	0	0	0	0	2	0	59	29	1	24	63	0	233
4:15 P	2	37	0	26	0	0	0	0	2	0	63	27	6	22	70	0	245
4:30 P	1	34	0	27	0	0	0	0	5	0	56	33	2	31	73	0	254
4:45 P	0	31	0	28	0	0	0	0	2	0	64	29	2	31	70	0	253
5:00 P	1	29	0	30	0	0	0	0	1	0	69	30	1	31	69	0	258
Total Survey	28	350	0	301	0	0	0	0	43	0	748	357	35	287	744	0	2787
	Peak Hour: 4:00 PM to 5:00 PM																
Total	4	131	0	111	0	0	0	0	10	0	252	119	11	115	282	0	1010
Approach	242				0				371				397				1010
%HV	1.7%				n/a				2.7%				2.8%				2.5%
PHF	0.96				n/a				0.94				0.95				0.98



1032 *1.0 PHF Peak Hour Volume*

PEDs Across:	N	S	E	W	
INT 01	0	0	0	2	2
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	2	2
INT 06	0	0	0	0	0
INT 07	0	0	0	1	1
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	0	0	5	5

	PHF	%HV
EB	0.95	2.8%
WB	0.94	2.7%
NB	n/a	n/a
SB	0.96	1.7%
T Int.	0.98	2.5%

Check

In: 1010

Out: 1010

Conditions:

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Special Notes

SCJ23038TM_06P_1

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

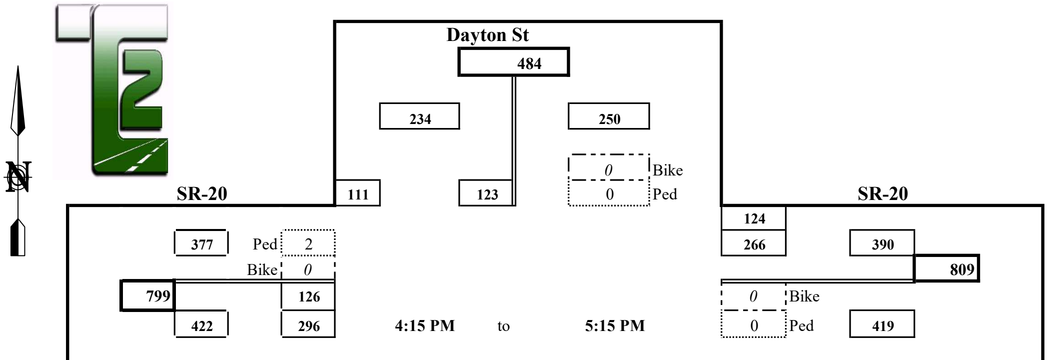
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Dayton St & SR-20 **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) Dayton St				From South on (NB) 0				From East on (WB) SR-20				From West on (EB) SR-20				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:15 P	4	48	0	25	0	0	0	0	7	0	69	36	3	22	54	0	254
3:30 P	0	28	0	24	0	0	0	0	1	0	62	26	2	21	63	0	224
3:45 P	6	33	0	22	0	0	0	0	3	0	63	29	3	33	67	0	247
4:00 P	4	29	0	29	0	0	0	0	2	0	59	29	1	24	63	0	233
4:15 P	2	37	0	26	0	0	0	0	2	0	63	27	6	22	70	0	245
4:30 P	1	34	0	27	0	0	0	0	5	0	56	33	2	31	73	0	254
4:45 P	0	31	0	28	0	0	0	0	2	0	64	29	2	31	70	0	253
5:00 P	1	29	0	30	0	0	0	0	1	0	69	30	1	31	69	0	258
5:15 P	0	29	0	26	0	0	0	0	4	0	77	32	1	33	84	0	281
5:30 P	0	25	0	20	0	0	0	0	4	0	56	32	0	28	67	0	228
5:45 P	1	35	0	25	0	0	0	0	2	0	75	26	5	31	60	0	252
6:00 P	0	22	0	26	0	0	0	0	4	0	60	30	1	21	55	0	214
Total Survey	19	380	0	308	0	0	0	0	37	0	773	359	27	328	795	0	2943
	Peak Hour: 4:15 PM to 5:15 PM																
Total	2	123	0	111	0	0	0	0	12	0	266	124	6	126	296	0	1046
Approach	234				0				390				422				1046
%HV	0.9%				n/a				3.1%				1.4%				1.9%
PHF	0.96				n/a				0.89				0.90				0.93



1124 *1.0 PHF Peak Hour Volume*

PEDs Across:	N	S	E	W	
INT 01	0	0	0	2	2
INT 02	0	0	0	0	0
INT 03	0	0	0	1	1
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	2	2
INT 10	0	0	0	2	2
INT 11	0	0	0	0	0
INT 12	0	0	0	1	1
	0	0	0	8	8

	PHF	%HV
EB	0.90	1.4%
WB	0.89	3.1%
NB	n/a	n/a
SB	0.96	0.9%
T Int.	0.93	1.9%

Check

In: 1046

Out: 1046

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Conditions:

Special Notes

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

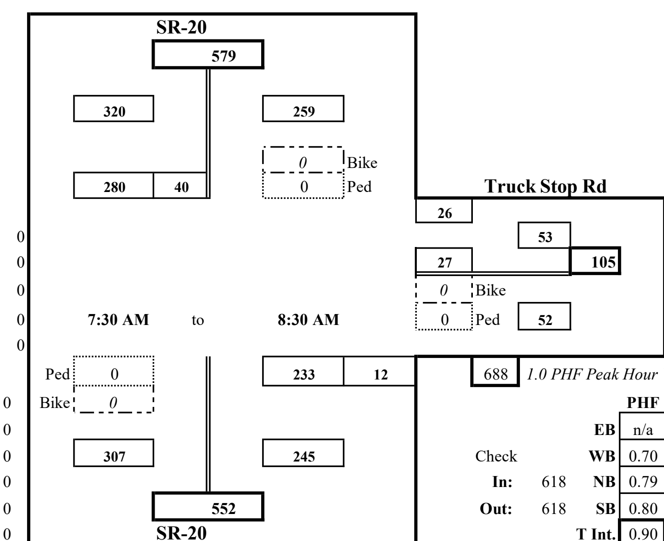
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: SR-20 & Truck Stop Rd **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) SR-20				From South on (NB) SR-20				From East on (WB) Truck Stop Rd				From West on (EB) 0				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:15 A	5	5	32	0	0	0	16	7	1	3	0	8	0	0	0	0	71
6:30 A	1	6	18	0	3	0	26	4	0	5	0	7	0	0	0	0	66
6:45 A	4	7	41	0	2	0	37	4	0	2	0	8	0	0	0	0	99
7:00 A	5	3	46	0	4	0	56	2	2	2	0	8	0	0	0	0	117
7:15 A	9	17	48	0	1	0	39	3	2	9	0	4	0	0	0	0	120
7:30 A	4	9	44	0	4	0	40	5	1	7	0	9	0	0	0	0	114
7:45 A	1	11	89	0	1	0	54	4	2	5	0	9	0	0	0	0	172
8:00 A	3	10	74	0	2	0	73	5	0	6	0	0	0	0	0	0	168
8:15 A	7	11	61	0	9	0	63	2	0	9	0	10	0	0	0	0	156
8:30 A	5	8	56	0	4	0	43	1	0	7	0	7	0	0	0	0	122
8:45 A	8	17	49	0	5	0	51	9	1	6	0	16	0	0	0	0	148
9:00 A	5	3	58	0	7	0	49	7	3	7	0	9	0	0	0	0	133
Total Survey	57	107	616	0	42	0	547	53	12	68	0	95	0	0	0	0	1486
Peak Hour: 7:30 AM to 8:30 AM																	
Total	16	40	280	0	16	0	233	12	2	27	0	26	0	0	0	0	618
Approach	320				245				53				0				618
%HV	5.0%				6.5%				3.8%				n/a				5.5%
PHF	0.80				0.79				0.70				n/a				0.90



PEDs Across:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	**0**

Bicycles From:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Check			PHF	%HV
		EB	n/a	n/a
		WB	0.70	3.8%
In:	618	NB	0.79	6.5%
Out:	618	SB	0.80	5.0%
		T Int.	0.90	5.5%

Conditions:

Special Notes

Prepared for: **SCJ Alliance**

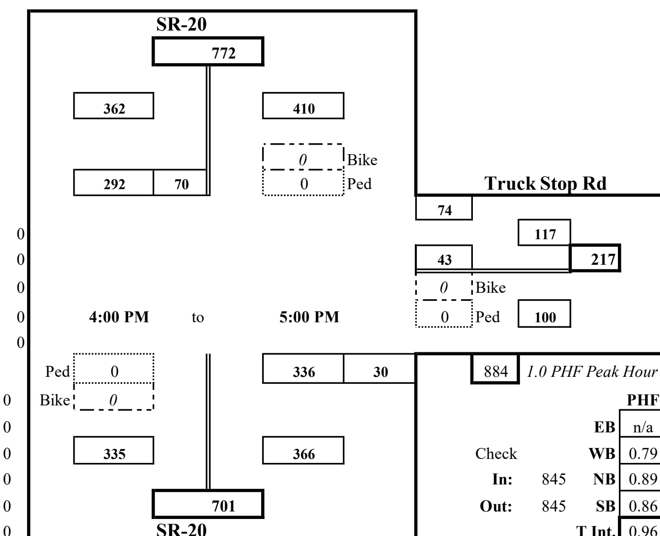
Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: SR-20 & Truck Stop Rd **Date of Count:** Thu 04/13/2023
Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) SR-20				From South on (NB) SR-20				From East on (WB) Truck Stop Rd				From West on (EB) 0				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
2:15 P	4	12	49	0	3	0	54	9	1	6	0	13	0	0	0	0	143
2:30 P	2	12	57	0	3	0	62	5	0	9	0	17	0	0	0	0	162
2:45 P	10	16	77	0	5	0	52	8	1	6	0	10	0	0	0	0	169
3:00 P	5	13	78	0	7	0	64	7	1	5	0	14	0	0	0	0	181
3:15 P	5	17	83	0	2	0	66	7	1	13	0	9	0	0	0	0	195
3:30 P	2	21	61	0	3	0	67	8	0	8	0	12	0	0	0	0	177
3:45 P	6	13	58	0	5	0	90	7	1	7	0	12	0	0	0	0	187
4:00 P	3	21	75	0	4	0	66	9	2	11	0	19	0	0	0	0	201
4:15 P	3	14	74	0	5	0	86	2	1	12	0	13	0	0	0	0	201
4:30 P	2	15	73	0	3	0	93	10	0	10	0	17	0	0	0	0	218
4:45 P	1	16	65	0	2	0	77	10	0	13	0	24	0	0	0	0	205
5:00 P	3	25	80	0	1	0	80	8	0	8	0	20	0	0	0	0	221
Total Survey	46	195	830	0	43	0	857	90	8	108	0	180	0	0	0	0	2260
	Peak Hour: 4:00 PM to 5:00 PM																
Total	9	70	292	0	11	0	336	30	1	43	0	74	0	0	0	0	845
Approach	362				366				117				0				845
%HV	2.5%				3.0%				0.9%				n/a				2.5%
PHF	0.86				0.89				0.79				n/a				0.96



884 *1.0 PHF Peak Hour Volume*

	PHF	%HV
EB	n/a	n/a
WB	0.79	0.9%
NB	0.89	3.0%
SB	0.86	2.5%
T Int.	0.96	2.5%

Check
In: 845
Out: 845

Conditions:

PEDs Across:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	**0**

Special Notes

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

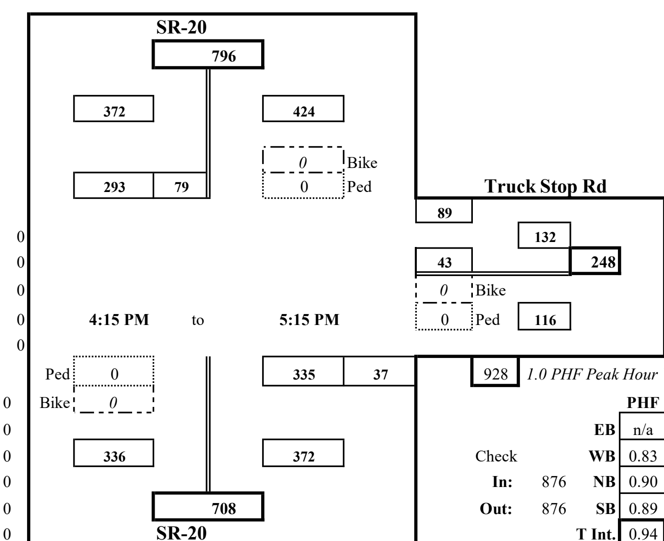
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: SR-20 & Truck Stop Rd | **Date of Count:** Thu 04/13/2023

Location: Omak, Washington | **Checked By:** Jen

Time Interval Ending at	From North on (SB) SR-20 T	L	S	R	From South on (NB) SR-20 T	L	S	R	From East on (WB) Truck Stop Rd T	L	S	R	From West on (EB) 0 T	L	S	R	Interval Total
3:15 P	5	17	83	0	2	0	66	7	1	13	0	9	0	0	0	0	195
3:30 P	2	21	61	0	3	0	67	8	0	8	0	12	0	0	0	0	177
3:45 P	6	13	58	0	5	0	90	7	1	7	0	12	0	0	0	0	187
4:00 P	3	21	75	0	4	0	66	9	2	11	0	19	0	0	0	0	201
4:15 P	3	14	74	0	5	0	86	2	1	12	0	13	0	0	0	0	201
4:30 P	2	15	73	0	3	0	93	10	0	10	0	17	0	0	0	0	218
4:45 P	1	16	65	0	2	0	77	10	0	13	0	24	0	0	0	0	205
5:00 P	3	25	80	0	1	0	80	8	0	8	0	20	0	0	0	0	221
5:15 P	2	23	75	0	1	0	85	9	1	12	0	28	0	0	0	0	232
5:30 P	2	12	65	0	0	0	86	5	0	14	0	9	0	0	0	0	191
5:45 P	1	23	72	0	6	0	79	6	0	8	0	13	0	0	0	0	201
6:00 P	2	15	70	0	3	0	61	11	0	18	0	13	0	0	0	0	188
Total Survey	32	215	851	0	35	0	936	92	6	134	0	189	0	0	0	0	2417
Peak Hour: 4:15 PM to 5:15 PM																	
Total	8	79	293	0	7	0	335	37	1	43	0	89	0	0	0	0	876
Approach	372				372				132				0				876
%HV	2.2%				1.9%				0.8%				n/a				1.8%
PHF	0.89				0.90				0.83				n/a				0.94



		PHF	%HV
	EB	n/a	n/a
Check	WB	0.83	0.8%
In: 876	NB	0.90	1.9%
Out: 876	SB	0.89	2.2%
	T Int.	0.94	1.8%

Conditions:

PEDs Across:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Special Notes

Bicycles From:

	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

Prepared for: **SCJ Alliance**

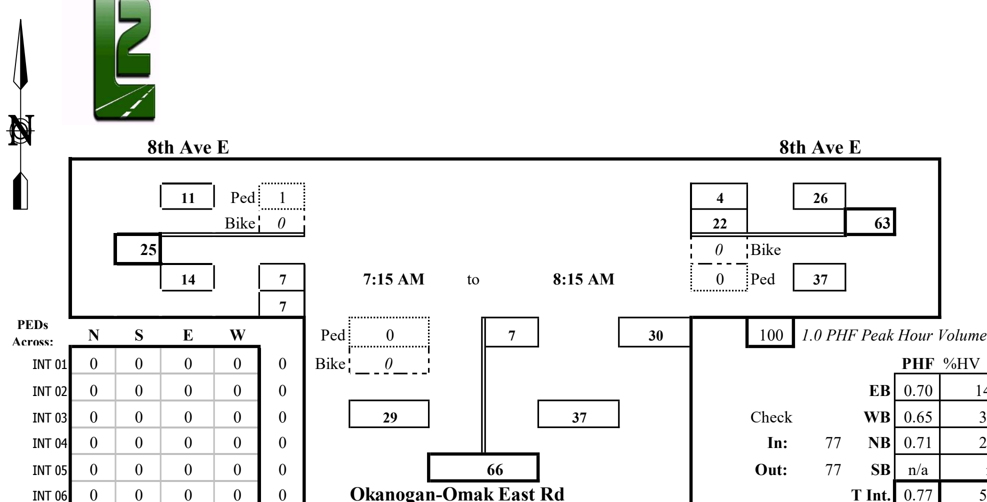
Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Okanogan-Omak East Rd & 8th Ave E **Date of Count:** Thu 04/13/2023
Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) 0				From South on (NB) Okanogan-Omak East Rd				From East on (WB) 8th Ave E				From West on (EB) 8th Ave E				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:15 A	0	0	0	0	0	1	0	1	0	3	1	0	0	0	1	0	7
6:30 A	0	0	0	0	0	0	0	2	0	1	1	0	0	0	1	1	6
6:45 A	0	0	0	0	0	2	0	1	1	1	2	0	0	0	1	2	9
7:00 A	0	0	0	0	1	2	0	6	0	2	3	0	0	0	2	0	15
7:15 A	0	0	0	0	0	0	0	3	0	2	1	0	1	0	4	1	11
7:30 A	0	0	0	0	1	3	0	10	1	4	0	0	2	0	2	2	21
7:45 A	0	0	0	0	0	2	0	9	0	7	2	0	0	0	2	3	25
8:00 A	0	0	0	0	0	1	0	3	0	8	2	0	0	0	3	1	18
8:15 A	0	0	0	0	0	1	0	8	0	3	0	0	0	0	0	1	13
8:30 A	0	0	0	0	0	2	0	2	0	2	3	0	0	0	0	1	10
8:45 A	0	0	0	0	0	2	0	6	0	2	3	0	0	0	1	1	15
9:00 A	0	0	0	0	0	1	0	5	0	2	4	0	0	0	1	4	17
Total Survey	0	0	0	0	2	17	0	56	2	37	22	0	3	0	18	17	167
Peak Hour: 7:15 AM to 8:15 AM																	
Total	0	0	0	0	1	7	0	30	1	22	4	0	2	0	7	7	77
Approach	0				37				26				14				77
%HV	n/a				2.7%				3.8%				14.3%				5.2%
PHF	n/a				0.71				0.65				0.70				0.77



PEDs Across:	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	1	0	0	1	2
INT 08	0	0	0	0	0
INT 09	1	0	0	0	1
INT 10	0	0	0	0	0
INT 11	1	0	0	0	1
INT 12	0	0	0	0	0
	3	0	0	1	4

Bicycles From:	N	S	E	W	
INT 01					0
INT 02					0
INT 03					0
INT 04					0
INT 05					0
INT 06					0
INT 07					0
INT 08					0
INT 09					0
INT 10					0
INT 11					0
INT 12					0
	0	0	0	0	0

	PHF	%HV
EB	0.70	14.3%
WB	0.65	3.8%
NB	0.71	2.7%
SB	n/a	n/a
T Int.	0.77	5.2%

Check
In: 77
Out: 77

Conditions:

Special Notes

SCJ23038TM_08A

Prepared for: **SCJ Alliance**

Traffic Count Consultants, Inc.

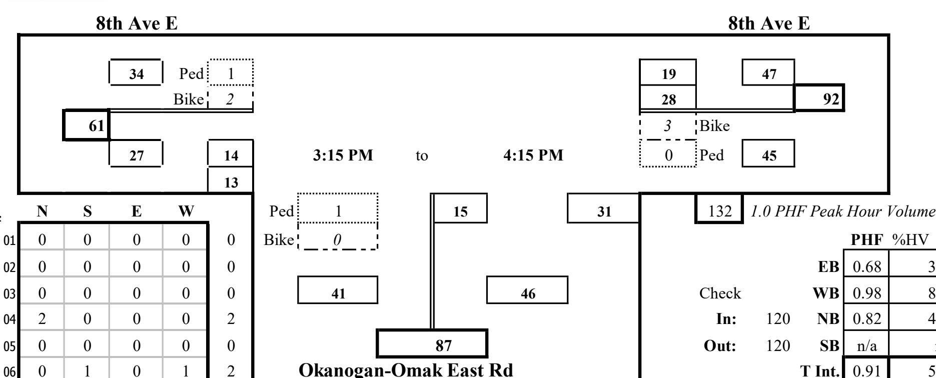
Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Okanogan-Omak East Rd & 8th Ave E **Date of Count:** Thu 04/13/2023

Location: Omak, Washington **Checked By:** Jen

Time Interval Ending at	From North on (SB) 0				From South on (NB) Okanogan-Omak East Rd				From East on (WB) 8th Ave E				From West on (EB) 8th Ave E				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
2:15 P	0	0	0	0	0	9	0	4	0	6	2	0	1	0	3	4	28
2:30 P	0	0	0	0	0	2	0	6	0	1	6	0	0	0	0	4	19
2:45 P	0	0	0	0	0	10	0	6	0	8	0	0	1	0	4	4	32
3:00 P	0	0	0	0	2	3	0	5	0	6	2	0	0	0	0	1	17
3:15 P	0	0	0	0	1	6	0	10	1	5	3	0	0	0	5	3	32
3:30 P	0	0	0	0	2	4	0	10	3	8	4	0	0	0	3	2	31
3:45 P	0	0	0	0	0	4	0	8	0	7	5	0	0	0	4	2	30
4:00 P	0	0	0	0	0	3	0	5	1	7	5	0	0	0	2	4	26
4:15 P	0	0	0	0	0	4	0	8	0	6	5	0	1	0	5	5	33
4:30 P	0	0	0	0	0	5	0	2	0	2	2	0	0	0	1	4	16
4:45 P	0	0	0	0	1	6	0	4	0	4	3	0	2	0	3	2	22
5:00 P	0	0	0	0	0	5	0	3	0	6	4	0	0	0	2	6	26
Total Survey	0	0	0	0	6	61	0	71	5	66	41	0	5	0	32	41	312
	Peak Hour: 3:15 PM to 4:15 PM																
Total	0	0	0	0	2	15	0	31	4	28	19	0	1	0	14	13	120
Approach	0				46				47				27				120
%HV	n/a				4.3%				8.5%				3.7%				5.8%
PHF	n/a				0.82				0.98				0.68				0.91



PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	2	0	0	0	2
INT 05	0	0	0	0	0
INT 06	0	1	0	1	2
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	2	1	0	1	4

Bicycles From:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	3	2	5
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	0	3	2	5

Check			PHF	%HV
		EB	0.68	3.7%
		WB	0.98	8.5%
In:	120	NB	0.82	4.3%
Out:	120	SB	n/a	n/a
		T Int.	0.91	5.8%

Conditions:

Special Notes

Prepared for: **SCJ Alliance**

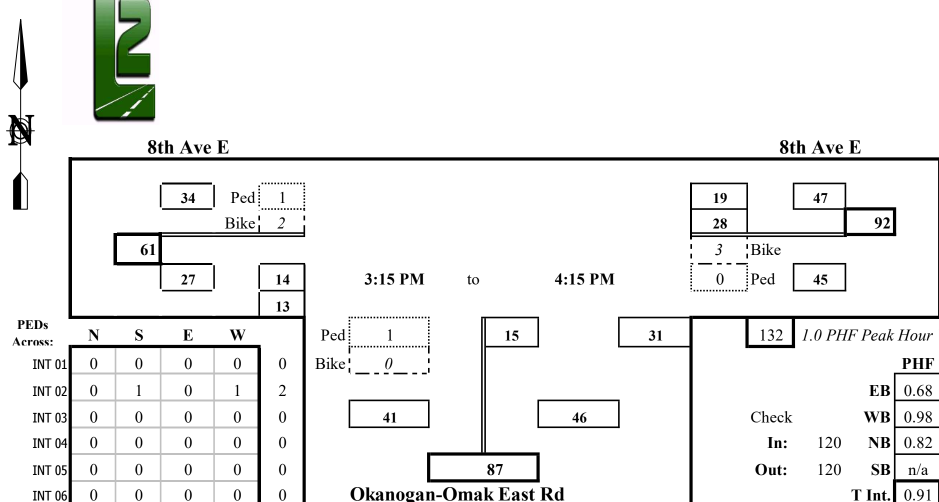
Traffic Count Consultants, Inc.

Phone: (253) 770-1407 FAX: (253) 770-1411 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: Okanogan-Omak East Rd & 8th Ave E
Location: Omak, Washington
Date of Count: Thu 04/13/2023
Checked By: Jen

Time Interval Ending at	From North on (SB) 0				From South on (NB) Okanogan-Omak East Rd				From East on (WB) 8th Ave E				From West on (EB) 8th Ave E				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:15 P	0	0	0	0	2	6	0	10	1	5	3	0	0	0	5	3	32
3:30 P	0	0	0	0	1	4	0	10	3	8	4	0	0	0	3	2	31
3:45 P	0	0	0	0	2	4	0	8	0	7	5	0	0	0	4	2	30
4:00 P	0	0	0	0	0	3	0	5	1	7	5	0	0	0	2	4	26
4:15 P	0	0	0	0	0	4	0	8	0	6	5	0	1	0	5	5	33
4:30 P	0	0	0	0	0	5	0	2	0	2	2	0	0	0	1	4	16
4:45 P	0	0	0	0	1	6	0	4	0	4	3	0	2	0	3	2	22
5:00 P	0	0	0	0	0	5	0	3	0	6	4	0	0	0	2	6	26
5:15 P	0	0	0	0	1	1	0	5	0	4	3	0	0	0	3	3	19
5:30 P	0	0	0	0	0	7	0	9	0	3	5	0	0	0	0	1	25
5:45 P	0	0	0	0	0	1	0	7	0	1	2	0	0	0	7	4	22
6:00 P	0	0	0	0	0	6	0	4	0	6	4	0	0	0	1	2	23
Total Survey	0	0	0	0	7	52	0	75	5	59	45	0	3	0	36	38	305
	Peak Hour: 3:15 PM to 4:15 PM																
Total	0	0	0	0	3	15	0	31	4	28	19	0	1	0	14	13	120
Approach	0				46				47				27				120
%HV	n/a				6.5%				8.5%				3.7%				6.7%
PHF	n/a				0.82				0.98				0.68				0.91



	PHF	%HV
EB	0.68	3.7%
WB	0.98	8.5%
NB	0.82	6.5%
SB	n/a	n/a
T Int.	0.91	6.7%

Check
In: 120
Out: 120

Conditions:

PEDs Across:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	1	0	1	2
INT 03	0	0	0	0	0
INT 04	0	0	0	0	0
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	0	0	0
	0	1	0	1	2

Special Notes

Bicycles From:

	N	S	E	W	
INT 01	0	0	0	0	0
INT 02	0	0	0	0	0
INT 03	0	0	0	0	0
INT 04	0	0	3	2	5
INT 05	0	0	0	0	0
INT 06	0	0	0	0	0
INT 07	0	0	0	0	0
INT 08	0	0	0	0	0
INT 09	0	0	0	0	0
INT 10	0	0	0	0	0
INT 11	0	0	0	0	0
INT 12	0	0	2	0	2
	0	0	5	2	7

Appendix B
WSDOT Crash Data

OFFICER REPORTED CRASHES THAT OCCURRED AT MULTIPLE INTERSECTIONS IN THE CITY OF OMAK & OKANOGAN COUNTY

01/01/2018 - 12/31/2022 *See 2nd tab below for road information*

JURISDICTION	COUNTY	CITY	PRIMARY TRAFFICWAY	MILEPOST	A/B	SR ONLY HISTORY/SUSPENSE	REPORT NUMBER	DATE	TIME	MOST SEVERE INJURY TYPE	# INJ	# FAT	# VEH	# PEDS	# BIKES	JUNCTION RELATIONSHIP	FIRST COLLISION TYPE / OBJECT STRUCK	VEHICLE 1 ACTION	VEHICLE 2 ACTION	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 1)	MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 2)	PEDESTRIAN CONTRIBUTING CIRCUMSTANCE 1 (UNIT 2)
State Route	Okanogan	Omak	155	80.47		No	EA41727	05/30/2020	20:15	Suspected Minor Injury	1	0	1	0	0	At Intersection and Not Related	Utility Box	Going Straight Ahead		Under Influence of Alcohol		
State Route	Okanogan		097	290.79		No	EC92431	10/09/2022	12:01	Suspected Minor Injury	2	0	2	0	0	At Intersection and Related	Entering at angle	Making Left Turn	Going Straight Ahead	Did Not Grant RW to Vehicle	None	
State Route	Okanogan		097	290.80		No	EC70115	07/21/2022	08:32	Possible Injury	1	0	2	0	0	Intersection Related but Not at I	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Going Straight Ahead	Did Not Grant RW to Vehicle	None	
State Route	Okanogan	Omak	097	291.24		No	E866369	11/22/2018	12:57	Possible Injury	3	0	2	0	0	At Intersection and Related	From same direction - all others	Backing	Stopped at Signal or Stop Sign	Other Contributing Circ Not Listed	None	
State Route	Okanogan	Omak	097	291.24		No	EA22060	03/05/2020	17:05	No Apparent Injury	0	0	1	0	0	At Intersection and Not Related	Domestic animal other (cat, dog, etc)	Going Straight Ahead		None		
State Route	Okanogan	Omak	097	291.24		No	E782284	03/22/2018	15:06	No Apparent Injury	0	0	2	0	0	At Intersection and Related	Entering at angle	Going Straight Ahead	Making Left Turn	Disregard Stop and Go Light	None	
State Route	Okanogan	Omak	097	291.24		No	EA41730	06/17/2020	14:10	Suspected Serious Injury	1	0	1	1	0	At Intersection and Related	Vehicle going straight hits pedestrian	Going Straight Ahead		None		Did Not Grant RW to Vehicle
State Route	Okanogan	Omak	097	291.24		No	E871132	12/06/2018	17:10	No Apparent Injury	0	0	2	0	0	At Intersection and Related	From same direction - both going straight - one stopped - rear-end	Stopped for Traffic	Going Straight Ahead	None	Follow Too Closely	
State Route	Okanogan	Omak	097	291.24		No	E989386	12/03/2019	14:16	No Apparent Injury	0	0	2	0	0	At Intersection and Related	From same direction - both going straight - both moving - rear-end	Slowing	Slowing	Follow Too Closely	None	
State Route	Okanogan	Omak	097	291.24		No	E862288	11/07/2018	12:25	No Apparent Injury	0	0	2	0	0	At Intersection and Related	From same direction - one right turn - one straight	Stopped at Signal or Stop Sign	Making Right Turn	None	Improper Turn/Merge	
State Route	Okanogan	Omak	097	291.24		No	EA24321	03/05/2020	16:30	Possible Injury	1	0	2	0	0	At Intersection and Related	Entering at angle	Going Straight Ahead	Making Left Turn	Disregard Traffic Sign and Signals	None	
State Route	Okanogan	Omak	097	291.24		No	EB53936	07/29/2021	15:30	Dead at Scene	0	1	1	1	0	At Intersection and Related	Vehicle going straight hits pedestrian	Going Straight Ahead		None		Disregard Traffic Sign and Signals
State Route	Okanogan	Omak	097	291.25		No	EC68282	07/26/2022	15:43	Possible Injury	1	0	3	0	0	Intersection Related but Not at I	From same direction - both going straight - one stopped - rear-end	Going Straight Ahead	Stopped for Traffic	Unknown Distraction	None	
State Route	Okanogan	Omak	097	291.26		No	E983292	11/13/2019	16:45	No Apparent Injury	0	0	2	0	0	Intersection Related but Not at I	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Slowing	Follow Too Closely	None	
State Route	Okanogan	Omak	097	291.37		No	EB60964	07/02/2021	10:16	No Apparent Injury	0	0	2	0	0	Not at Intersection and Not Rela	From same direction - both going straight - both moving - rear-end	Going Straight Ahead	Slowing	Did Not Grant RW to Vehicle	None	

Appendix C

Traffic Volume Calculations Worksheets

SCJ ALLIANCE
CONSULTING SERVICES

Omak Industrial Park

AM Peak Hour Volumes

SR 20 Throughput

Growth Rate: 0.5% 1.5%

Intersection	Movement		Existing 2023 Counts	Background 2045 Growth	Pipline Colville Clinic Volumes	Baseline 2045 Volumes	Alt 1 Total Site Development	Alt 1 Projected 2045 Volumes	Alt 2 Total Site Development	Alt 2 Projected 2045 Volumes	Alt 3 Total Site Development	Alt 3 Projected 2045 Volumes
		L	24	3	0	27	0	27	0	27	0	27
	EB	T	103	11	0	114	6	120	3	117	4	118
		R	0	0	89	89	0	89	0	89	0	89
1		L	0	0	30	30	0	30	0	30	0	30
SR 155	WB	T	88	10	0	98	10	108	12	110	11	109
East Access Road		R	5	1	0	6	0	6	0	6	0	6
		L	0	0	45	45	0	45	0	45	0	45
TMC Date: 04/13/2023	NB	T	0	0	8	8	0	8	0	8	0	8
		R	0	0	15	15	0	15	0	15	0	15
7:15 - 8:15 AM		L	12	1	0	13	0	13	0	13	0	13
PHF: 0.88	SB	T	0	0	15	15	0	15	0	15	0	15
		R	62	7	0	69	0	69	0	69	0	69
			294		202		16	544	15	543	15	543
		L	0	0	0	0	0	0	0	0	0	0
	EB	T	104	11	89	204	1	205	1	205	0	204
		R	33	4	15	52	146	198	100	152	34	86
2		L	23	3	0	26	11	37	11	37	11	37
SR 155	WB	T	127	14	45	186	1	187	1	187	0	186
Jackson St		R	0	0	0	0	0	0	0	0	0	0
		L	34	4	8	46	39	85	30	76	10	56
TMC Date: 04/13/2023	NB	T	0	0	0	0	0	0	0	0	0	0
		R	23	3	0	26	3	29	3	29	4	30
7:15 - 8:15 AM		L	0	0	0	0	0	0	0	0	0	0
PHF: 0.89	SB	T	0	0	0	0	0	0	0	0	0	0
		R	0	0	0	0	0	0	0	0	0	0
			344		157		201	740	146	685	59	598
		L	69	8	0	77	0	77	0	77	0	77
	EB	T	174	19	104	297	147	444	101	398	34	331
		R	5	1	0	6	0	6	0	6	0	6
3		L	11	1	0	12	0	12	0	12	0	12
SR 155	WB	T	163	18	53	234	40	274	31	265	10	244
Hanford St/East School Drwy		R	14	2	0	16	0	16	0	16	0	16
		L	9	1	0	10	0	10	0	10	0	10
TMC Date: 04/13/2023	NB	T	0	0	0	0	0	0	0	0	0	0
		R	12	1	0	13	0	13	0	13	0	13
7:15 - 8:15 AM		L	1	0	0	1	0	1	0	1	0	1
PHF: 0.87	SB	T	0	0	0	0	0	0	0	0	0	0
		R	16	2	0	18	0	18	0	18	0	18
			474		157		187	870	132	815	44	727

Intersection	Movement		Existing 2023 Counts	Background 2045 Growth	Pipline Colville Clinic Volumes	Baseline 2045 Volumes	Alt 1 Total Site Development	Projected 2045 Volumes	Alt 2 Total Site Development	Projected 2045 Volumes	Alt 3 Total Site Development	Projected 2045 Volumes
		L	1	0	0	1	0	1	0	1	0	1
	EB	T	311	34	104	449	147	596	101	550	34	483
		R	10	1	0	11	0	11	0	11	0	11
4		L	1	0	0	1	0	1	0	1	0	1
SR 155	WB	T	232	26	53	311	40	351	31	342	10	321
Garfield St/West School Drwy		R	0	0	0	0	0	0	0	0	0	0
		L	20	2	0	22	0	22	0	22	0	22
TMC Date: 04/13/2023	NB	T	0	0	0	0	0	0	0	0	0	0
		R	3	0	0	3	0	3	0	3	0	3
7:15 - 8:15 AM		L	5	1	0	6	0	6	0	6	0	6
PHF: 0.87	SB	T	0	0	0	0	0	0	0	0	0	0
		R	76	8	0	84	0	84	0	84	0	84
			659		157		187	1,075	132	1,020	44	932
		L	1	0	0	1	0	1	0	1	0	1
	EB	T	183	20	30	233	30	263	36	269	34	267
		R	52	6	0	58	10	68	4	62	3	61
5		L	63	7	38	108	32	140	21	129	0	108
SR 155	WB	T	188	21	15	224	8	232	10	234	10	234
2nd Ave/Dayton St		R	2	0	0	2	0	2	0	2	0	2
		L	46	5	0	51	5	56	3	54	2	53
TMC Date: 04/13/2023	NB	T	0	0	0	0	0	0	0	0	0	0
		R	65	7	74	146	117	263	65	211	0	146
7:15 - 8:15 AM		L	3	0	0	3	0	3	0	3	0	3
PHF: 0.74	SB	T	0	0	0	0	0	0	0	0	0	0
		R	0	0	0	0	0	0	0	0	0	0
			603		157		202	1,028	139	965	49	875
		L	83	9	8	100	14	114	20	120	0	100
	EB	T	0	0	0	0	0	0	0	0	0	0
		R	86	9	30	125	28	153	5	130	3	128
6		L	0	0	0	0	0	0	0	0	0	0
SR 20	WB	T	0	0	0	0	0	0	0	0	0	0
Dayton St		R	0	0	0	0	0	0	0	0	0	0
		L	69	8	59	136	69	205	4	140	2	138
TMC Date: 04/13/2023	NB	T	200	66	0	266	11	277	5	271	23	289
		R	0	0	0	0	0	0	0	0	0	0
7:30 - 8:30 AM		L	0	0	0	0	0	0	0	0	0	0
PHF: 0.88	SB	T	235	78	0	313	18	331	7	320	68	381
		R	101	11	15	127	53	180	64	191	0	127
			774		112		193	1,260	105	1,172	96	1,163

Intersection	Movement		Existing 2023 Counts	Background 2045 Growth	Pipline Colville Clinic Volumes	Baseline 2045 Volumes	Alt 1 Total Site Development	Projected 2045 Volumes	Alt 2 Total Site Development	Projected 2045 Volumes	Alt 3 Total Site Development	Projected 2045 Volumes
		L	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	EB	T	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		R	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
7		L	**27**	3	0	**30**	**11**	**41**	**11**	**41**	**37**	**67**
SR 20	WB	T	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Truck Stop Drwy		R	**26**	3	0	**29**	**15**	**44**	**15**	**44**	**30**	**59**
		L	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
TMC Date: 04/13/2023	NB	T	**223**	74	59	**356**	**65**	**421**	**-6**	**350**	**-5**	**351**
		R	**12**	1	0	**13**	**15**	**28**	**15**	**28**	**91**	**104**
7:30 - 8:30 AM		L	**40**	4	0	**44**	**18**	**62**	**18**	**62**	**76**	**120**
PHF: 0.90	SB	T	**280**	92	30	**402**	**28**	**430**	**-6**	**396**	**-5**	**397**
		R	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
			608		89		**152**	**1,027**	**47**	**922**	**224**	**1,099**
		L	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	EB	T	**7**	1	0	**8**	**0**	**8**	**0**	**8**	**0**	**0**
		R	**7**	1	0	**8**	**0**	**8**	**0**	**8**	**0**	**0**
8		L	**22**	2	0	**24**	**0**	**24**	**0**	**24**	**0**	**29**
Okanogan-Omak East Rd	WB	T	**4**	0	0	**4**	**0**	**4**	**0**	**4**	**0**	**0**
8th Ave E		R	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		L	**7**	1	0	**8**	**0**	**8**	**0**	**8**	**0**	**0**
TMC Date: 04/13/2023	NB	T	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		R	**30**	3	0	**33**	**0**	**33**	**0**	**33**	**0**	**57**
7:15 - 8:15 AM		L	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
PHF: 0.77	SB	T	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		R	**0**	0	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**
			77		0		**0**	**85**	**0**	**85**	**0**	**85**

Omak Industrial Park

PM Peak Hour Volumes — SR 20 Throughput

Growth Rate: 0.5% 1.5%

Intersection	Movement		Existing 2023 Counts	Background 2045 Growth	Pipeline Colville Clinic Volumes	Baseline 2045 Volumes	Alt 1 Total Site Development	Alt 1 Projected 2045 Volumes	Alt 2 Total Site Development	Alt 2 Projected 2045 Volumes	Alt 3 Total Site Development	Alt 3 Rail Crossing Reassingment	Alt 3 Sensitivity Reassingment	Alt 3 Sensitivity Projected 2045 Volumes	Alt 3 Projected 2045 Volumes
		L	85	9	0	94	0	94	0	94	0	0	0	0	94
	EB	T	95	10	0	105	10	115	10	115	10	0	0	115	115
		R	1	0	65	66	0	66	0	66	0	0	0	66	66
1		L	1	0	22	23	0	23	0	23	0	0	0	23	23
SR 155	WB	T	103	11	0	114	6	120	5	119	5	0	0	119	119
East Access Road		R	13	1	0	14	0	14	0	14	0	0	0	14	14
		L	1	0	98	99	0	99	0	99	0	0	0	99	99
TMC Date: 04/13/2023	NB	T	1	0	16	17	0	17	0	17	0	0	0	17	17
		R	0	0	33	33	0	33	0	33	0	0	0	33	33
3:45 - 4:45 PM		L	6	1	0	7	0	7	0	7	0	0	0	7	7
PHF: 0.89	SB	T	0	0	11	11	0	11	0	11	0	0	0	11	11
		R	64	7	0	71	0	71	0	71	0	0	0	0	71
			370		245		16	672	15	671	15			505	671
		L	0	0	0	0	0	0	0	0	0	0	0	0	0
	EB	T	152	17	65	234	2	236	2	236	0	0	-50	184	184
		R	48	5	11	64	36	100	30	94	10	0	0	74	74
2		L	13	1	0	14	4	18	3	17	5	0	50	69	69
SR 155	WB	T	155	17	98	270	2	272	2	272	0	0	-50	220	220
Jackson St		R	0	0	0	0	0	0	0	0	0	0	0	0	0
		L	40	4	16	60	91	151	68	128	23	0	0	83	83
TMC Date: 04/13/2023	NB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
		R	29	3	0	32	8	40	8	40	10	0	50	92	92
3:45 - 4:45 PM		L	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF: 0.88	SB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
		R	0	0	0	0	0	0	0	0	0	0	0	0	0
			437		190		143	818	113	788	48			723	723
		L	8	1	0	9	0	9	0	9	0	0	0	0	9
	EB	T	206	23	76	305	38	343	32	337	10	0	0	315	315
		R	7	1	0	8	0	8	0	8	0	0	0	8	8
3		L	8	1	0	9	0	9	0	9	0	0	0	9	9
SR 155	WB	T	268	29	114	411	93	504	70	481	23	0	0	434	434
Hanford St/East School Drwy		R	1	0	0	1	0	1	0	1	0	0	0	1	1
		L	11	1	0	12	0	12	0	12	0	0	0	12	12
TMC Date: 04/13/2023	NB	T	1	0	0	1	0	1	0	1	0	0	0	1	1
		R	25	3	0	28	0	28	0	28	0	0	0	28	28
3:45 - 4:45 PM		L	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF: 0.93	SB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
		R	4	0	0	4	0	4	0	4	0	0	0	0	4
			539		190		131	919	102	890	33			808	821

Intersection	Movement		Existing 2023 Counts	Background 2045 Growth	Pipeline Colville Clinic Volumes	Baseline 2045 Volumes	Alt 1 Total Site Development	Projected 2045 Volumes	Alt 2 Total Site Development	Projected 2045 Volumes	Alt 3 Total Site Development	Alt 3 Rail Crossing Reassingment	Alt 3 Sensitivity Reassingment	Projected 2045 Volumes	Projected 2045 Volumes
		L	0	0	0	0	0	0	0	0	0	0	0	0	0
	EB	T	240	26	76	342	38	380	32	374	10	0	0	352	352
		R	33	4	0	37	0	37	0	37	0	0	0	37	37
4		L	5	1	0	6	0	6	0	6	0	0	0	6	6
SR 155	WB	T	300	33	114	447	93	540	70	517	23	0	0	470	470
Garfield St/West School Drwy		R	0	0	0	0	0	0	0	0	0	0	0	0	0
		L	45	5	0	50	0	50	0	50	0	0	0	50	50
TMC Date: 04/13/2023	NB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
		R	2	0	0	2	0	2	0	2	0	0	0	2	2
3:00 - 4:00 PM		L	3	0	0	3	0	3	0	3	0	0	0	3	3
PHF: 0.76	SB	T	1	0	0	1	0	1	0	1	0	0	0	1	1
		R	48	5	0	53	0	53	0	53	0	0	0	0	53
			677		190		131	1,072	102	1,043	33			921	974
		L	15	2	0	17	0	17	0	17	0	0	0	0	17
	EB	T	167	18	33	218	8	226	11	229	10	0	0	228	228
		R	77	8	0	85	12	97	9	94	8	0	0	93	93
5		L	81	9	65	155	75	230	46	201	3	0	-50	108	108
SR 155	WB	T	252	28	50	330	18	348	24	354	22	0	0	352	352
2nd Ave/Dayton St		R	2	0	0	2	0	2	0	2	0	0	0	2	2
		L	79	9	0	88	15	103	9	97	8	0	0	96	96
TMC Date: 04/13/2023	NB	T	8	1	0	9	0	9	0	9	0	0	0	9	9
		R	93	10	44	147	30	177	21	168	0	0	-50	97	97
2:45 - 3:45 PM		L	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF: 0.80	SB	T	1	0	0	1	0	1	0	1	0	0	0	1	1
		R	11	1	0	12	0	12	0	12	0	0	0	0	12
			786		192		158	1,222	120	1,184	51			987	1,015
		L	123	14	0	137	32	169	44	181	0	0	0	0	137
	EB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
		R	111	12	65	188	55	243	11	199	8	0	-50	146	146
6		L	0	0	0	0	0	0	0	0	0	0	0	0	0
SR 20	WB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
Dayton St		R	0	0	0	0	0	0	0	0	0	0	0	0	0
		L	125	14	43	182	41	223	11	193	8	0	-50	140	140
TMC Date: 04/13/2023	NB	T	296	98	0	394	28	422	16	410	56	0	0	450	450
		R	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 - 5:15 PM		L	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF: 0.93	SB	T	266	88	0	354	21	375	15	369	32	0	0	386	386
		R	124	14	0	138	13	151	19	157	0	0	0	138	138
			1,045		108		190	1,582	116	1,508	104			1,259	1,396
		L	0	0	0	0	0	0	0	0	0	0	0	0	0
	EB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
		R	0	0	0	0	0	0	0	0	0	0	0	0	0
7		L	43	5	0	48	33	81	33	81	86	0	50	184	184
SR 20	WB	T	0	0	0	0	0	0	0	0	0	0	0	0	0
Truck Stop Drwy		R	89	10	0	99	42	141	42	141	78	0	0	177	177
		L	0	0	0	0	0	0	0	0	0	0	0	0	0
TMC Date: 04/13/2023	NB	T	335	111	43	489	18	507	-15	474	-14	0	-50	425	425
		R	37	4	0	41	33	74	33	74	54	0	50	145	145
4:15 - 5:15 PM		L	79	9	0	88	41	129	41	129	54	0	0	142	142
PHF: 0.94	SB	T	293	97	65	455	35	490	-15	440	-14	0	-50	391	391
		R	0	0	0	0	0	0	0	0	0	0	0	0	0
			876		108		202	1,421	119	1,338	244			1,463	1,463

Intersection	Movement		Existing 2023 Counts	Background 2045 Growth	Pipeline Colville Clinic Volumes	Baseline 2045 Volumes	Alt 1 Total Site Development	Projected 2045 Volumes	Alt 2 Total Site Development	Projected 2045 Volumes	Alt 3 Total Site Development	Alt 3 Rail Crossing Reassingment	Alt 3 Sensitivity Reassingment	Projected 2045 Volumes	Projected 2045 Volumes
		L	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	**0**	**0**
	EB	T	**14**	2	**0**	**16**	**0**	**16**	**0**	**16**	**0**	-16	0	**0**	**0**
		R	**13**	1	**0**	**14**	**0**	**14**	**0**	**14**	**0**	-14	0	**0**	**0**
8		L	**28**	3	**0**	**31**	**0**	**31**	**0**	**31**	**0**	21	0	**0**	**52**
Okanogan-Omak East Rd	WB	T	**19**	2	**0**	**21**	**0**	**21**	**0**	**21**	**0**	-21	0	**0**	**0**
8th Ave E		R	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	**0**	**0**
		L	**15**	2	**0**	**17**	**0**	**17**	**0**	**17**	**0**	-17	0	**0**	**0**
TMC Date: 04/13/2023	NB	T	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	**0**	**0**
		R	**31**	3	**0**	**34**	**0**	**34**	**0**	**34**	**0**	47	0	**0**	**81**
3:15 - 4:15 PM		L	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	**0**	**0**
PHF: 0.91	SB	T	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	**0**	**0**
		R	**0**	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0	**0**	**0**
			120		0		0	133	0	133	0			0	133

Appendix D

Operations Analysis Worksheets

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	105	1	1	90	5	1	1	1	10	1	60
Future Vol, veh/h	25	105	1	1	90	5	1	1	1	10	1	60
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	225	-	-	225	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	0	0	0	4	4	4
Mvmt Flow	28	119	1	1	102	6	1	1	1	11	1	68

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	108	0	0	120	0	0	318	286	120	284	283	105
Stage 1	-	-	-	-	-	-	176	176	-	107	107	-
Stage 2	-	-	-	-	-	-	142	110	-	177	176	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.1	6.5	6.2	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.5	4	3.3	3.536	4.036	3.336
Pot Cap-1 Maneuver	1464	-	-	1449	-	-	639	627	937	664	623	944
Stage 1	-	-	-	-	-	-	831	757	-	894	803	-
Stage 2	-	-	-	-	-	-	866	808	-	820	750	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1464	-	-	1449	-	-	583	614	937	652	611	944
Mov Cap-2 Maneuver	-	-	-	-	-	-	583	614	-	652	611	-
Stage 1	-	-	-	-	-	-	815	743	-	877	802	-
Stage 2	-	-	-	-	-	-	802	807	-	802	736	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0.1	10.3	9.5
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	680	1464	-	-	1449	-	-	882
HCM Lane V/C Ratio	0.005	0.019	-	-	0.001	-	-	0.091
HCM Control Delay (s)	10.3	7.5	-	-	7.5	-	-	9.5
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0	0.1	-	-	0	-	-	0.3

Intersection						
Int Delay, s/veh	2.6					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	105	35	25	125	35	25
Future Vol, veh/h	105	35	25	125	35	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	118	39	28	140	39	28

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	118	0	314	118
Stage 1	-	-	-	-	118	-
Stage 2	-	-	-	-	196	-
Critical Hdwy	-	-	4.15	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.245	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	1452	-	679	934
Stage 1	-	0	-	-	907	-
Stage 2	-	0	-	-	837	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1452	-	665	934
Mov Cap-2 Maneuver	-	-	-	-	665	-
Stage 1	-	-	-	-	907	-
Stage 2	-	-	-	-	819	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	756	-	1452	-
HCM Lane V/C Ratio	0.089	-	0.019	-
HCM Control Delay (s)	10.2	-	7.5	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	0.3	-	0.1	-

Intersection	
Int Delay, s/veh	1.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	70	175	5	10	165	15	10	1	10	0	0	0
Future Vol, veh/h	70	175	5	10	165	15	10	1	10	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	9	9	9	4	4	4	14	14	14	2	2	2
Mvmt Flow	80	201	6	11	190	17	11	1	11	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	207	0	0	207	0	0	585	593	204
Stage 1	-	-	-	-	-	-	364	364	-
Stage 2	-	-	-	-	-	-	221	229	-
Critical Hdwy	4.19	-	-	4.14	-	-	6.54	6.64	6.34
Critical Hdwy Stg 1	-	-	-	-	-	-	5.54	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.54	5.64	-
Follow-up Hdwy	2.281	-	-	2.236	-	-	3.626	4.126	3.426
Pot Cap-1 Maneuver	1323	-	-	1352	-	-	454	403	807
Stage 1	-	-	-	-	-	-	677	603	-
Stage 2	-	-	-	-	-	-	788	693	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1323	-	-	1352	-	-	423	0	807
Mov Cap-2 Maneuver	-	-	-	-	-	-	423	0	-
Stage 1	-	-	-	-	-	-	636	0	-
Stage 2	-	-	-	-	-	-	781	0	-

Approach	SE	NW	NE
HCM Control Delay, s	2.2	0.4	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	555	1352	-	-	1323	-	-
HCM Lane V/C Ratio	0.043	0.009	-	-	0.061	-	-
HCM Control Delay (s)	11.8	7.7	0	-	7.9	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.1	0	-	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.7					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	315	10	5	230	20	5
Future Vol, veh/h	315	10	5	230	20	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	7	7	10	10	13	13
Mvmt Flow	362	11	6	264	23	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	373	0	644	368
Stage 1	-	-	-	-	368	-
Stage 2	-	-	-	-	276	-
Critical Hdwy	-	-	4.2	-	6.53	6.33
Critical Hdwy Stg 1	-	-	-	-	5.53	-
Critical Hdwy Stg 2	-	-	-	-	5.53	-
Follow-up Hdwy	-	-	2.29	-	3.617	3.417
Pot Cap-1 Maneuver	-	-	1143	-	420	654
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	746	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1143	-	418	654
Mov Cap-2 Maneuver	-	-	-	-	418	-
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	742	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.2	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	451	1143	-	-	-
HCM Lane V/C Ratio	0.064	0.005	-	-	-
HCM Control Delay (s)	13.5	8.2	-	-	-
HCM Lane LOS	B	A	-	-	-
HCM 95th %tile Q(veh)	0.2	0	-	-	-

Intersection	
Int Delay, s/veh	4.3

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	185	50	65	190	5	45	1	65	5	1	1
Future Vol, veh/h	5	185	50	65	190	5	45	1	65	5	1	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	3	3	3	5	5	5	12	12	12	33	33	33
Mvmt Flow	7	250	68	88	257	7	61	1	88	7	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	264	0	-	250	0	0	702	704	250	746	701	261
Stage 1	-	-	-	-	-	-	264	264	-	437	437	-
Stage 2	-	-	-	-	-	-	438	440	-	309	264	-
Critical Hdwy	4.13	-	-	4.15	-	-	7.22	6.62	6.32	7.43	6.83	6.53
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Follow-up Hdwy	2.227	-	-	2.245	-	-	3.608	4.108	3.408	3.797	4.297	3.597
Pot Cap-1 Maneuver	1294	-	0	1298	-	-	340	349	765	294	327	708
Stage 1	-	-	0	-	-	-	720	672	-	542	530	-
Stage 2	-	-	0	-	-	-	578	561	-	640	637	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1294	-	-	1298	-	-	319	324	765	245	303	708
Mov Cap-2 Maneuver	-	-	-	-	-	-	319	324	-	245	303	-
Stage 1	-	-	-	-	-	-	716	669	-	539	494	-
Stage 2	-	-	-	-	-	-	536	523	-	562	634	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	2	15.7	18.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	484	1298	-	-	1294	-	279
HCM Lane V/C Ratio	0.31	0.068	-	-	0.005	-	0.034
HCM Control Delay (s)	15.7	8	-	-	7.8	-	18.4
HCM Lane LOS	C	A	-	-	A	-	C
HCM 95th %tile Q(veh)	1.3	0.2	-	-	0	-	0.1

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	85	85	70	200	235	100
Future Volume (vph)	85	85	70	200	235	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		

Intersection Summary

Area Type: Other
Cycle Length: 55
Actuated Cycle Length: 36.5
Natural Cycle: 55
Control Type: Actuated-Uncoordinated

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	85	85	70	200	235	100
Future Volume (veh/h)	85	85	70	200	235	100
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1811	1811	1826	1826	1826	1826
Adj Flow Rate, veh/h	97	97	80	227	267	114
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	6	6	5	5	5	5
Cap, veh/h	128	128	145	929	472	400
Arrive On Green	0.16	0.16	0.08	0.51	0.26	0.26
Sat Flow, veh/h	808	808	1739	1826	1826	1547
Grp Volume(v), veh/h	195	0	80	227	267	114
Grp Sat Flow(s),veh/h/ln	1625	0	1739	1826	1826	1547
Q Serve(g_s), s	3.1	0.0	1.2	1.9	3.4	1.6
Cycle Q Clear(g_c), s	3.1	0.0	1.2	1.9	3.4	1.6
Prop In Lane	0.50	0.50	1.00			1.00
Lane Grp Cap(c), veh/h	256	0	145	929	472	400
V/C Ratio(X)	0.76	0.00	0.55	0.24	0.57	0.28
Avail Cap(c_a), veh/h	1083	0	354	1893	1217	1032
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	10.9	0.0	11.9	3.7	8.7	8.0
Incr Delay (d2), s/veh	4.6	0.0	3.2	0.1	1.1	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.0	0.5	0.2	1.0	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	15.5	0.0	15.1	3.9	9.8	8.4
LnGrp LOS	B	A	B	A	A	A
Approach Vol, veh/h	195			307	381	
Approach Delay, s/veh	15.5			6.8	9.3	
Approach LOS	B			A	A	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		18.2			6.8	11.5		8.8
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		3.9			3.2	5.4		5.1
Green Ext Time (p_c), s		1.3			0.0	1.6		0.4

Intersection Summary		
HCM 6th Ctrl Delay		9.8
HCM 6th LOS		A

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	25	225	10	40	280
Future Vol, veh/h	25	25	225	10	40	280
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	4	4	7	7	5	5
Mvmt Flow	28	28	250	11	44	311

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	649	250	0	-	250	0
Stage 1	250	-	-	-	-	-
Stage 2	399	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.15	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.245	-
Pot Cap-1 Maneuver	431	784	-	0	1298	-
Stage 1	787	-	-	0	-	-
Stage 2	673	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	416	784	-	-	1298	-
Mov Cap-2 Maneuver	511	-	-	-	-	-
Stage 1	787	-	-	-	-	-
Stage 2	650	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	511	784	1298	-
HCM Lane V/C Ratio	-	0.054	0.035	0.034	-
HCM Control Delay (s)	-	12.5	9.8	7.9	-
HCM Lane LOS	-	B	A	A	-
HCM 95th %tile Q(veh)	-	0.2	0.1	0.1	-

Intersection	
Int Delay, s/veh	6.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	5	5	20	5	5	30
Future Vol, veh/h	5	5	20	5	5	30
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	77	77	77	77	77	77
Heavy Vehicles, %	14	14	4	4	3	3
Mvmt Flow	6	6	26	6	6	39

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	12	0	67	9
Stage 1	-	-	-	-	9	-
Stage 2	-	-	-	-	58	-
Critical Hdwy	-	-	4.14	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.236	-	3.527	3.327
Pot Cap-1 Maneuver	-	-	1594	-	936	1070
Stage 1	-	-	-	-	1011	-
Stage 2	-	-	-	-	962	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1594	-	921	1070
Mov Cap-2 Maneuver	-	-	-	-	921	-
Stage 1	-	-	-	-	1011	-
Stage 2	-	-	-	-	947	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.8	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1046	-	-	1594	-
HCM Lane V/C Ratio	0.043	-	-	0.016	-
HCM Control Delay (s)	8.6	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	115	90	30	100	5	45	10	15	15	15	70
Future Vol, veh/h	25	115	90	30	100	5	45	10	15	15	15	70
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	225	-	-	225	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	0	0	0	4	4	4
Mvmt Flow	28	131	102	34	114	6	51	11	17	17	17	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	120	0	0	233	0	0	472	426	182	437	474	117
Stage 1	-	-	-	-	-	-	238	238	-	185	185	-
Stage 2	-	-	-	-	-	-	234	188	-	252	289	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.1	6.5	6.2	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.5	4	3.3	3.536	4.036	3.336
Pot Cap-1 Maneuver	1449	-	-	1317	-	-	506	524	866	526	486	930
Stage 1	-	-	-	-	-	-	770	712	-	812	743	-
Stage 2	-	-	-	-	-	-	774	748	-	748	669	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1449	-	-	1317	-	-	435	500	866	490	464	930
Mov Cap-2 Maneuver	-	-	-	-	-	-	435	500	-	490	464	-
Stage 1	-	-	-	-	-	-	755	698	-	797	724	-
Stage 2	-	-	-	-	-	-	673	729	-	707	656	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	1.7	13.6	10.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	497	1449	-	-	1317	-	-	724
HCM Lane V/C Ratio	0.16	0.02	-	-	0.026	-	-	0.157
HCM Control Delay (s)	13.6	7.5	-	-	7.8	-	-	10.9
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.6

MOVEMENT SUMMARY

Site: 1 [No Build (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	45	2.0	51	2.0	0.064	10.5	LOS B	0.3	8.2	0.34	0.58	0.34	35.3
8	T1	10	2.0	11	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.58	0.34	35.2
18	R2	15	2.0	17	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.58	0.34	34.2
Approach		70	2.0	80	2.0	0.064	8.4	LOS A	0.3	8.2	0.34	0.58	0.34	35.0
East: WB SR 155														
1	L2	30	5.0	34	5.0	0.119	10.2	LOS B	0.6	16.2	0.25	0.46	0.25	36.6
6	T1	100	5.0	114	5.0	0.119	4.3	LOS A	0.6	16.2	0.25	0.46	0.25	36.5
16	R2	5	5.0	6	5.0	0.119	4.3	LOS A	0.6	16.2	0.25	0.46	0.25	35.4
Approach		135	5.0	153	5.0	0.119	5.6	LOS A	0.6	16.2	0.25	0.46	0.25	36.5
North: SB SR 280														
7	L2	15	4.0	17	4.0	0.095	10.7	LOS B	0.5	12.6	0.37	0.52	0.37	36.6
4	T1	15	4.0	17	4.0	0.095	4.8	LOS A	0.5	12.6	0.37	0.52	0.37	36.6
14	R2	70	4.0	80	4.0	0.095	4.8	LOS A	0.5	12.6	0.37	0.52	0.37	35.4
Approach		100	4.0	114	4.0	0.095	5.7	LOS A	0.5	12.6	0.37	0.52	0.37	35.8
West: EB SR 155														
5	L2	25	5.0	28	5.0	0.199	10.2	LOS B	1.1	29.0	0.23	0.45	0.23	37.0
2	T1	115	5.0	131	5.0	0.199	4.2	LOS A	1.1	29.0	0.23	0.45	0.23	37.0
12	R2	90	5.0	102	5.0	0.199	4.2	LOS A	1.1	29.0	0.23	0.45	0.23	35.8
Approach		230	5.0	261	5.0	0.199	4.9	LOS A	1.1	29.0	0.23	0.45	0.23	36.5
All Vehicles		535	4.4	608	4.4	0.199	5.7	LOS A	1.1	29.0	0.28	0.48	0.28	36.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection						
Int Delay, s/veh	2.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↰	Y	
Traffic Vol, veh/h	205	50	25	185	45	25
Future Vol, veh/h	205	50	25	185	45	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	230	56	28	208	51	28

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	230	0	494	230
Stage 1	-	-	-	-	230	-
Stage 2	-	-	-	-	264	-
Critical Hdwy	-	-	4.15	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.245	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	1320	-	535	809
Stage 1	-	0	-	-	808	-
Stage 2	-	0	-	-	780	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1320	-	522	809
Mov Cap-2 Maneuver	-	-	-	-	522	-
Stage 1	-	-	-	-	808	-
Stage 2	-	-	-	-	761	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	11.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	598	-	1320	-
HCM Lane V/C Ratio	0.132	-	0.021	-
HCM Control Delay (s)	11.9	-	7.8	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	0.5	-	0.1	-

Intersection	
Int Delay, s/veh	1.6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	75	295	5	10	235	15	10	1	15	0	0	0
Future Vol, veh/h	75	295	5	10	235	15	10	1	15	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	9	9	9	4	4	4	14	14	14	2	2	2
Mvmt Flow	86	339	6	11	270	17	11	1	17	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	287	0	0	345	0	0	815	823	342
Stage 1	-	-	-	-	-	-	514	514	-
Stage 2	-	-	-	-	-	-	301	309	-
Critical Hdwy	4.19	-	-	4.14	-	-	6.54	6.64	6.34
Critical Hdwy Stg 1	-	-	-	-	-	-	5.54	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.54	5.64	-
Follow-up Hdwy	2.281	-	-	2.236	-	-	3.626	4.126	3.426
Pot Cap-1 Maneuver	1236	-	-	1203	-	-	331	295	674
Stage 1	-	-	-	-	-	-	577	516	-
Stage 2	-	-	-	-	-	-	724	639	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1236	-	-	1203	-	-	305	0	674
Mov Cap-2 Maneuver	-	-	-	-	-	-	305	0	-
Stage 1	-	-	-	-	-	-	537	0	-
Stage 2	-	-	-	-	-	-	716	0	-

Approach	SE	NW	NE
HCM Control Delay, s	1.6	0.3	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	454	1203	-	-	1236	-	-
HCM Lane V/C Ratio	0.066	0.01	-	-	0.07	-	-
HCM Control Delay (s)	13.5	8	0	-	8.1	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.6					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	455	10	5	310	20	5
Future Vol, veh/h	455	10	5	310	20	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	7	7	10	10	13	13
Mvmt Flow	523	11	6	356	23	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	534	0	897	529
Stage 1	-	-	-	-	529	-
Stage 2	-	-	-	-	368	-
Critical Hdwy	-	-	4.2	-	6.53	6.33
Critical Hdwy Stg 1	-	-	-	-	5.53	-
Critical Hdwy Stg 2	-	-	-	-	5.53	-
Follow-up Hdwy	-	-	2.29	-	3.617	3.417
Pot Cap-1 Maneuver	-	-	994	-	297	529
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	677	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	994	-	295	529
Mov Cap-2 Maneuver	-	-	-	-	295	-
Stage 1	-	-	-	-	569	-
Stage 2	-	-	-	-	673	-

Approach	SE		NW		NE	
HCM Control Delay, s	0		0.1		17.2	
HCM LOS					C	

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	324	994	-	-	-
HCM Lane V/C Ratio	0.089	0.006	-	-	-
HCM Control Delay (s)	17.2	8.6	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	-

Intersection	
Int Delay, s/veh	6

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	235	60	110	225	5	50	1	145	5	1	1
Future Vol, veh/h	5	235	60	110	225	5	50	1	145	5	1	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	5	5	5	12	12	12	33	33	33
Mvmt Flow	6	276	71	129	265	6	59	1	171	6	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	271	0	-	276	0	0	815	817	276	900	814	268
Stage 1	-	-	-	-	-	-	288	288	-	526	526	-
Stage 2	-	-	-	-	-	-	527	529	-	374	288	-
Critical Hdwy	4.13	-	-	4.15	-	-	7.22	6.62	6.32	7.43	6.83	6.53
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Follow-up Hdwy	2.227	-	-	2.245	-	-	3.608	4.108	3.408	3.797	4.297	3.597
Pot Cap-1 Maneuver	1287	-	0	1270	-	-	285	300	739	229	280	702
Stage 1	-	-	0	-	-	-	698	656	-	483	481	-
Stage 2	-	-	0	-	-	-	517	511	-	588	621	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1287	-	-	1270	-	-	260	268	739	161	250	702
Mov Cap-2 Maneuver	-	-	-	-	-	-	260	268	-	161	250	-
Stage 1	-	-	-	-	-	-	695	653	-	481	432	-
Stage 2	-	-	-	-	-	-	462	459	-	449	618	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.2	2.6	18.2	24.6
HCM LOS			C	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	500	1270	-	-	1287	-	192
HCM Lane V/C Ratio	0.461	0.102	-	-	0.005	-	0.043
HCM Control Delay (s)	18.2	8.2	-	-	7.8	-	24.6
HCM Lane LOS	C	A	-	-	A	-	C
HCM 95th %tile Q(veh)	2.4	0.3	-	-	0	-	0.1

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	100	125	135	265	315	125
Future Volume (vph)	100	125	135	265	315	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 43.1	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	100	125	135	265	315	125
Future Volume (veh/h)	100	125	135	265	315	125
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1811	1811	1826	1826	1826	1826
Adj Flow Rate, veh/h	114	142	153	301	358	142
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	6	6	5	5	5	5
Cap, veh/h	148	184	195	970	526	446
Arrive On Green	0.21	0.21	0.11	0.53	0.29	0.29
Sat Flow, veh/h	716	892	1739	1826	1826	1547
Grp Volume(v), veh/h	257	0	153	301	358	142
Grp Sat Flow(s),veh/h/ln	1615	0	1739	1826	1826	1547
Q Serve(g_s), s	5.2	0.0	2.9	3.2	6.0	2.5
Cycle Q Clear(g_c), s	5.2	0.0	2.9	3.2	6.0	2.5
Prop In Lane	0.44	0.55	1.00			1.00
Lane Grp Cap(c), veh/h	333	0	195	970	526	446
V/C Ratio(X)	0.77	0.00	0.79	0.31	0.68	0.32
Avail Cap(c_a), veh/h	848	0	279	1491	958	812
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.8	0.0	14.8	4.5	10.8	9.6
Incr Delay (d2), s/veh	3.8	0.0	9.1	0.2	1.6	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	1.4	0.6	2.0	0.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	16.7	0.0	23.9	4.7	12.4	10.0
LnGrp LOS	B	A	C	A	B	A
Approach Vol, veh/h	257			454	500	
Approach Delay, s/veh	16.7			11.2	11.7	
Approach LOS	B			B	B	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		22.7			8.3	14.4		11.6
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		5.2			4.9	8.0		7.2
Green Ext Time (p_c), s		1.8			0.0	1.9		0.6

Intersection Summary	
HCM 6th Ctrl Delay	12.5
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	30	30	355	15	45	400
Future Vol, veh/h	30	30	355	15	45	400
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	4	4	7	7	5	5
Mvmt Flow	33	33	394	17	50	444

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	938	394	0	-	394	0
Stage 1	394	-	-	-	-	-
Stage 2	544	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.15	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.245	-
Pot Cap-1 Maneuver	291	651	-	0	1148	-
Stage 1	677	-	-	0	-	-
Stage 2	578	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	278	651	-	-	1148	-
Mov Cap-2 Maneuver	402	-	-	-	-	-
Stage 1	677	-	-	-	-	-
Stage 2	553	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.8	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	402	651	1148	-
HCM Lane V/C Ratio	-	0.083	0.051	0.044	-
HCM Control Delay (s)	-	14.8	10.8	8.3	-
HCM Lane LOS	-	B	B	A	-
HCM 95th %tile Q(veh)	-	0.3	0.2	0.1	-

Intersection	
Int Delay, s/veh	6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	10	25	5	10	35
Future Vol, veh/h	10	10	25	5	10	35
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	85	85	85	85	85	85
Heavy Vehicles, %	14	14	4	4	3	3
Mvmt Flow	12	12	29	6	12	41

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	24	0	82	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	64	-
Critical Hdwy	-	-	4.14	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.236	-	3.527	3.327
Pot Cap-1 Maneuver	-	-	1578	-	918	1058
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1578	-	901	1058
Mov Cap-2 Maneuver	-	-	-	-	901	-
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	939	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1578	-
HCM Lane V/C Ratio	0.052	-	-	0.019	-
HCM Control Delay (s)	8.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	120	90	30	110	5	45	10	15	15	15	70
Future Vol, veh/h	25	120	90	30	110	5	45	10	15	15	15	70
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	225	-	-	225	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	0	0	0	4	4	4
Mvmt Flow	28	136	102	34	125	6	51	11	17	17	17	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	131	0	0	238	0	0	488	442	187	453	490	128
Stage 1	-	-	-	-	-	-	243	243	-	196	196	-
Stage 2	-	-	-	-	-	-	245	199	-	257	294	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.1	6.5	6.2	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.5	4	3.3	3.536	4.036	3.336
Pot Cap-1 Maneuver	1436	-	-	1311	-	-	493	513	860	514	476	917
Stage 1	-	-	-	-	-	-	765	708	-	801	735	-
Stage 2	-	-	-	-	-	-	763	740	-	743	666	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1436	-	-	1311	-	-	423	490	860	478	455	917
Mov Cap-2 Maneuver	-	-	-	-	-	-	423	490	-	478	455	-
Stage 1	-	-	-	-	-	-	750	695	-	786	716	-
Stage 2	-	-	-	-	-	-	663	721	-	702	653	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	1.6	13.9	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	485	1436	-	-	1311	-	-	711
HCM Lane V/C Ratio	0.164	0.02	-	-	0.026	-	-	0.16
HCM Control Delay (s)	13.9	7.6	-	-	7.8	-	-	11
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.6

MOVEMENT SUMMARY

Site: 1 [Alternative 1 (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	45	2.0	51	2.0	0.064	10.6	LOS B	0.3	8.2	0.34	0.59	0.34	35.2
8	T1	10	2.0	11	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.59	0.34	35.2
18	R2	15	2.0	17	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.59	0.34	34.1
Approach		70	2.0	80	2.0	0.064	8.4	LOS A	0.3	8.2	0.34	0.59	0.34	35.0
East: WB SR 155														
1	L2	30	5.0	34	5.0	0.128	10.2	LOS B	0.7	17.6	0.25	0.46	0.25	36.6
6	T1	110	5.0	125	5.0	0.128	4.3	LOS A	0.7	17.6	0.25	0.46	0.25	36.6
16	R2	5	5.0	6	5.0	0.128	4.3	LOS A	0.7	17.6	0.25	0.46	0.25	35.5
Approach		145	5.0	165	5.0	0.128	5.5	LOS A	0.7	17.6	0.25	0.46	0.25	36.6
North: SB SR 280														
7	L2	15	4.0	17	4.0	0.096	10.8	LOS B	0.5	12.7	0.38	0.53	0.38	36.6
4	T1	15	4.0	17	4.0	0.096	4.8	LOS A	0.5	12.7	0.38	0.53	0.38	36.6
14	R2	70	4.0	80	4.0	0.096	4.9	LOS A	0.5	12.7	0.38	0.53	0.38	35.4
Approach		100	4.0	114	4.0	0.096	5.7	LOS A	0.5	12.7	0.38	0.53	0.38	35.8
West: EB SR 155														
5	L2	25	5.0	28	5.0	0.203	10.2	LOS B	1.1	29.8	0.23	0.45	0.23	37.0
2	T1	120	5.0	136	5.0	0.203	4.2	LOS A	1.1	29.8	0.23	0.45	0.23	37.0
12	R2	90	5.0	102	5.0	0.203	4.2	LOS A	1.1	29.8	0.23	0.45	0.23	35.8
Approach		235	5.0	267	5.0	0.203	4.9	LOS A	1.1	29.8	0.23	0.45	0.23	36.6
All Vehicles		550	4.4	625	4.4	0.203	5.7	LOS A	1.1	29.8	0.28	0.48	0.28	36.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection						
Int Delay, s/veh	3.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↰	Y	
Traffic Vol, veh/h	205	200	35	185	85	30
Future Vol, veh/h	205	200	35	185	85	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	230	225	39	208	96	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	230	0	516	230
Stage 1	-	-	-	-	230	-
Stage 2	-	-	-	-	286	-
Critical Hdwy	-	-	4.15	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.245	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	1320	-	519	809
Stage 1	-	0	-	-	808	-
Stage 2	-	0	-	-	763	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1320	-	502	809
Mov Cap-2 Maneuver	-	-	-	-	502	-
Stage 1	-	-	-	-	808	-
Stage 2	-	-	-	-	738	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	13.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	557	-	1320	-
HCM Lane V/C Ratio	0.232	-	0.03	-
HCM Control Delay (s)	13.4	-	7.8	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	0.9	-	0.1	-

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	75	445	5	10	275	15	10	1	15	0	0	0
Future Vol, veh/h	75	445	5	10	275	15	10	1	15	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	9	9	9	4	4	4	14	14	14	2	2	2
Mvmt Flow	86	511	6	11	316	17	11	1	17	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	333	0	0	517	0	0	1033	1041	514
Stage 1	-	-	-	-	-	-	686	686	-
Stage 2	-	-	-	-	-	-	347	355	-
Critical Hdwy	4.19	-	-	4.14	-	-	6.54	6.64	6.34
Critical Hdwy Stg 1	-	-	-	-	-	-	5.54	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.54	5.64	-
Follow-up Hdwy	2.281	-	-	2.236	-	-	3.626	4.126	3.426
Pot Cap-1 Maneuver	1188	-	-	1039	-	-	245	219	537
Stage 1	-	-	-	-	-	-	478	430	-
Stage 2	-	-	-	-	-	-	690	609	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1188	-	-	1039	-	-	224	0	537
Mov Cap-2 Maneuver	-	-	-	-	-	-	224	0	-
Stage 1	-	-	-	-	-	-	444	0	-
Stage 2	-	-	-	-	-	-	681	0	-

Approach	SE	NW	NE
HCM Control Delay, s	1.2	0.3	16.5
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	344	1039	-	-	1188	-	-
HCM Lane V/C Ratio	0.087	0.011	-	-	0.073	-	-
HCM Control Delay (s)	16.5	8.5	0	-	8.3	-	-
HCM Lane LOS	C	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	595	10	5	350	20	5
Future Vol, veh/h	595	10	5	350	20	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	7	7	10	10	13	13
Mvmt Flow	684	11	6	402	23	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	695	0	1104	690
Stage 1	-	-	-	-	690	-
Stage 2	-	-	-	-	414	-
Critical Hdwy	-	-	4.2	-	6.53	6.33
Critical Hdwy Stg 1	-	-	-	-	5.53	-
Critical Hdwy Stg 2	-	-	-	-	5.53	-
Follow-up Hdwy	-	-	2.29	-	3.617	3.417
Pot Cap-1 Maneuver	-	-	865	-	222	427
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	644	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	865	-	220	427
Mov Cap-2 Maneuver	-	-	-	-	220	-
Stage 1	-	-	-	-	478	-
Stage 2	-	-	-	-	639	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	21.7
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	244	865	-	-	-
HCM Lane V/C Ratio	0.118	0.007	-	-	-
HCM Control Delay (s)	21.7	9.2	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	0.4	0	-	-	-

Intersection	
Int Delay, s/veh	11.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	265	70	140	230	5	55	1	265	5	1	1
Future Vol, veh/h	5	265	70	140	230	5	55	1	265	5	1	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	5	5	5	12	12	12	33	33	33
Mvmt Flow	6	312	82	165	271	6	65	1	312	6	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	277	0	-	312	0	0	929	931	312	1085	928	274
Stage 1	-	-	-	-	-	-	324	324	-	604	604	-
Stage 2	-	-	-	-	-	-	605	607	-	481	324	-
Critical Hdwy	4.13	-	-	4.15	-	-	7.22	6.62	6.32	7.43	6.83	6.53
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Follow-up Hdwy	2.227	-	-	2.245	-	-	3.608	4.108	3.408	3.797	4.297	3.597
Pot Cap-1 Maneuver	1280	-	0	1232	-	-	238	257	705	170	238	696
Stage 1	-	-	0	-	-	-	668	632	-	436	442	-
Stage 2	-	-	0	-	-	-	468	471	-	512	598	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1280	-	-	1232	-	-	212	222	705	84	205	696
Mov Cap-2 Maneuver	-	-	-	-	-	-	212	222	-	84	205	-
Stage 1	-	-	-	-	-	-	665	629	-	434	383	-
Stage 2	-	-	-	-	-	-	403	408	-	284	595	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.1	3.1	30.8	41.8
HCM LOS			D	E

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	502	1232	-	-	1280	-	106
HCM Lane V/C Ratio	0.752	0.134	-	-	0.005	-	0.078
HCM Control Delay (s)	30.8	8.4	-	-	7.8	-	41.8
HCM Lane LOS	D	A	-	-	A	-	E
HCM 95th %tile Q(veh)	6.4	0.5	-	-	0	-	0.2

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	115	155	205	275	330	180
Future Volume (vph)	115	155	205	275	330	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 44.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR		
Lane Configurations								
Traffic Volume (veh/h)	115	155	205	275	330	180		
Future Volume (veh/h)	115	155	205	275	330	180		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00		
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Work Zone On Approach	No			No	No			
Adj Sat Flow, veh/h/ln	1811	1811	1826	1826	1826	1826		
Adj Flow Rate, veh/h	131	176	233	312	375	205		
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88		
Percent Heavy Veh, %	6	6	5	5	5	5		
Cap, veh/h	164	220	240	979	521	442		
Arrive On Green	0.24	0.24	0.14	0.54	0.29	0.29		
Sat Flow, veh/h	685	921	1739	1826	1826	1547		
Grp Volume(v), veh/h	308	0	233	312	375	205		
Grp Sat Flow(s),veh/h/ln	1611	0	1739	1826	1826	1547		
Q Serve(g_s), s	7.2	0.0	5.3	3.8	7.4	4.4		
Cycle Q Clear(g_c), s	7.2	0.0	5.3	3.8	7.4	4.4		
Prop In Lane	0.43	0.57	1.00			1.00		
Lane Grp Cap(c), veh/h	384	0	240	979	521	442		
V/C Ratio(X)	0.80	0.00	0.97	0.32	0.72	0.46		
Avail Cap(c_a), veh/h	726	0	240	1281	823	698		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	14.3	0.0	17.1	5.2	12.8	11.7		
Incr Delay (d2), s/veh	3.9	0.0	50.3	0.2	1.9	0.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.4	0.0	5.1	0.9	2.7	1.3		
Unsig. Movement Delay, s/veh								
LnGrp Delay(d),s/veh	18.2	0.0	67.4	5.4	14.7	12.5		
LnGrp LOS	B	A	E	A	B	B		
Approach Vol, veh/h	308			545	580			
Approach Delay, s/veh	18.2			31.9	13.9			
Approach LOS	B			C	B			
Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		25.9			10.0	15.9		14.0
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		5.8			7.3	9.4		9.2
Green Ext Time (p_c), s		1.8			0.0	2.0		0.7
Intersection Summary								
HCM 6th Ctrl Delay			21.7					
HCM 6th LOS			C					

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	45	420	30	60	430
Future Vol, veh/h	40	45	420	30	60	430
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	4	4	7	7	5	5
Mvmt Flow	44	50	467	33	67	478

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1079	467	0	-	467	0
Stage 1	467	-	-	-	-	-
Stage 2	612	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.15	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.245	-
Pot Cap-1 Maneuver	240	592	-	0	1079	-
Stage 1	627	-	-	0	-	-
Stage 2	537	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	225	592	-	-	1079	-
Mov Cap-2 Maneuver	356	-	-	-	-	-
Stage 1	627	-	-	-	-	-
Stage 2	504	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14	0	1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	356	592	1079	-
HCM Lane V/C Ratio	-	0.125	0.084	0.062	-
HCM Control Delay (s)	-	16.6	11.6	8.6	-
HCM Lane LOS	-	C	B	A	-
HCM 95th %tile Q(veh)	-	0.4	0.3	0.2	-

Intersection						
Int Delay, s/veh	6					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	10	25	5	10	35
Future Vol, veh/h	10	10	25	5	10	35
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	85	85	85	85	85	85
Heavy Vehicles, %	14	14	4	4	3	3
Mvmt Flow	12	12	29	6	12	41

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	24	0	82	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	64	-
Critical Hdwy	-	-	4.14	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.236	-	3.527	3.327
Pot Cap-1 Maneuver	-	-	1578	-	918	1058
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1578	-	901	1058
Mov Cap-2 Maneuver	-	-	-	-	901	-
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	939	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1578	-
HCM Lane V/C Ratio	0.052	-	-	0.019	-
HCM Control Delay (s)	8.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	115	90	30	110	5	45	10	15	15	15	70
Future Vol, veh/h	25	115	90	30	110	5	45	10	15	15	15	70
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	225	-	-	225	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	0	0	0	4	4	4
Mvmt Flow	28	131	102	34	125	6	51	11	17	17	17	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	131	0	0	233	0	0	483	437	182	448	485	128
Stage 1	-	-	-	-	-	-	238	238	-	196	196	-
Stage 2	-	-	-	-	-	-	245	199	-	252	289	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.1	6.5	6.2	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.5	4	3.3	3.536	4.036	3.336
Pot Cap-1 Maneuver	1436	-	-	1317	-	-	497	516	866	518	479	917
Stage 1	-	-	-	-	-	-	770	712	-	801	735	-
Stage 2	-	-	-	-	-	-	763	740	-	748	669	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1436	-	-	1317	-	-	426	493	866	482	457	917
Mov Cap-2 Maneuver	-	-	-	-	-	-	426	493	-	482	457	-
Stage 1	-	-	-	-	-	-	755	698	-	786	716	-
Stage 2	-	-	-	-	-	-	663	721	-	707	656	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	1.6	13.8	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	489	1436	-	-	1317	-	-	713
HCM Lane V/C Ratio	0.163	0.02	-	-	0.026	-	-	0.159
HCM Control Delay (s)	13.8	7.6	-	-	7.8	-	-	11
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.6

MOVEMENT SUMMARY

Site: 1 [Alternative 2 (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	45	2.0	51	2.0	0.064	10.5	LOS B	0.3	8.2	0.34	0.58	0.34	35.3
8	T1	10	2.0	11	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.58	0.34	35.2
18	R2	15	2.0	17	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.58	0.34	34.2
Approach		70	2.0	80	2.0	0.064	8.4	LOS A	0.3	8.2	0.34	0.58	0.34	35.0
East: WB SR 155														
1	L2	30	5.0	34	5.0	0.128	10.2	LOS B	0.7	17.6	0.25	0.46	0.25	36.6
6	T1	110	5.0	125	5.0	0.128	4.3	LOS A	0.7	17.6	0.25	0.46	0.25	36.6
16	R2	5	5.0	6	5.0	0.128	4.3	LOS A	0.7	17.6	0.25	0.46	0.25	35.5
Approach		145	5.0	165	5.0	0.128	5.5	LOS A	0.7	17.6	0.25	0.46	0.25	36.6
North: SB SR 280														
7	L2	15	4.0	17	4.0	0.096	10.8	LOS B	0.5	12.7	0.38	0.53	0.38	36.6
4	T1	15	4.0	17	4.0	0.096	4.8	LOS A	0.5	12.7	0.38	0.53	0.38	36.6
14	R2	70	4.0	80	4.0	0.096	4.9	LOS A	0.5	12.7	0.38	0.53	0.38	35.4
Approach		100	4.0	114	4.0	0.096	5.7	LOS A	0.5	12.7	0.38	0.53	0.38	35.8
West: EB SR 155														
5	L2	25	5.0	28	5.0	0.199	10.2	LOS B	1.1	29.0	0.23	0.45	0.23	37.0
2	T1	115	5.0	131	5.0	0.199	4.2	LOS A	1.1	29.0	0.23	0.45	0.23	37.0
12	R2	90	5.0	102	5.0	0.199	4.2	LOS A	1.1	29.0	0.23	0.45	0.23	35.8
Approach		230	5.0	261	5.0	0.199	4.9	LOS A	1.1	29.0	0.23	0.45	0.23	36.5
All Vehicles		545	4.4	619	4.4	0.199	5.7	LOS A	1.1	29.0	0.28	0.48	0.28	36.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	205	150	35	185	75	30
Future Vol, veh/h	205	150	35	185	75	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	230	169	39	208	84	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	230	0	516	230
Stage 1	-	-	-	-	230	-
Stage 2	-	-	-	-	286	-
Critical Hdwy	-	-	4.15	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.245	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	1320	-	519	809
Stage 1	-	0	-	-	808	-
Stage 2	-	0	-	-	763	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1320	-	502	809
Mov Cap-2 Maneuver	-	-	-	-	502	-
Stage 1	-	-	-	-	808	-
Stage 2	-	-	-	-	738	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	13.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	563	-	1320	-
HCM Lane V/C Ratio	0.21	-	0.03	-
HCM Control Delay (s)	13.1	-	7.8	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	0.8	-	0.1	-

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	75	400	15	10	265	15	10	1	15	0	0	0
Future Vol, veh/h	75	400	15	10	265	15	10	1	15	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	9	9	9	4	4	4	14	14	14	2	2	2
Mvmt Flow	86	460	17	11	305	17	11	1	17	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	322	0	0	477	0	0	977	985	469
Stage 1	-	-	-	-	-	-	641	641	-
Stage 2	-	-	-	-	-	-	336	344	-
Critical Hdwy	4.19	-	-	4.14	-	-	6.54	6.64	6.34
Critical Hdwy Stg 1	-	-	-	-	-	-	5.54	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.54	5.64	-
Follow-up Hdwy	2.281	-	-	2.236	-	-	3.626	4.126	3.426
Pot Cap-1 Maneuver	1199	-	-	1075	-	-	264	237	570
Stage 1	-	-	-	-	-	-	503	451	-
Stage 2	-	-	-	-	-	-	698	616	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1199	-	-	1075	-	-	242	0	570
Mov Cap-2 Maneuver	-	-	-	-	-	-	242	0	-
Stage 1	-	-	-	-	-	-	467	0	-
Stage 2	-	-	-	-	-	-	690	0	-

Approach	SE	NW	NE
HCM Control Delay, s	1.3	0.3	15.6
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	370	1075	-	-	1199	-	-
HCM Lane V/C Ratio	0.081	0.011	-	-	0.072	-	-
HCM Control Delay (s)	15.6	8.4	0	-	8.2	-	-
HCM Lane LOS	C	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	550	10	5	340	20	5
Future Vol, veh/h	550	10	5	340	20	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	7	7	10	10	13	13
Mvmt Flow	632	11	6	391	23	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	643	0	1041	638
Stage 1	-	-	-	-	638	-
Stage 2	-	-	-	-	403	-
Critical Hdwy	-	-	4.2	-	6.53	6.33
Critical Hdwy Stg 1	-	-	-	-	5.53	-
Critical Hdwy Stg 2	-	-	-	-	5.53	-
Follow-up Hdwy	-	-	2.29	-	3.617	3.417
Pot Cap-1 Maneuver	-	-	905	-	243	457
Stage 1	-	-	-	-	506	-
Stage 2	-	-	-	-	652	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	905	-	241	457
Mov Cap-2 Maneuver	-	-	-	-	241	-
Stage 1	-	-	-	-	506	-
Stage 2	-	-	-	-	647	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	20.2
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	266	905	-	-	-
HCM Lane V/C Ratio	0.108	0.006	-	-	-
HCM Control Delay (s)	20.2	9	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	0.4	0	-	-	-

Intersection	
Int Delay, s/veh	8.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	270	60	130	235	5	55	1	210	5	1	1
Future Vol, veh/h	5	270	60	130	235	5	55	1	210	5	1	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	5	5	5	12	12	12	33	33	33
Mvmt Flow	6	318	71	153	276	6	65	1	247	6	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	282	0	-	318	0	0	916	918	318	1039	915	279
Stage 1	-	-	-	-	-	-	330	330	-	585	585	-
Stage 2	-	-	-	-	-	-	586	588	-	454	330	-
Critical Hdwy	4.13	-	-	4.15	-	-	7.22	6.62	6.32	7.43	6.83	6.53
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Follow-up Hdwy	2.227	-	-	2.245	-	-	3.608	4.108	3.408	3.797	4.297	3.597
Pot Cap-1 Maneuver	1275	-	0	1225	-	-	243	261	700	183	243	691
Stage 1	-	-	0	-	-	-	663	628	-	447	451	-
Stage 2	-	-	0	-	-	-	479	480	-	530	594	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1275	-	-	1225	-	-	218	227	700	106	212	691
Mov Cap-2 Maneuver	-	-	-	-	-	-	218	227	-	106	212	-
Stage 1	-	-	-	-	-	-	660	625	-	445	395	-
Stage 2	-	-	-	-	-	-	417	420	-	341	591	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.1	2.9	25.7	34.3
HCM LOS			D	D

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	478	1225	-	-	1275	-	131
HCM Lane V/C Ratio	0.655	0.125	-	-	0.005	-	0.063
HCM Control Delay (s)	25.7	8.4	-	-	7.8	-	34.3
HCM Lane LOS	D	A	-	-	A	-	D
HCM 95th %tile Q(veh)	4.6	0.4	-	-	0	-	0.2

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	120	130	140	270	320	190
Future Volume (vph)	120	130	140	270	320	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 43.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	120	130	140	270	320	190
Future Volume (veh/h)	120	130	140	270	320	190
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1811	1811	1826	1826	1826	1826
Adj Flow Rate, veh/h	136	148	159	307	364	216
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	6	6	5	5	5	5
Cap, veh/h	174	189	201	965	529	449
Arrive On Green	0.22	0.22	0.12	0.53	0.29	0.29
Sat Flow, veh/h	773	842	1739	1826	1826	1547
Grp Volume(v), veh/h	285	0	159	307	364	216
Grp Sat Flow(s),veh/h/ln	1621	0	1739	1826	1826	1547
Q Serve(g_s), s	6.0	0.0	3.2	3.5	6.4	4.2
Cycle Q Clear(g_c), s	6.0	0.0	3.2	3.5	6.4	4.2
Prop In Lane	0.48	0.52	1.00			1.00
Lane Grp Cap(c), veh/h	364	0	201	965	529	449
V/C Ratio(X)	0.78	0.00	0.79	0.32	0.69	0.48
Avail Cap(c_a), veh/h	800	0	262	1402	901	764
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.3	0.0	15.7	4.9	11.5	10.7
Incr Delay (d2), s/veh	3.7	0.0	11.7	0.2	1.6	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	1.7	0.7	2.2	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.0	0.0	27.4	5.1	13.1	11.5
LnGrp LOS	B	A	C	A	B	B
Approach Vol, veh/h	285			466	580	
Approach Delay, s/veh	17.0			12.7	12.5	
Approach LOS	B			B	B	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		23.8			8.7	15.1		12.7
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		5.5			5.2	8.4		8.0
Green Ext Time (p_c), s		1.8			0.0	2.1		0.6

Intersection Summary		
HCM 6th Ctrl Delay		13.5
HCM 6th LOS		B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	40	45	350	30	60	395
Future Vol, veh/h	40	45	350	30	60	395
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	4	4	7	7	5	5
Mvmt Flow	44	50	389	33	67	439

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	962	389	0	-	389	0
Stage 1	389	-	-	-	-	-
Stage 2	573	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.15	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.245	-
Pot Cap-1 Maneuver	282	655	-	0	1153	-
Stage 1	681	-	-	0	-	-
Stage 2	560	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	266	655	-	-	1153	-
Mov Cap-2 Maneuver	389	-	-	-	-	-
Stage 1	681	-	-	-	-	-
Stage 2	528	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	13.1		0		1.1	
HCM LOS	B					

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	389	655	1153	-
HCM Lane V/C Ratio	-	0.114	0.076	0.058	-
HCM Control Delay (s)	-	15.4	11	8.3	-
HCM Lane LOS	-	C	B	A	-
HCM 95th %tile Q(veh)	-	0.4	0.2	0.2	-

Intersection	
Int Delay, s/veh	6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	10	25	5	10	35
Future Vol, veh/h	10	10	25	5	10	35
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	85	85	85	85	85	85
Heavy Vehicles, %	14	14	4	4	3	3
Mvmt Flow	12	12	29	6	12	41

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	24	0	82	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	64	-
Critical Hdwy	-	-	4.14	-	6.43	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.236	-	3.527	3.327
Pot Cap-1 Maneuver	-	-	1578	-	918	1058
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	956	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1578	-	901	1058
Mov Cap-2 Maneuver	-	-	-	-	901	-
Stage 1	-	-	-	-	1002	-
Stage 2	-	-	-	-	939	-

Approach	EB	WB	NB
HCM Control Delay, s	0	6.1	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1019	-	-	1578	-
HCM Lane V/C Ratio	0.052	-	-	0.019	-
HCM Control Delay (s)	8.7	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	120	90	30	110	5	45	10	15	15	15	70
Future Vol, veh/h	25	120	90	30	110	5	45	10	15	15	15	70
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	225	-	-	225	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	5	5	5	5	5	5	0	0	0	4	4	4
Mvmt Flow	28	136	102	34	125	6	51	11	17	17	17	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	131	0	0	238	0	0	488	442	187	453	490	128
Stage 1	-	-	-	-	-	-	243	243	-	196	196	-
Stage 2	-	-	-	-	-	-	245	199	-	257	294	-
Critical Hdwy	4.15	-	-	4.15	-	-	7.1	6.5	6.2	7.14	6.54	6.24
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.14	5.54	-
Follow-up Hdwy	2.245	-	-	2.245	-	-	3.5	4	3.3	3.536	4.036	3.336
Pot Cap-1 Maneuver	1436	-	-	1311	-	-	493	513	860	514	476	917
Stage 1	-	-	-	-	-	-	765	708	-	801	735	-
Stage 2	-	-	-	-	-	-	763	740	-	743	666	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1436	-	-	1311	-	-	423	490	860	478	455	917
Mov Cap-2 Maneuver	-	-	-	-	-	-	423	490	-	478	455	-
Stage 1	-	-	-	-	-	-	750	695	-	786	716	-
Stage 2	-	-	-	-	-	-	663	721	-	702	653	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.8	1.6	13.9	11
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	485	1436	-	-	1311	-	-	711
HCM Lane V/C Ratio	0.164	0.02	-	-	0.026	-	-	0.16
HCM Control Delay (s)	13.9	7.6	-	-	7.8	-	-	11
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.6

MOVEMENT SUMMARY

Site: 1 [Alternative 3 (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	45	2.0	51	2.0	0.064	10.6	LOS B	0.3	8.2	0.34	0.59	0.34	35.2
8	T1	10	2.0	11	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.59	0.34	35.2
18	R2	15	2.0	17	2.0	0.064	4.6	LOS A	0.3	8.2	0.34	0.59	0.34	34.1
Approach		70	2.0	80	2.0	0.064	8.4	LOS A	0.3	8.2	0.34	0.59	0.34	35.0
East: WB SR 155														
1	L2	30	5.0	34	5.0	0.128	10.2	LOS B	0.7	17.6	0.25	0.46	0.25	36.6
6	T1	110	5.0	125	5.0	0.128	4.3	LOS A	0.7	17.6	0.25	0.46	0.25	36.6
16	R2	5	5.0	6	5.0	0.128	4.3	LOS A	0.7	17.6	0.25	0.46	0.25	35.5
Approach		145	5.0	165	5.0	0.128	5.5	LOS A	0.7	17.6	0.25	0.46	0.25	36.6
North: SB SR 280														
7	L2	15	4.0	17	4.0	0.096	10.8	LOS B	0.5	12.7	0.38	0.53	0.38	36.6
4	T1	15	4.0	17	4.0	0.096	4.8	LOS A	0.5	12.7	0.38	0.53	0.38	36.6
14	R2	70	4.0	80	4.0	0.096	4.9	LOS A	0.5	12.7	0.38	0.53	0.38	35.4
Approach		100	4.0	114	4.0	0.096	5.7	LOS A	0.5	12.7	0.38	0.53	0.38	35.8
West: EB SR 155														
5	L2	25	5.0	28	5.0	0.203	10.2	LOS B	1.1	29.8	0.23	0.45	0.23	37.0
2	T1	120	5.0	136	5.0	0.203	4.2	LOS A	1.1	29.8	0.23	0.45	0.23	37.0
12	R2	90	5.0	102	5.0	0.203	4.2	LOS A	1.1	29.8	0.23	0.45	0.23	35.8
Approach		235	5.0	267	5.0	0.203	4.9	LOS A	1.1	29.8	0.23	0.45	0.23	36.6
All Vehicles		550	4.4	625	4.4	0.203	5.7	LOS A	1.1	29.8	0.28	0.48	0.28	36.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	2.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	205	85	35	185	55	30
Future Vol, veh/h	205	85	35	185	55	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	89	89
Heavy Vehicles, %	5	5	5	5	2	2
Mvmt Flow	230	96	39	208	62	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	230	0	516	230
Stage 1	-	-	-	-	230	-
Stage 2	-	-	-	-	286	-
Critical Hdwy	-	-	4.15	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.245	-	3.518	3.318
Pot Cap-1 Maneuver	-	0	1320	-	519	809
Stage 1	-	0	-	-	808	-
Stage 2	-	0	-	-	763	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1320	-	502	809
Mov Cap-2 Maneuver	-	-	-	-	502	-
Stage 1	-	-	-	-	808	-
Stage 2	-	-	-	-	738	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	12.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	580	-	1320	-
HCM Lane V/C Ratio	0.165	-	0.03	-
HCM Control Delay (s)	12.4	-	7.8	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	0.6	-	0.1	-

Intersection	
Int Delay, s/veh	1.5

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	75	330	5	10	245	15	10	1	15	0	0	0
Future Vol, veh/h	75	330	5	10	245	15	10	1	15	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	87	87	87	87	87	87	87	87	87	87	87	87
Heavy Vehicles, %	9	9	9	4	4	4	14	14	14	2	2	2
Mvmt Flow	86	379	6	11	282	17	11	1	17	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	299	0	0	385	0	0	867	875	382
Stage 1	-	-	-	-	-	-	554	554	-
Stage 2	-	-	-	-	-	-	313	321	-
Critical Hdwy	4.19	-	-	4.14	-	-	6.54	6.64	6.34
Critical Hdwy Stg 1	-	-	-	-	-	-	5.54	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.54	5.64	-
Follow-up Hdwy	2.281	-	-	2.236	-	-	3.626	4.126	3.426
Pot Cap-1 Maneuver	1223	-	-	1163	-	-	308	275	640
Stage 1	-	-	-	-	-	-	552	495	-
Stage 2	-	-	-	-	-	-	715	631	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1223	-	-	1163	-	-	283	0	640
Mov Cap-2 Maneuver	-	-	-	-	-	-	283	0	-
Stage 1	-	-	-	-	-	-	513	0	-
Stage 2	-	-	-	-	-	-	707	0	-

Approach	SE	NW	NE
HCM Control Delay, s	1.5	0.3	14.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	425	1163	-	-	1223	-	-
HCM Lane V/C Ratio	0.07	0.01	-	-	0.07	-	-
HCM Control Delay (s)	14.1	8.1	0	-	8.2	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.2	0	-	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	485	10	5	320	20	5
Future Vol, veh/h	485	10	5	320	20	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	7	7	10	10	13	13
Mvmt Flow	557	11	6	368	23	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	568	0	943	563
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	380	-
Critical Hdwy	-	-	4.2	-	6.53	6.33
Critical Hdwy Stg 1	-	-	-	-	5.53	-
Critical Hdwy Stg 2	-	-	-	-	5.53	-
Follow-up Hdwy	-	-	2.29	-	3.617	3.417
Pot Cap-1 Maneuver	-	-	966	-	278	505
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	668	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	966	-	276	505
Mov Cap-2 Maneuver	-	-	-	-	276	-
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	664	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	18.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	304	966	-	-	-
HCM Lane V/C Ratio	0.095	0.006	-	-	-
HCM Control Delay (s)	18.1	8.7	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	-

Intersection	
Int Delay, s/veh	6.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	5	265	60	110	235	5	55	1	145	5	1	1
Future Vol, veh/h	5	265	60	110	235	5	55	1	145	5	1	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	5	5	5	12	12	12	33	33	33
Mvmt Flow	6	312	71	129	276	6	65	1	171	6	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	282	0	-	312	0	0	862	864	312	947	861	279
Stage 1	-	-	-	-	-	-	324	324	-	537	537	-
Stage 2	-	-	-	-	-	-	538	540	-	410	324	-
Critical Hdwy	4.13	-	-	4.15	-	-	7.22	6.62	6.32	7.43	6.83	6.53
Critical Hdwy Stg 1	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.22	5.62	-	6.43	5.83	-
Follow-up Hdwy	2.227	-	-	2.245	-	-	3.608	4.108	3.408	3.797	4.297	3.597
Pot Cap-1 Maneuver	1275	-	0	1232	-	-	264	281	705	212	262	691
Stage 1	-	-	0	-	-	-	668	632	-	476	476	-
Stage 2	-	-	0	-	-	-	510	505	-	561	598	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1275	-	-	1232	-	-	241	250	705	147	233	691
Mov Cap-2 Maneuver	-	-	-	-	-	-	241	250	-	147	233	-
Stage 1	-	-	-	-	-	-	665	629	-	474	426	-
Stage 2	-	-	-	-	-	-	455	452	-	422	595	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.1	2.6	20.9	26.5
HCM LOS			C	D

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	459	1232	-	-	1275	-	176
HCM Lane V/C Ratio	0.515	0.105	-	-	0.005	-	0.047
HCM Control Delay (s)	20.9	8.3	-	-	7.8	-	26.5
HCM Lane LOS	C	A	-	-	A	-	D
HCM 95th %tile Q(veh)	2.9	0.4	-	-	0	-	0.1

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	100	130	140	290	380	125
Future Volume (vph)	100	130	140	290	380	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			0		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 44.4	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	100	130	140	290	380	125
Future Volume (veh/h)	100	130	140	290	380	125
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1811	1811	1826	1826	1826	1826
Adj Flow Rate, veh/h	114	148	159	330	432	142
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Percent Heavy Veh, %	6	6	5	5	5	5
Cap, veh/h	146	189	201	1009	581	492
Arrive On Green	0.21	0.21	0.12	0.55	0.32	0.32
Sat Flow, veh/h	699	908	1739	1826	1826	1547
Grp Volume(v), veh/h	263	0	159	330	432	142
Grp Sat Flow(s),veh/h/ln	1613	0	1739	1826	1826	1547
Q Serve(g_s), s	5.8	0.0	3.4	3.7	8.0	2.6
Cycle Q Clear(g_c), s	5.8	0.0	3.4	3.7	8.0	2.6
Prop In Lane	0.43	0.56	1.00			1.00
Lane Grp Cap(c), veh/h	336	0	201	1009	581	492
V/C Ratio(X)	0.78	0.00	0.79	0.33	0.74	0.29
Avail Cap(c_a), veh/h	770	0	254	1355	871	738
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.1	0.0	16.2	4.6	11.5	9.7
Incr Delay (d2), s/veh	4.0	0.0	12.6	0.2	1.9	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	0.0	1.8	0.8	2.7	0.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.1	0.0	28.8	4.8	13.4	10.0
LnGrp LOS	B	A	C	A	B	A
Approach Vol, veh/h	263			489	574	
Approach Delay, s/veh	18.1			12.6	12.6	
Approach LOS	B			B	B	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		25.3			8.8	16.5		12.4
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		5.7			5.4	10.0		7.8
Green Ext Time (p_c), s		2.0			0.0	2.0		0.6

Intersection Summary	
HCM 6th Ctrl Delay	13.7
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	65	60	350	105	120	395
Future Vol, veh/h	65	60	350	105	120	395
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	4	4	7	7	5	5
Mvmt Flow	72	67	389	117	133	439

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1094	389	0	-	389	0
Stage 1	389	-	-	-	-	-
Stage 2	705	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.15	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.245	-
Pot Cap-1 Maneuver	235	655	-	0	1153	-
Stage 1	681	-	-	0	-	-
Stage 2	486	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	208	655	-	-	1153	-
Mov Cap-2 Maneuver	328	-	-	-	-	-
Stage 1	681	-	-	-	-	-
Stage 2	430	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.2	0	2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	328	655	1153	-
HCM Lane V/C Ratio	-	0.22	0.102	0.116	-
HCM Control Delay (s)	-	19	11.1	8.5	-
HCM Lane LOS	-	C	B	A	-
HCM 95th %tile Q(veh)	-	0.8	0.3	0.4	-

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	85	95	5	5	105	15	5	5	1	5	1	65
Future Vol, veh/h	85	95	5	5	105	15	5	5	1	5	1	65
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	225	-	-	225	-	-	-	-	-	-	-	-
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	3	3	3	0	0	0	3	0	3
Mvmt Flow	96	107	6	6	118	17	6	6	1	6	1	73

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	135	0	0	113	0	0	478	449	110	445	444	127
Stage 1	-	-	-	-	-	-	302	302	-	139	139	-
Stage 2	-	-	-	-	-	-	176	147	-	306	305	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.1	6.5	6.2	7.13	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.5	4	3.3	3.527	4	3.327
Pot Cap-1 Maneuver	1449	-	-	1470	-	-	501	508	949	522	511	921
Stage 1	-	-	-	-	-	-	712	668	-	862	785	-
Stage 2	-	-	-	-	-	-	831	779	-	702	666	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1449	-	-	1470	-	-	436	472	949	489	475	921
Mov Cap-2 Maneuver	-	-	-	-	-	-	436	472	-	489	475	-
Stage 1	-	-	-	-	-	-	665	624	-	805	782	-
Stage 2	-	-	-	-	-	-	761	776	-	649	622	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.5	0.3	12.8	9.6
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	476	1449	-	-	1470	-	-	856
HCM Lane V/C Ratio	0.026	0.066	-	-	0.004	-	-	0.093
HCM Control Delay (s)	12.8	7.7	-	-	7.5	-	-	9.6
HCM Lane LOS	B	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0.2	-	-	0	-	-	0.3

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	150	50	15	155	40	30
Future Vol, veh/h	150	50	15	155	40	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	170	57	17	176	45	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	170	0	380	170
Stage 1	-	-	-	-	170	-
Stage 2	-	-	-	-	210	-
Critical Hdwy	-	-	4.12	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.218	-	3.554	3.354
Pot Cap-1 Maneuver	-	0	1407	-	614	864
Stage 1	-	0	-	-	850	-
Stage 2	-	0	-	-	816	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1407	-	606	864
Mov Cap-2 Maneuver	-	-	-	-	606	-
Stage 1	-	-	-	-	850	-
Stage 2	-	-	-	-	805	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	10.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	695	-	1407	-
HCM Lane V/C Ratio	0.114	-	0.012	-
HCM Control Delay (s)	10.8	-	7.6	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	0.4	-	0	-

Intersection	
Int Delay, s/veh	1.1

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	10	206	5	10	270	5	10	5	25	0	0	0
Future Vol, veh/h	10	206	5	10	270	5	10	5	25	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	222	5	11	290	5	11	5	27	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	295	0	0	227	0	0	562	564	225
Stage 1	-	-	-	-	-	-	247	247	-
Stage 2	-	-	-	-	-	-	315	317	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1266	-	-	1341	-	-	488	435	814
Stage 1	-	-	-	-	-	-	794	702	-
Stage 2	-	-	-	-	-	-	740	654	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1266	-	-	1341	-	-	479	0	814
Mov Cap-2 Maneuver	-	-	-	-	-	-	479	0	-
Stage 1	-	-	-	-	-	-	787	0	-
Stage 2	-	-	-	-	-	-	733	0	-

Approach	SE	NW	NE
HCM Control Delay, s	0.4	0.3	10.7
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	678	1341	-	-	1266	-	-
HCM Lane V/C Ratio	0.063	0.008	-	-	0.008	-	-
HCM Control Delay (s)	10.7	7.7	0	-	7.9	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-

Intersection						
Int Delay, s/veh	1.3					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	245	35	5	300	45	5
Future Vol, veh/h	245	35	5	300	45	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	76	76	76	76	76	76
Heavy Vehicles, %	5	5	8	8	0	0
Mvmt Flow	322	46	7	395	59	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	368	0	754	345
Stage 1	-	-	-	-	345	-
Stage 2	-	-	-	-	409	-
Critical Hdwy	-	-	4.18	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.272	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1158	-	380	702
Stage 1	-	-	-	-	722	-
Stage 2	-	-	-	-	675	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1158	-	378	702
Mov Cap-2 Maneuver	-	-	-	-	378	-
Stage 1	-	-	-	-	722	-
Stage 2	-	-	-	-	671	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	15.9
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	396	1158	-	-	-
HCM Lane V/C Ratio	0.166	0.006	-	-	-
HCM Control Delay (s)	15.9	8.1	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	0.6	0	-	-	-

Intersection	
Int Delay, s/veh	7.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	165	75	80	250	5	80	10	95	1	5	10
Future Vol, veh/h	15	165	75	80	250	5	80	10	95	1	5	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	3	3	3	7	7	7	9	9	9	8	8	8
Mvmt Flow	19	206	94	100	313	6	100	13	119	1	6	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	319	0	-	206	0	0	770	763	206	826	760	316
Stage 1	-	-	-	-	-	-	244	244	-	516	516	-
Stage 2	-	-	-	-	-	-	526	519	-	310	244	-
Critical Hdwy	4.13	-	-	4.17	-	-	7.19	6.59	6.29	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Follow-up Hdwy	2.227	-	-	2.263	-	-	3.581	4.081	3.381	3.572	4.072	3.372
Pot Cap-1 Maneuver	1235	-	0	1336	-	-	309	326	817	284	329	711
Stage 1	-	-	0	-	-	-	744	691	-	531	524	-
Stage 2	-	-	0	-	-	-	523	521	-	688	693	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1235	-	-	1336	-	-	278	297	817	219	300	711
Mov Cap-2 Maneuver	-	-	-	-	-	-	278	297	-	219	300	-
Stage 1	-	-	-	-	-	-	733	681	-	523	485	-
Stage 2	-	-	-	-	-	-	469	482	-	568	683	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.7	1.9	23.3	13.3
HCM LOS			C	B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	423	1336	-	-	1235	-	453
HCM Lane V/C Ratio	0.547	0.075	-	-	0.015	-	0.044
HCM Control Delay (s)	23.3	7.9	-	-	8	-	13.3
HCM Lane LOS	C	A	-	-	A	-	B
HCM 95th %tile Q(veh)	3.2	0.2	-	-	0	-	0.1

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	125	110	125	295	265	125
Future Volume (vph)	125	110	125	295	265	125
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			2		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 41.9	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	125	110	125	295	265	125
Future Volume (veh/h)	125	110	125	295	265	125
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1856	1856
Adj Flow Rate, veh/h	134	118	134	317	285	134
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	1	3	3
Cap, veh/h	181	159	198	959	470	399
Arrive On Green	0.20	0.20	0.11	0.51	0.25	0.25
Sat Flow, veh/h	897	790	1795	1885	1856	1572
Grp Volume(v), veh/h	253	0	134	317	285	134
Grp Sat Flow(s),veh/h/ln	1694	0	1795	1885	1856	1572
Q Serve(g_s), s	4.4	0.0	2.2	3.1	4.2	2.2
Cycle Q Clear(g_c), s	4.4	0.0	2.2	3.1	4.2	2.2
Prop In Lane	0.53	0.47	1.00			1.00
Lane Grp Cap(c), veh/h	342	0	198	959	470	399
V/C Ratio(X)	0.74	0.00	0.68	0.33	0.61	0.34
Avail Cap(c_a), veh/h	981	0	318	1699	1075	911
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.6	0.0	13.3	4.5	10.2	9.5
Incr Delay (d2), s/veh	3.2	0.0	4.0	0.2	1.3	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	0.9	0.6	1.4	0.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	14.8	0.0	17.3	4.7	11.5	10.0
LnGrp LOS	B	A	B	A	B	A
Approach Vol, veh/h	253			451	419	
Approach Delay, s/veh	14.8			8.4	11.0	
Approach LOS	B			A	B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s		20.3			7.9	12.4		10.8
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		5.1			4.2	6.2		6.4
Green Ext Time (p_c), s		1.9			0.0	1.7		0.6

Intersection Summary	
HCM 6th Ctrl Delay	10.8
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection						
Int Delay, s/veh	2.7					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	45	90	335	35	80	295
Future Vol, veh/h	45	90	335	35	80	295
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	92	94
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	48	96	356	37	87	314

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	844	356	0	-	356	0
Stage 1	356	-	-	-	-	-
Stage 2	488	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	335	690	-	0	1203	-
Stage 1	711	-	-	0	-	-
Stage 2	619	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	311	690	-	-	1203	-
Mov Cap-2 Maneuver	429	-	-	-	-	-
Stage 1	711	-	-	-	-	-
Stage 2	574	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.2	0	1.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	429	690	1203	-
HCM Lane V/C Ratio	-	0.112	0.139	0.072	-
HCM Control Delay (s)	-	14.4	11.1	8.2	-
HCM Lane LOS	-	B	B	A	-
HCM 95th %tile Q(veh)	-	0.4	0.5	0.2	-

Intersection						
Int Delay, s/veh	5					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	15	15	30	20	15	30
Future Vol, veh/h	15	15	30	20	15	30
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	91	91	91	91	91	91
Heavy Vehicles, %	4	4	9	9	7	7
Mvmt Flow	16	16	33	22	16	33

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	32	0	112	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	88	-
Critical Hdwy	-	-	4.19	-	6.47	6.27
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.281	-	3.563	3.363
Pot Cap-1 Maneuver	-	-	1536	-	873	1038
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	923	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1536	-	854	1038
Mov Cap-2 Maneuver	-	-	-	-	854	-
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	903	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	968	-	-	1536	-
HCM Lane V/C Ratio	0.051	-	-	0.021	-
HCM Control Delay (s)	8.9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	105	65	25	115	15	100	15	35	5	10	70
Future Vol, veh/h	95	105	65	25	115	15	100	15	35	5	10	70
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	225	-	-	225	-	-	-	-	-	-	-	-
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	3	3	3	0	0	0	3	0	3
Mvmt Flow	107	118	73	28	129	17	112	17	39	6	11	79

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	146	0	0	191	0	0	608	571	155	591	599	138
Stage 1	-	-	-	-	-	-	369	369	-	194	194	-
Stage 2	-	-	-	-	-	-	239	202	-	397	405	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.1	6.5	6.2	7.13	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.5	4	3.3	3.527	4	3.327
Pot Cap-1 Maneuver	1436	-	-	1377	-	-	411	434	896	417	418	908
Stage 1	-	-	-	-	-	-	655	624	-	805	744	-
Stage 2	-	-	-	-	-	-	769	738	-	627	602	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1436	-	-	1377	-	-	341	394	896	358	379	908
Mov Cap-2 Maneuver	-	-	-	-	-	-	341	394	-	358	379	-
Stage 1	-	-	-	-	-	-	606	577	-	745	729	-
Stage 2	-	-	-	-	-	-	678	723	-	539	557	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.8	1.2	20.1	10.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	405	1436	-	-	1377	-	-	724
HCM Lane V/C Ratio	0.416	0.074	-	-	0.02	-	-	0.132
HCM Control Delay (s)	20.1	7.7	-	-	7.7	-	-	10.7
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	2	0.2	-	-	0.1	-	-	0.5

MOVEMENT SUMMARY

Site: 1 [No Build (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	100	2.0	112	2.0	0.141	10.9	LOS B	0.8	19.1	0.40	0.62	0.40	35.0
8	T1	15	2.0	17	2.0	0.141	4.9	LOS A	0.8	19.1	0.40	0.62	0.40	35.0
18	R2	35	2.0	39	2.0	0.141	4.9	LOS A	0.8	19.1	0.40	0.62	0.40	34.0
Approach		150	2.0	169	2.0	0.141	8.9	LOS A	0.8	19.1	0.40	0.62	0.40	34.8
East: WB SR 155														
1	L2	25	3.0	28	3.0	0.148	10.9	LOS B	0.8	20.5	0.41	0.53	0.41	36.3
6	T1	115	3.0	129	3.0	0.148	5.0	LOS A	0.8	20.5	0.41	0.53	0.41	36.2
16	R2	15	3.0	17	3.0	0.148	5.0	LOS A	0.8	20.5	0.41	0.53	0.41	35.1
Approach		155	3.0	174	3.0	0.148	5.9	LOS A	0.8	20.5	0.41	0.53	0.41	36.1
North: SB SR 280														
7	L2	5	3.0	6	3.0	0.083	11.0	LOS B	0.4	11.1	0.42	0.53	0.42	36.8
4	T1	10	3.0	11	3.0	0.083	5.1	LOS A	0.4	11.1	0.42	0.53	0.42	36.7
14	R2	70	3.0	79	3.0	0.083	5.1	LOS A	0.4	11.1	0.42	0.53	0.42	35.6
Approach		85	3.0	96	3.0	0.083	5.4	LOS A	0.4	11.1	0.42	0.53	0.42	35.8
West: EB SR 155														
5	L2	95	2.0	107	2.0	0.215	10.0	LOS A	1.3	32.0	0.19	0.50	0.19	36.5
2	T1	105	2.0	118	2.0	0.215	4.0	LOS A	1.3	32.0	0.19	0.50	0.19	36.4
12	R2	65	2.0	73	2.0	0.215	4.1	LOS A	1.3	32.0	0.19	0.50	0.19	35.3
Approach		265	2.0	298	2.0	0.215	6.2	LOS A	1.3	32.0	0.19	0.50	0.19	36.2
All Vehicles		655	2.4	736	2.4	0.215	6.6	LOS A	1.3	32.0	0.32	0.54	0.32	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	235	65	15	270	60	30
Future Vol, veh/h	235	65	15	270	60	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	267	74	17	307	68	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	267	0	608	267
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	341	-
Critical Hdwy	-	-	4.12	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.218	-	3.554	3.354
Pot Cap-1 Maneuver	-	0	1297	-	452	762
Stage 1	-	0	-	-	769	-
Stage 2	-	0	-	-	711	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1297	-	445	762
Mov Cap-2 Maneuver	-	-	-	-	445	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	700	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	13.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	517	-	1297	-
HCM Lane V/C Ratio	0.198	-	0.013	-
HCM Control Delay (s)	13.7	-	7.8	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	0.7	-	0	-

Intersection												
Int Delay, s/veh	0.9											
Movement	**SEL**	**SET**	**SER**	**NWL**	**NWT**	**NWR**	**NEL**	**NET**	**NER**	**SWL**	**SWT**	**SWR**
Lane Configurations												
Traffic Vol, veh/h	10	305	10	10	410	5	10	5	30	0	0	0
Future Vol, veh/h	10	305	10	10	410	5	10	5	30	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	328	11	11	441	5	11	5	32	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	446	0	0	339	0	0	822	824	334
Stage 1	-	-	-	-	-	-	356	356	-
Stage 2	-	-	-	-	-	-	466	468	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1114	-	-	1220	-	-	344	308	708
Stage 1	-	-	-	-	-	-	709	629	-
Stage 2	-	-	-	-	-	-	632	561	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1114	-	-	1220	-	-	336	0	708
Mov Cap-2 Maneuver	-	-	-	-	-	-	336	0	-
Stage 1	-	-	-	-	-	-	702	0	-
Stage 2	-	-	-	-	-	-	624	0	-

Approach	SE	NW	NE
HCM Control Delay, s	0.3	0.2	12.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	555	1220	-	-	1114	-	-
HCM Lane V/C Ratio	0.087	0.009	-	-	0.01	-	-
HCM Control Delay (s)	12.1	8	0	-	8.3	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	345	40	5	445	50	5
Future Vol, veh/h	345	40	5	445	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	5	5	8	8	0	0
Mvmt Flow	406	47	6	524	59	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	453	0	966	430
Stage 1	-	-	-	-	430	-
Stage 2	-	-	-	-	536	-
Critical Hdwy	-	-	4.18	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.272	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1077	-	285	629
Stage 1	-	-	-	-	660	-
Stage 2	-	-	-	-	591	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1077	-	283	629
Mov Cap-2 Maneuver	-	-	-	-	283	-
Stage 1	-	-	-	-	660	-
Stage 2	-	-	-	-	587	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	20.4
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	298	1077	-	-	-
HCM Lane V/C Ratio	0.217	0.005	-	-	-
HCM Control Delay (s)	20.4	8.4	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	0.8	0	-	-	-

Intersection	
Int Delay, s/veh	19.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	220	85	155	330	5	90	10	145	1	5	10
Future Vol, veh/h	15	220	85	155	330	5	90	10	145	1	5	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	7	7	7	9	9	9	8	8	8
Mvmt Flow	18	259	100	182	388	6	106	12	171	1	6	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	394	0	-	259	0	0	1059	1053	259	1142	1050	391
Stage 1	-	-	-	-	-	-	295	295	-	755	755	-
Stage 2	-	-	-	-	-	-	764	758	-	387	295	-
Critical Hdwy	4.13	-	-	4.17	-	-	7.19	6.59	6.29	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Follow-up Hdwy	2.227	-	-	2.263	-	-	3.581	4.081	3.381	3.572	4.072	3.372
Pot Cap-1 Maneuver	1159	-	0	1277	-	-	196	220	763	173	222	645
Stage 1	-	-	0	-	-	-	699	656	-	392	408	-
Stage 2	-	-	0	-	-	-	386	405	-	625	658	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1159	-	-	1277	-	-	165	185	763	113	187	645
Mov Cap-2 Maneuver	-	-	-	-	-	-	165	185	-	113	187	-
Stage 1	-	-	-	-	-	-	688	646	-	386	350	-
Stage 2	-	-	-	-	-	-	319	347	-	469	647	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.5	2.6	72.3	17.2
HCM LOS			F	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	310	1277	-	-	1159	-	313
HCM Lane V/C Ratio	0.93	0.143	-	-	0.015	-	0.06
HCM Control Delay (s)	72.3	8.3	-	-	8.2	-	17.2
HCM Lane LOS	F	A	-	-	A	-	C
HCM 95th %tile Q(veh)	9.1	0.5	-	-	0	-	0.2

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	135	190	180	395	355	140
Future Volume (vph)	135	190	180	395	355	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			2		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 44.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	135	190	180	395	355	140
Future Volume (veh/h)	135	190	180	395	355	140
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1856	1856
Adj Flow Rate, veh/h	145	204	194	425	382	151
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	1	3	3
Cap, veh/h	180	253	239	985	520	440
Arrive On Green	0.26	0.26	0.13	0.52	0.28	0.28
Sat Flow, veh/h	692	974	1795	1885	1856	1572
Grp Volume(v), veh/h	350	0	194	425	382	151
Grp Sat Flow(s),veh/h/ln	1671	0	1795	1885	1856	1572
Q Serve(g_s), s	8.1	0.0	4.3	5.7	7.7	3.2
Cycle Q Clear(g_c), s	8.1	0.0	4.3	5.7	7.7	3.2
Prop In Lane	0.41	0.58	1.00			1.00
Lane Grp Cap(c), veh/h	434	0	239	985	520	440
V/C Ratio(X)	0.81	0.00	0.81	0.43	0.74	0.34
Avail Cap(c_a), veh/h	729	0	239	1279	809	686
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.3	0.0	17.4	6.1	13.5	11.8
Incr Delay (d2), s/veh	3.6	0.0	18.6	0.3	2.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.8	0.0	2.8	1.5	2.9	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.9	0.0	36.0	6.4	15.5	12.3
LnGrp LOS	B	A	D	A	B	B
Approach Vol, veh/h	350			619	533	
Approach Delay, s/veh	17.9			15.7	14.6	
Approach LOS	B			B	B	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		26.1			10.0	16.1		15.2
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		7.7			6.3	9.7		10.1
Green Ext Time (p_c), s		2.6			0.0	1.9		0.7

Intersection Summary	
HCM 6th Ctrl Delay	15.8
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	50	100	490	40	90	455
Future Vol, veh/h	50	100	490	40	90	455
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	92	94
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	53	106	521	43	98	484

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1201	521	0	-	521	0
Stage 1	521	-	-	-	-	-
Stage 2	680	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	205	557	-	0	1045	-
Stage 1	598	-	-	0	-	-
Stage 2	505	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	186	557	-	-	1045	-
Mov Cap-2 Maneuver	319	-	-	-	-	-
Stage 1	598	-	-	-	-	-
Stage 2	458	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.8	0	1.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	319	557	1045	-
HCM Lane V/C Ratio	-	0.167	0.191	0.094	-
HCM Control Delay (s)	-	18.5	13	8.8	-
HCM Lane LOS	-	C	B	A	-
HCM 95th %tile Q(veh)	-	0.6	0.7	0.3	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	15	15	30	20	15	35
Future Vol, veh/h	15	15	30	20	15	35
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	91	91	91	91	91	91
Heavy Vehicles, %	4	4	9	9	7	7
Mvmt Flow	16	16	33	22	16	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	32	0	112	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	88	-
Critical Hdwy	-	-	4.19	-	6.47	6.27
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.281	-	3.563	3.363
Pot Cap-1 Maneuver	-	-	1536	-	873	1038
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	923	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1536	-	854	1038
Mov Cap-2 Maneuver	-	-	-	-	854	-
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	903	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	975	-	-	1536	-
HCM Lane V/C Ratio	0.056	-	-	0.021	-
HCM Control Delay (s)	8.9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection												
Int Delay, s/veh	7.4											
Movement	**EBL**	**EBT**	**EBR**	**WBL**	**WBT**	**WBR**	**NBL**	**NBT**	**NBR**	**SBL**	**SBT**	**SBR**
Lane Configurations												
Traffic Vol, veh/h	95	115	65	25	120	15	100	15	35	5	10	70
Future Vol, veh/h	95	115	65	25	120	15	100	15	35	5	10	70
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	225	-	-	225	-	-	-	-	-	-	-	-
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	3	3	3	0	0	0	3	0	3
Mvmt Flow	107	129	73	28	135	17	112	17	39	6	11	79

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	152	0	0	202	0	0	625	588	166	608	616	144
Stage 1	-	-	-	-	-	-	380	380	-	200	200	-
Stage 2	-	-	-	-	-	-	245	208	-	408	416	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.1	6.5	6.2	7.13	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.5	4	3.3	3.527	4	3.327
Pot Cap-1 Maneuver	1429	-	-	1364	-	-	400	424	884	406	409	901
Stage 1	-	-	-	-	-	-	646	617	-	800	739	-
Stage 2	-	-	-	-	-	-	763	734	-	618	595	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1429	-	-	1364	-	-	331	384	884	348	371	901
Mov Cap-2 Maneuver	-	-	-	-	-	-	331	384	-	348	371	-
Stage 1	-	-	-	-	-	-	598	571	-	740	723	-
Stage 2	-	-	-	-	-	-	671	719	-	530	550	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	1.2	20.8	10.8
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	394	1429	-	-	1364	-	-	714
HCM Lane V/C Ratio	0.428	0.075	-	-	0.021	-	-	0.134
HCM Control Delay (s)	20.8	7.7	-	-	7.7	-	-	10.8
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	2.1	0.2	-	-	0.1	-	-	0.5

MOVEMENT SUMMARY

Site: 1 [Alternative 1 (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	100	2.0	112	2.0	0.142	10.9	LOS B	0.8	19.3	0.41	0.62	0.41	35.0
8	T1	15	2.0	17	2.0	0.142	5.0	LOS A	0.8	19.3	0.41	0.62	0.41	34.9
18	R2	35	2.0	39	2.0	0.142	5.0	LOS A	0.8	19.3	0.41	0.62	0.41	33.9
Approach		150	2.0	169	2.0	0.142	8.9	LOS A	0.8	19.3	0.41	0.62	0.41	34.7
East: WB SR 155														
1	L2	25	3.0	28	3.0	0.153	10.9	LOS B	0.8	21.3	0.42	0.53	0.42	36.3
6	T1	120	3.0	135	3.0	0.153	5.0	LOS A	0.8	21.3	0.42	0.53	0.42	36.2
16	R2	15	3.0	17	3.0	0.153	5.0	LOS A	0.8	21.3	0.42	0.53	0.42	35.1
Approach		160	3.0	180	3.0	0.153	5.9	LOS A	0.8	21.3	0.42	0.53	0.42	36.2
North: SB SR 280														
7	L2	5	3.0	6	3.0	0.084	11.0	LOS B	0.4	11.2	0.43	0.54	0.43	36.8
4	T1	10	3.0	11	3.0	0.084	5.1	LOS A	0.4	11.2	0.43	0.54	0.43	36.7
14	R2	70	3.0	79	3.0	0.084	5.1	LOS A	0.4	11.2	0.43	0.54	0.43	35.6
Approach		85	3.0	96	3.0	0.084	5.5	LOS A	0.4	11.2	0.43	0.54	0.43	35.8
West: EB SR 155														
5	L2	95	2.0	107	2.0	0.223	10.0	LOS A	1.3	33.5	0.19	0.50	0.19	36.5
2	T1	115	2.0	129	2.0	0.223	4.0	LOS A	1.3	33.5	0.19	0.50	0.19	36.4
12	R2	65	2.0	73	2.0	0.223	4.1	LOS A	1.3	33.5	0.19	0.50	0.19	35.3
Approach		275	2.0	309	2.0	0.223	6.1	LOS A	1.3	33.5	0.19	0.50	0.19	36.2
All Vehicles		670	2.4	753	2.4	0.223	6.6	LOS A	1.3	33.5	0.32	0.54	0.32	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection						
Int Delay, s/veh	5.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱		↰	Y	
Traffic Vol, veh/h	235	100	20	270	150	40
Future Vol, veh/h	235	100	20	270	150	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	267	114	23	307	170	45

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	267	0	620	267
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	353	-
Critical Hdwy	-	-	4.12	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.218	-	3.554	3.354
Pot Cap-1 Maneuver	-	0	1297	-	445	762
Stage 1	-	0	-	-	769	-
Stage 2	-	0	-	-	702	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1297	-	436	762
Mov Cap-2 Maneuver	-	-	-	-	436	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	687	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	18.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	479	-	1297	-
HCM Lane V/C Ratio	0.451	-	0.018	-
HCM Control Delay (s)	18.5	-	7.8	0
HCM Lane LOS	C	-	A	A
HCM 95th %tile Q(veh)	2.3	-	0.1	-

Intersection	
Int Delay, s/veh	0.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	10	345	10	10	505	5	10	5	30	0	0	0
Future Vol, veh/h	10	345	10	10	505	5	10	5	30	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	371	11	11	543	5	11	5	32	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	548	0	0	382	0	0	967	969	377
Stage 1	-	-	-	-	-	-	399	399	-
Stage 2	-	-	-	-	-	-	568	570	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1021	-	-	1176	-	-	282	254	670
Stage 1	-	-	-	-	-	-	678	602	-
Stage 2	-	-	-	-	-	-	567	505	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1021	-	-	1176	-	-	275	0	670
Mov Cap-2 Maneuver	-	-	-	-	-	-	275	0	-
Stage 1	-	-	-	-	-	-	671	0	-
Stage 2	-	-	-	-	-	-	560	0	-

Approach	SE	NW	NE
HCM Control Delay, s	0.2	0.2	13.1
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	493	1176	-	-	1021	-	-
HCM Lane V/C Ratio	0.098	0.009	-	-	0.011	-	-
HCM Control Delay (s)	13.1	8.1	0	-	8.6	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	380	40	5	540	50	5
Future Vol, veh/h	380	40	5	540	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	5	5	8	8	0	0
Mvmt Flow	447	47	6	635	59	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	494	0	1118	471
Stage 1	-	-	-	-	471	-
Stage 2	-	-	-	-	647	-
Critical Hdwy	-	-	4.18	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.272	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1039	-	231	597
Stage 1	-	-	-	-	632	-
Stage 2	-	-	-	-	525	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1039	-	230	597
Mov Cap-2 Maneuver	-	-	-	-	230	-
Stage 1	-	-	-	-	632	-
Stage 2	-	-	-	-	522	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	25
HCM LOS			D

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	244	1039	-	-	-
HCM Lane V/C Ratio	0.265	0.006	-	-	-
HCM Control Delay (s)	25	8.5	-	-	-
HCM Lane LOS	D	A	-	-	-
HCM 95th %tile Q(veh)	1	0	-	-	-

Intersection	
Int Delay, s/veh	74.4

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	225	95	230	350	5	105	10	175	1	5	10
Future Vol, veh/h	15	225	95	230	350	5	105	10	175	1	5	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	7	7	7	9	9	9	8	8	8
Mvmt Flow	18	265	112	271	412	6	124	12	206	1	6	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	418	0	-	265	0	0	1267	1261	265	1367	1258	415
Stage 1	-	-	-	-	-	-	301	301	-	957	957	-
Stage 2	-	-	-	-	-	-	966	960	-	410	301	-
Critical Hdwy	4.13	-	-	4.17	-	-	7.19	6.59	6.29	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Follow-up Hdwy	2.227	-	-	2.263	-	-	3.581	4.081	3.381	3.572	4.072	3.372
Pot Cap-1 Maneuver	1136	-	0	1271	-	-	141	165	757	121	166	625
Stage 1	-	-	0	-	-	-	693	652	-	302	328	-
Stage 2	-	-	0	-	-	-	297	326	-	607	654	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1136	-	-	1271	-	-	~ 110	128	757	68	128	625
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 110	128	-	68	128	-
Stage 1	-	-	-	-	-	-	682	642	-	297	258	-
Stage 2	-	-	-	-	-	-	224	257	-	427	644	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.5	3.4	281.6	22.1
HCM LOS			F	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	229	1271	-	-	1136	-	229
HCM Lane V/C Ratio	1.49	0.213	-	-	0.016	-	0.082
HCM Control Delay (s)	281.6	8.6	-	-	8.2	-	22.1
HCM Lane LOS	F	A	-	-	A	-	C
HCM 95th %tile Q(veh)	20.3	0.8	-	-	0	-	0.3

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	170	245	225	420	375	150
Future Volume (vph)	170	245	225	420	375	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			2		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 48	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	170	245	225	420	375	150
Future Volume (veh/h)	170	245	225	420	375	150
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1856	1856
Adj Flow Rate, veh/h	183	263	242	452	403	161
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	1	3	3
Cap, veh/h	212	305	213	935	520	441
Arrive On Green	0.31	0.31	0.12	0.50	0.28	0.28
Sat Flow, veh/h	684	983	1795	1885	1856	1572
Grp Volume(v), veh/h	447	0	242	452	403	161
Grp Sat Flow(s),veh/h/ln	1670	0	1795	1885	1856	1572
Q Serve(g_s), s	11.7	0.0	5.5	7.4	9.3	3.8
Cycle Q Clear(g_c), s	11.7	0.0	5.5	7.4	9.3	3.8
Prop In Lane	0.41	0.59	1.00			1.00
Lane Grp Cap(c), veh/h	518	0	213	935	520	441
V/C Ratio(X)	0.86	0.00	1.14	0.48	0.78	0.37
Avail Cap(c_a), veh/h	649	0	213	1139	721	611
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.1	0.0	20.4	7.7	15.3	13.4
Incr Delay (d2), s/veh	9.7	0.0	103.1	0.4	3.6	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	8.1	2.2	3.8	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	24.8	0.0	123.5	8.1	18.9	13.9
LnGrp LOS	C	A	F	A	B	B
Approach Vol, veh/h	447			694	564	
Approach Delay, s/veh	24.8			48.4	17.5	
Approach LOS	C			D	B	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		27.5			10.0	17.5		18.9
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		9.4			7.5	11.3		13.7
Green Ext Time (p_c), s		2.7			0.0	1.7		0.7

Intersection Summary	
HCM 6th Ctrl Delay	32.0
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↑	↱	↰	↑
Traffic Vol, veh/h	80	140	505	75	130	490
Future Vol, veh/h	80	140	505	75	130	490
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	92	94
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	85	149	537	80	141	521

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1340	537	0	-	537	0
Stage 1	537	-	-	-	-	-
Stage 2	803	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	169	546	-	0	1031	-
Stage 1	588	-	-	0	-	-
Stage 2	443	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	146	546	-	-	1031	-
Mov Cap-2 Maneuver	274	-	-	-	-	-
Stage 1	588	-	-	-	-	-
Stage 2	382	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.6	0	1.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	274	546	1031	-
HCM Lane V/C Ratio	-	0.311	0.273	0.137	-
HCM Control Delay (s)	-	24	14	9	-
HCM Lane LOS	-	C	B	A	-
HCM 95th %tile Q(veh)	-	1.3	1.1	0.5	-

Intersection	
Int Delay, s/veh	5.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	15	15	30	20	15	35
Future Vol, veh/h	15	15	30	20	15	35
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	91	91	91	91	91	91
Heavy Vehicles, %	4	4	9	9	7	7
Mvmt Flow	16	16	33	22	16	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	32	0	112	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	88	-
Critical Hdwy	-	-	4.19	-	6.47	6.27
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.281	-	3.563	3.363
Pot Cap-1 Maneuver	-	-	1536	-	873	1038
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	923	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1536	-	854	1038
Mov Cap-2 Maneuver	-	-	-	-	854	-
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	903	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	975	-	-	1536	-
HCM Lane V/C Ratio	0.056	-	-	0.021	-
HCM Control Delay (s)	8.9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	115	65	25	120	15	100	15	35	5	10	70
Future Vol, veh/h	95	115	65	25	120	15	100	15	35	5	10	70
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	225	-	-	225	-	-	-	-	-	-	-	-
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	3	3	3	0	0	0	3	0	3
Mvmt Flow	107	129	73	28	135	17	112	17	39	6	11	79

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	152	0	0	202	0	0	625	588	166	608	616	144
Stage 1	-	-	-	-	-	-	380	380	-	200	200	-
Stage 2	-	-	-	-	-	-	245	208	-	408	416	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.1	6.5	6.2	7.13	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.5	4	3.3	3.527	4	3.327
Pot Cap-1 Maneuver	1429	-	-	1364	-	-	400	424	884	406	409	901
Stage 1	-	-	-	-	-	-	646	617	-	800	739	-
Stage 2	-	-	-	-	-	-	763	734	-	618	595	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1429	-	-	1364	-	-	331	384	884	348	371	901
Mov Cap-2 Maneuver	-	-	-	-	-	-	331	384	-	348	371	-
Stage 1	-	-	-	-	-	-	598	571	-	740	723	-
Stage 2	-	-	-	-	-	-	671	719	-	530	550	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	1.2	20.8	10.8
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	394	1429	-	-	1364	-	-	714
HCM Lane V/C Ratio	0.428	0.075	-	-	0.021	-	-	0.134
HCM Control Delay (s)	20.8	7.7	-	-	7.7	-	-	10.8
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	2.1	0.2	-	-	0.1	-	-	0.5

MOVEMENT SUMMARY

Site: 1 [Alternative 2 (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	100	2.0	112	2.0	0.142	10.9	LOS B	0.8	19.3	0.41	0.62	0.41	35.0
8	T1	15	2.0	17	2.0	0.142	5.0	LOS A	0.8	19.3	0.41	0.62	0.41	34.9
18	R2	35	2.0	39	2.0	0.142	5.0	LOS A	0.8	19.3	0.41	0.62	0.41	33.9
Approach		150	2.0	169	2.0	0.142	8.9	LOS A	0.8	19.3	0.41	0.62	0.41	34.7
East: WB SR 155														
1	L2	25	3.0	28	3.0	0.153	10.9	LOS B	0.8	21.3	0.42	0.53	0.42	36.3
6	T1	120	3.0	135	3.0	0.153	5.0	LOS A	0.8	21.3	0.42	0.53	0.42	36.2
16	R2	15	3.0	17	3.0	0.153	5.0	LOS A	0.8	21.3	0.42	0.53	0.42	35.1
Approach		160	3.0	180	3.0	0.153	5.9	LOS A	0.8	21.3	0.42	0.53	0.42	36.2
North: SB SR 280														
7	L2	5	3.0	6	3.0	0.084	11.0	LOS B	0.4	11.2	0.43	0.54	0.43	36.8
4	T1	10	3.0	11	3.0	0.084	5.1	LOS A	0.4	11.2	0.43	0.54	0.43	36.7
14	R2	70	3.0	79	3.0	0.084	5.1	LOS A	0.4	11.2	0.43	0.54	0.43	35.6
Approach		85	3.0	96	3.0	0.084	5.5	LOS A	0.4	11.2	0.43	0.54	0.43	35.8
West: EB SR 155														
5	L2	95	2.0	107	2.0	0.223	10.0	LOS A	1.3	33.5	0.19	0.50	0.19	36.5
2	T1	115	2.0	129	2.0	0.223	4.0	LOS A	1.3	33.5	0.19	0.50	0.19	36.4
12	R2	65	2.0	73	2.0	0.223	4.1	LOS A	1.3	33.5	0.19	0.50	0.19	35.3
Approach		275	2.0	309	2.0	0.223	6.1	LOS A	1.3	33.5	0.19	0.50	0.19	36.2
All Vehicles		670	2.4	753	2.4	0.223	6.6	LOS A	1.3	33.5	0.32	0.54	0.32	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	4.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	235	95	15	270	130	40
Future Vol, veh/h	235	95	15	270	130	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	267	108	17	307	148	45

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	267	0	608	267
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	341	-
Critical Hdwy	-	-	4.12	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.218	-	3.554	3.354
Pot Cap-1 Maneuver	-	0	1297	-	452	762
Stage 1	-	0	-	-	769	-
Stage 2	-	0	-	-	711	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1297	-	445	762
Mov Cap-2 Maneuver	-	-	-	-	445	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	700	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	16.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	493	-	1297	-
HCM Lane V/C Ratio	0.392	-	0.013	-
HCM Control Delay (s)	16.9	-	7.8	0
HCM Lane LOS	C	-	A	A
HCM 95th %tile Q(veh)	1.8	-	0	-

Intersection	
Int Delay, s/veh	0.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	10	335	10	10	480	5	10	5	30	0	0	0
Future Vol, veh/h	10	335	10	10	480	5	10	5	30	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	360	11	11	516	5	11	5	32	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	521	0	0	371	0	0	929	931	366
Stage 1	-	-	-	-	-	-	388	388	-
Stage 2	-	-	-	-	-	-	541	543	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1045	-	-	1188	-	-	297	267	679
Stage 1	-	-	-	-	-	-	686	609	-
Stage 2	-	-	-	-	-	-	583	520	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1045	-	-	1188	-	-	290	0	679
Mov Cap-2 Maneuver	-	-	-	-	-	-	290	0	-
Stage 1	-	-	-	-	-	-	678	0	-
Stage 2	-	-	-	-	-	-	575	0	-

Approach	SE	NW	NE
HCM Control Delay, s	0.2	0.2	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	508	1188	-	-	1045	-	-
HCM Lane V/C Ratio	0.095	0.009	-	-	0.01	-	-
HCM Control Delay (s)	12.8	8.1	0	-	8.5	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-

Intersection	
Int Delay, s/veh	1.4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	375	35	5	515	50	5
Future Vol, veh/h	375	35	5	515	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	5	5	8	8	0	0
Mvmt Flow	441	41	6	606	59	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	482	0	1080	462
Stage 1	-	-	-	-	462	-
Stage 2	-	-	-	-	618	-
Critical Hdwy	-	-	4.18	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.272	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1050	-	244	604
Stage 1	-	-	-	-	638	-
Stage 2	-	-	-	-	542	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1050	-	243	604
Mov Cap-2 Maneuver	-	-	-	-	243	-
Stage 1	-	-	-	-	638	-
Stage 2	-	-	-	-	539	-

Approach	SE		NW		NE	
HCM Control Delay, s	0		0.1		23.7	
HCM LOS					C	

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	257	1050	-	-	-
HCM Lane V/C Ratio	0.252	0.006	-	-	-
HCM Control Delay (s)	23.7	8.4	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	1	0	-	-	-

Intersection	
Int Delay, s/veh	46.5

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	230	95	200	355	5	95	10	170	1	5	10
Future Vol, veh/h	15	230	95	200	355	5	95	10	170	1	5	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	7	7	7	9	9	9	8	8	8
Mvmt Flow	18	271	112	235	418	6	112	12	200	1	6	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	424	0	-	271	0	0	1207	1201	271	1304	1198	421
Stage 1	-	-	-	-	-	-	307	307	-	891	891	-
Stage 2	-	-	-	-	-	-	900	894	-	413	307	-
Critical Hdwy	4.13	-	-	4.17	-	-	7.19	6.59	6.29	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Follow-up Hdwy	2.227	-	-	2.263	-	-	3.581	4.081	3.381	3.572	4.072	3.372
Pot Cap-1 Maneuver	1130	-	0	1264	-	-	155	179	751	133	181	620
Stage 1	-	-	0	-	-	-	688	648	-	329	353	-
Stage 2	-	-	0	-	-	-	324	350	-	605	650	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1130	-	-	1264	-	-	125	143	751	78	145	620
Mov Cap-2 Maneuver	-	-	-	-	-	-	125	143	-	78	145	-
Stage 1	-	-	-	-	-	-	677	638	-	324	287	-
Stage 2	-	-	-	-	-	-	253	285	-	429	640	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.5	3	177.6	20.4
HCM LOS			F	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	260	1264	-	-	1130	-	252
HCM Lane V/C Ratio	1.244	0.186	-	-	0.016	-	0.075
HCM Control Delay (s)	177.6	8.5	-	-	8.2	-	20.4
HCM Lane LOS	F	A	-	-	A	-	C
HCM 95th %tile Q(veh)	15.7	0.7	-	-	0	-	0.2

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	180	200	195	410	370	155
Future Volume (vph)	180	200	195	410	370	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			2		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 47.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	180	200	195	410	370	155
Future Volume (veh/h)	180	200	195	410	370	155
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1856	1856
Adj Flow Rate, veh/h	194	215	210	441	398	167
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	1	3	3
Cap, veh/h	231	256	222	956	523	443
Arrive On Green	0.29	0.29	0.12	0.51	0.28	0.28
Sat Flow, veh/h	796	883	1795	1885	1856	1572
Grp Volume(v), veh/h	410	0	210	441	398	167
Grp Sat Flow(s),veh/h/ln	1683	0	1795	1885	1856	1572
Q Serve(g_s), s	10.2	0.0	5.2	6.7	8.7	3.8
Cycle Q Clear(g_c), s	10.2	0.0	5.2	6.7	8.7	3.8
Prop In Lane	0.47	0.52	1.00			1.00
Lane Grp Cap(c), veh/h	488	0	222	956	523	443
V/C Ratio(X)	0.84	0.00	0.94	0.46	0.76	0.38
Avail Cap(c_a), veh/h	682	0	222	1189	752	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	19.3	7.0	14.6	12.8
Incr Delay (d2), s/veh	6.6	0.0	44.9	0.3	2.8	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	0.0	4.6	1.9	3.4	1.2
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	21.4	0.0	64.2	7.4	17.4	13.3
LnGrp LOS	C	A	E	A	B	B
Approach Vol, veh/h	410			651	565	
Approach Delay, s/veh	21.4			25.7	16.2	
Approach LOS	C			C	B	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		27.0			10.0	17.0		17.4
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		8.7			7.2	10.7		12.2
Green Ext Time (p_c), s		2.7			0.0	1.8		0.7

Intersection Summary	
HCM 6th Ctrl Delay	21.3
HCM 6th LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	3.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	80	140	475	75	130	440
Future Vol, veh/h	80	140	475	75	130	440
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	92	94
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	85	149	505	80	141	468

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1255	505	0	-	505	0
Stage 1	505	-	-	-	-	-
Stage 2	750	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	190	569	-	0	1060	-
Stage 1	608	-	-	0	-	-
Stage 2	469	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	165	569	-	-	1060	-
Mov Cap-2 Maneuver	293	-	-	-	-	-
Stage 1	608	-	-	-	-	-
Stage 2	407	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.7	0	2.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	293	569	1060	-
HCM Lane V/C Ratio	-	0.29	0.262	0.133	-
HCM Control Delay (s)	-	22.2	13.6	8.9	-
HCM Lane LOS	-	C	B	A	-
HCM 95th %tile Q(veh)	-	1.2	1	0.5	-

Intersection						
Int Delay, s/veh	5.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	15	15	30	20	15	35
Future Vol, veh/h	15	15	30	20	15	35
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	91	91	91	91	91	91
Heavy Vehicles, %	4	4	9	9	7	7
Mvmt Flow	16	16	33	22	16	38

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	32	0	112	24
Stage 1	-	-	-	-	24	-
Stage 2	-	-	-	-	88	-
Critical Hdwy	-	-	4.19	-	6.47	6.27
Critical Hdwy Stg 1	-	-	-	-	5.47	-
Critical Hdwy Stg 2	-	-	-	-	5.47	-
Follow-up Hdwy	-	-	2.281	-	3.563	3.363
Pot Cap-1 Maneuver	-	-	1536	-	873	1038
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	923	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1536	-	854	1038
Mov Cap-2 Maneuver	-	-	-	-	854	-
Stage 1	-	-	-	-	986	-
Stage 2	-	-	-	-	903	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	975	-	-	1536	-
HCM Lane V/C Ratio	0.056	-	-	0.021	-
HCM Control Delay (s)	8.9	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	7.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	95	115	65	25	120	15	100	15	35	5	10	70
Future Vol, veh/h	95	115	65	25	120	15	100	15	35	5	10	70
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	225	-	-	225	-	-	-	-	-	-	-	-
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	3	3	3	0	0	0	3	0	3
Mvmt Flow	107	129	73	28	135	17	112	17	39	6	11	79

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	152	0	0	202	0	0	625	588	166	608	616	144
Stage 1	-	-	-	-	-	-	380	380	-	200	200	-
Stage 2	-	-	-	-	-	-	245	208	-	408	416	-
Critical Hdwy	4.12	-	-	4.13	-	-	7.1	6.5	6.2	7.13	6.5	6.23
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.13	5.5	-
Follow-up Hdwy	2.218	-	-	2.227	-	-	3.5	4	3.3	3.527	4	3.327
Pot Cap-1 Maneuver	1429	-	-	1364	-	-	400	424	884	406	409	901
Stage 1	-	-	-	-	-	-	646	617	-	800	739	-
Stage 2	-	-	-	-	-	-	763	734	-	618	595	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1429	-	-	1364	-	-	331	384	884	348	371	901
Mov Cap-2 Maneuver	-	-	-	-	-	-	331	384	-	348	371	-
Stage 1	-	-	-	-	-	-	598	571	-	740	723	-
Stage 2	-	-	-	-	-	-	671	719	-	530	550	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.7	1.2	20.8	10.8
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	394	1429	-	-	1364	-	-	714
HCM Lane V/C Ratio	0.428	0.075	-	-	0.021	-	-	0.134
HCM Control Delay (s)	20.8	7.7	-	-	7.7	-	-	10.8
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	2.1	0.2	-	-	0.1	-	-	0.5

MOVEMENT SUMMARY

Site: 1 [Alternative 3 (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Clinic Driveway														
3	L2	100	2.0	112	2.0	0.142	10.9	LOS B	0.8	19.3	0.41	0.62	0.41	35.0
8	T1	15	2.0	17	2.0	0.142	5.0	LOS A	0.8	19.3	0.41	0.62	0.41	34.9
18	R2	35	2.0	39	2.0	0.142	5.0	LOS A	0.8	19.3	0.41	0.62	0.41	33.9
Approach		150	2.0	169	2.0	0.142	8.9	LOS A	0.8	19.3	0.41	0.62	0.41	34.7
East: WB SR 155														
1	L2	25	3.0	28	3.0	0.153	10.9	LOS B	0.8	21.3	0.42	0.53	0.42	36.3
6	T1	120	3.0	135	3.0	0.153	5.0	LOS A	0.8	21.3	0.42	0.53	0.42	36.2
16	R2	15	3.0	17	3.0	0.153	5.0	LOS A	0.8	21.3	0.42	0.53	0.42	35.1
Approach		160	3.0	180	3.0	0.153	5.9	LOS A	0.8	21.3	0.42	0.53	0.42	36.2
North: SB SR 280														
7	L2	5	3.0	6	3.0	0.084	11.0	LOS B	0.4	11.2	0.43	0.54	0.43	36.8
4	T1	10	3.0	11	3.0	0.084	5.1	LOS A	0.4	11.2	0.43	0.54	0.43	36.7
14	R2	70	3.0	79	3.0	0.084	5.1	LOS A	0.4	11.2	0.43	0.54	0.43	35.6
Approach		85	3.0	96	3.0	0.084	5.5	LOS A	0.4	11.2	0.43	0.54	0.43	35.8
West: EB SR 155														
5	L2	95	2.0	107	2.0	0.223	10.0	LOS A	1.3	33.5	0.19	0.50	0.19	36.5
2	T1	115	2.0	129	2.0	0.223	4.0	LOS A	1.3	33.5	0.19	0.50	0.19	36.4
12	R2	65	2.0	73	2.0	0.223	4.1	LOS A	1.3	33.5	0.19	0.50	0.19	35.3
Approach		275	2.0	309	2.0	0.223	6.1	LOS A	1.3	33.5	0.19	0.50	0.19	36.2
All Vehicles		670	2.4	753	2.4	0.223	6.6	LOS A	1.3	33.5	0.32	0.54	0.32	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Intersection	
Int Delay, s/veh	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	235	75	20	270	85	40
Future Vol, veh/h	235	75	20	270	85	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	267	85	23	307	97	45

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	267	0	620	267
Stage 1	-	-	-	-	267	-
Stage 2	-	-	-	-	353	-
Critical Hdwy	-	-	4.12	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.218	-	3.554	3.354
Pot Cap-1 Maneuver	-	0	1297	-	445	762
Stage 1	-	0	-	-	769	-
Stage 2	-	0	-	-	702	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1297	-	436	762
Mov Cap-2 Maneuver	-	-	-	-	436	-
Stage 1	-	-	-	-	769	-
Stage 2	-	-	-	-	687	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	14.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	505	-	1297	-
HCM Lane V/C Ratio	0.281	-	0.018	-
HCM Control Delay (s)	14.9	-	7.8	0
HCM Lane LOS	B	-	A	A
HCM 95th %tile Q(veh)	1.1	-	0.1	-

Intersection	
Int Delay, s/veh	0.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	10	315	10	10	435	5	10	5	30	0	0	0
Future Vol, veh/h	10	315	10	10	435	5	10	5	30	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	125	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	339	11	11	468	5	11	5	32	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	473	0	0	350	0	0	860	862	345
Stage 1	-	-	-	-	-	-	367	367	-
Stage 2	-	-	-	-	-	-	493	495	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1089	-	-	1209	-	-	326	293	698
Stage 1	-	-	-	-	-	-	701	622	-
Stage 2	-	-	-	-	-	-	614	546	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1089	-	-	1209	-	-	319	0	698
Mov Cap-2 Maneuver	-	-	-	-	-	-	319	0	-
Stage 1	-	-	-	-	-	-	694	0	-
Stage 2	-	-	-	-	-	-	607	0	-

Approach	SE	NW	NE
HCM Control Delay, s	0.2	0.2	12.4
HCM LOS			B

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER
Capacity (veh/h)	538	1209	-	-	1089	-	-
HCM Lane V/C Ratio	0.09	0.009	-	-	0.01	-	-
HCM Control Delay (s)	12.4	8	0	-	8.3	-	-
HCM Lane LOS	B	A	A	-	A	-	-
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-

Intersection	
Int Delay, s/veh	1.3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	350	35	5	470	50	5
Future Vol, veh/h	350	35	5	470	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	-	-	75	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	5	5	8	8	0	0
Mvmt Flow	412	41	6	553	59	6

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	453	0	998	433
Stage 1	-	-	-	-	433	-
Stage 2	-	-	-	-	565	-
Critical Hdwy	-	-	4.18	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.272	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1077	-	273	627
Stage 1	-	-	-	-	658	-
Stage 2	-	-	-	-	573	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1077	-	271	627
Mov Cap-2 Maneuver	-	-	-	-	271	-
Stage 1	-	-	-	-	658	-
Stage 2	-	-	-	-	570	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.1	21.2
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	SET	SER
Capacity (veh/h)	286	1077	-	-	-
HCM Lane V/C Ratio	0.226	0.005	-	-	-
HCM Control Delay (s)	21.2	8.4	-	-	-
HCM Lane LOS	C	A	-	-	-
HCM 95th %tile Q(veh)	0.9	0	-	-	-

Intersection	
Int Delay, s/veh	24.9

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	230	95	155	350	5	95	10	145	1	5	10
Future Vol, veh/h	15	230	95	155	350	5	95	10	145	1	5	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	7	7	7	9	9	9	8	8	8
Mvmt Flow	18	271	112	182	412	6	112	12	171	1	6	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	418	0	-	271	0	0	1095	1089	271	1178	1086	415
Stage 1	-	-	-	-	-	-	307	307	-	779	779	-
Stage 2	-	-	-	-	-	-	788	782	-	399	307	-
Critical Hdwy	4.13	-	-	4.17	-	-	7.19	6.59	6.29	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Follow-up Hdwy	2.227	-	-	2.263	-	-	3.581	4.081	3.381	3.572	4.072	3.372
Pot Cap-1 Maneuver	1136	-	0	1264	-	-	185	209	751	163	211	625
Stage 1	-	-	0	-	-	-	688	648	-	380	398	-
Stage 2	-	-	0	-	-	-	374	395	-	615	650	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1136	-	-	1264	-	-	156	176	751	105	178	625
Mov Cap-2 Maneuver	-	-	-	-	-	-	156	176	-	105	178	-
Stage 1	-	-	-	-	-	-	677	638	-	374	341	-
Stage 2	-	-	-	-	-	-	309	338	-	459	640	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.5	2.5	94.8	17.9
HCM LOS			F	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	291	1264	-	-	1136	-	298
HCM Lane V/C Ratio	1.011	0.144	-	-	0.016	-	0.063
HCM Control Delay (s)	94.8	8.3	-	-	8.2	-	17.9
HCM Lane LOS	F	A	-	-	A	-	C
HCM 95th %tile Q(veh)	10.7	0.5	-	-	0	-	0.2

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	135	195	190	450	385	140
Future Volume (vph)	135	195	190	450	385	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			2		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 45.6	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	135	195	190	450	385	140
Future Volume (veh/h)	135	195	190	450	385	140
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1856	1856
Adj Flow Rate, veh/h	145	210	204	484	414	151
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	1	3	3
Cap, veh/h	178	258	231	994	544	461
Arrive On Green	0.26	0.26	0.13	0.53	0.29	0.29
Sat Flow, veh/h	680	985	1795	1885	1856	1572
Grp Volume(v), veh/h	356	0	204	484	414	151
Grp Sat Flow(s),veh/h/ln	1669	0	1795	1885	1856	1572
Q Serve(g_s), s	8.5	0.0	4.8	7.0	8.7	3.2
Cycle Q Clear(g_c), s	8.5	0.0	4.8	7.0	8.7	3.2
Prop In Lane	0.41	0.59	1.00			1.00
Lane Grp Cap(c), veh/h	437	0	231	994	544	461
V/C Ratio(X)	0.81	0.00	0.88	0.49	0.76	0.33
Avail Cap(c_a), veh/h	704	0	231	1236	782	663
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.8	0.0	18.3	6.4	13.7	11.8
Incr Delay (d2), s/veh	3.9	0.0	30.3	0.4	2.7	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.0	0.0	3.7	1.9	3.3	1.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	18.7	0.0	48.6	6.8	16.4	12.2
LnGrp LOS	B	A	D	A	B	B
Approach Vol, veh/h	356			688	565	
Approach Delay, s/veh	18.7			19.2	15.3	
Approach LOS	B			B	B	

Timer - Assigned Phs	2	5	6	8
Phs Duration (G+Y+Rc), s	27.0	10.0	17.0	15.7
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5
Max Green Setting (Gmax), s	28.0	5.5	18.0	18.0
Max Q Clear Time (g_c+I1), s	9.0	6.8	10.7	10.5
Green Ext Time (p_c), s	3.0	0.0	1.8	0.7

Intersection Summary	
HCM 6th Ctrl Delay	17.7
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	135	175	475	95	140	440
Future Vol, veh/h	135	175	475	95	140	440
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	92	94
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	144	186	505	101	152	468

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1277	505	0	-	505	0
Stage 1	505	-	-	-	-	-
Stage 2	772	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	185	569	-	0	1060	-
Stage 1	608	-	-	0	-	-
Stage 2	458	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	159	569	-	-	1060	-
Mov Cap-2 Maneuver	286	-	-	-	-	-
Stage 1	608	-	-	-	-	-
Stage 2	393	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	21		0		2.2	
HCM LOS	C					

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	286	569	1060	-
HCM Lane V/C Ratio	-	0.502	0.327	0.144	-
HCM Control Delay (s)	-	29.6	14.4	9	-
HCM Lane LOS	-	D	B	A	-
HCM 95th %tile Q(veh)	-	2.6	1.4	0.5	-

Intersection	
Int Delay, s/veh	4.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	185	75	70	220	85	90
Future Vol, veh/h	185	75	70	220	85	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	Free	-	None	-	None
Storage Length	-	300	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	6	6
Mvmt Flow	210	85	80	250	97	102

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	-	210	0	620	210
Stage 1	-	-	-	-	210	-
Stage 2	-	-	-	-	410	-
Critical Hdwy	-	-	4.12	-	6.46	6.26
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	-	-	2.218	-	3.554	3.354
Pot Cap-1 Maneuver	-	0	1361	-	445	820
Stage 1	-	0	-	-	816	-
Stage 2	-	0	-	-	661	-
Platoon blocked, %	-			-		
Mov Cap-1 Maneuver	-	-	1361	-	415	820
Mov Cap-2 Maneuver	-	-	-	-	415	-
Stage 1	-	-	-	-	816	-
Stage 2	-	-	-	-	616	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.9	15
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	WBL	WBT
Capacity (veh/h)	556	-	1361	-
HCM Lane V/C Ratio	0.358	-	0.058	-
HCM Control Delay (s)	15	-	7.8	0
HCM Lane LOS	C	-	A	A
HCM 95th %tile Q(veh)	1.6	-	0.2	-

Intersection	
Int Delay, s/veh	12.2

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	15	230	95	110	350	5	95	10	95	1	5	10
Future Vol, veh/h	15	230	95	110	350	5	95	10	95	1	5	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	-	-	Free	-	-	None	-	-	None	-	-	None
Storage Length	50	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	85	85	85	85	85	85	85	85	85	85	85	85
Heavy Vehicles, %	3	3	3	7	7	7	9	9	9	8	8	8
Mvmt Flow	18	271	112	129	412	6	112	12	112	1	6	12

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	418	0	-	271	0	0	989	983	271	1042	980	415
Stage 1	-	-	-	-	-	-	307	307	-	673	673	-
Stage 2	-	-	-	-	-	-	682	676	-	369	307	-
Critical Hdwy	4.13	-	-	4.17	-	-	7.19	6.59	6.29	7.18	6.58	6.28
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.18	5.58	-
Follow-up Hdwy	2.227	-	-	2.263	-	-	3.581	4.081	3.381	3.572	4.072	3.372
Pot Cap-1 Maneuver	1136	-	0	1264	-	-	219	242	751	202	244	625
Stage 1	-	-	0	-	-	-	688	648	-	435	445	-
Stage 2	-	-	0	-	-	-	429	442	-	639	650	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1136	-	-	1264	-	-	192	214	751	150	216	625
Mov Cap-2 Maneuver	-	-	-	-	-	-	192	214	-	150	216	-
Stage 1	-	-	-	-	-	-	677	638	-	428	400	-
Stage 2	-	-	-	-	-	-	372	397	-	525	640	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	0.5	1.9	50.1	15.9
HCM LOS			F	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	299	1264	-	-	1136	-	349
HCM Lane V/C Ratio	0.787	0.102	-	-	0.016	-	0.054
HCM Control Delay (s)	50.1	8.2	-	-	8.2	-	15.9
HCM Lane LOS	F	A	-	-	A	-	C
HCM 95th %tile Q(veh)	6.2	0.3	-	-	0	-	0.2

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	135	145	140	450	385	140
Future Volume (vph)	135	145	140	450	385	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	300			600
Storage Lanes	1	0	1			1
Taper Length (ft)	25		25			
Right Turn on Red		Yes				Yes
Link Speed (mph)	35			30	30	
Link Distance (ft)	1739			2421	1003	
Travel Time (s)	33.9			55.0	22.8	
Turn Type	Prot		Prot	NA	NA	Perm
Protected Phases	3		5	2	6	
Permitted Phases						6
Detector Phase	3		5	2	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	22.5		10.0	32.5	22.5	22.5
Total Split (%)	40.9%		18.2%	59.1%	40.9%	40.9%
Maximum Green (s)	18.0		5.5	28.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	Min	Min	Min
Walk Time (s)	7.0			7.0		
Flash Dont Walk (s)	11.0			11.0		
Pedestrian Calls (#/hr)	0			2		

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 45	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 6: US 97/US 20 & Dayton St

Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (veh/h)	135	145	140	450	385	140
Future Volume (veh/h)	135	145	140	450	385	140
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1856	1856
Adj Flow Rate, veh/h	145	156	151	484	414	151
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	1	1	1	1	3	3
Cap, veh/h	187	201	193	1002	567	480
Arrive On Green	0.23	0.23	0.11	0.53	0.31	0.31
Sat Flow, veh/h	808	870	1795	1885	1856	1572
Grp Volume(v), veh/h	302	0	151	484	414	151
Grp Sat Flow(s),veh/h/ln	1684	0	1795	1885	1856	1572
Q Serve(g_s), s	6.4	0.0	3.1	6.1	7.6	2.8
Cycle Q Clear(g_c), s	6.4	0.0	3.1	6.1	7.6	2.8
Prop In Lane	0.48	0.52	1.00			1.00
Lane Grp Cap(c), veh/h	389	0	193	1002	567	480
V/C Ratio(X)	0.78	0.00	0.78	0.48	0.73	0.31
Avail Cap(c_a), veh/h	799	0	260	1391	880	746
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.7	0.0	16.5	5.6	11.8	10.1
Incr Delay (d2), s/veh	3.3	0.0	10.3	0.4	1.8	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.2	0.0	1.6	1.4	2.6	0.8
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	17.0	0.0	26.8	6.0	13.6	10.5
LnGrp LOS	B	A	C	A	B	B
Approach Vol, veh/h	302			635	565	
Approach Delay, s/veh	17.0			10.9	12.8	
Approach LOS	B			B	B	

Timer - Assigned Phs		2			5	6		8
Phs Duration (G+Y+Rc), s		24.7			8.6	16.1		13.3
Change Period (Y+Rc), s		4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s		28.0			5.5	18.0		18.0
Max Q Clear Time (g_c+I1), s		8.1			5.1	9.6		8.4
Green Ext Time (p_c), s		3.0			0.0	2.0		0.7

Intersection Summary	
HCM 6th Ctrl Delay	12.8
HCM 6th LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	7.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	185	175	425	145	140	390
Future Vol, veh/h	185	175	425	145	140	390
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	100	0	-	200	225	-
Veh in Median Storage, #	1	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	92	94
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	197	186	452	154	152	415

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1171	452	0	-	452	0
Stage 1	452	-	-	-	-	-
Stage 2	719	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	214	610	-	0	1109	-
Stage 1	643	-	-	0	-	-
Stage 2	484	-	-	0	-	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	~ 185	610	-	-	1109	-
Mov Cap-2 Maneuver	310	-	-	-	-	-
Stage 1	643	-	-	-	-	-
Stage 2	418	-	-	-	-	-

Approach	WB		NB		SB	
HCM Control Delay, s	24.4		0		2.4	
HCM LOS	C					

Minor Lane/Major Mvmt	NBT	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	310	610	1109	-
HCM Lane V/C Ratio	-	0.635	0.305	0.137	-
HCM Control Delay (s)	-	34.8	13.5	8.8	-
HCM Lane LOS	-	D	B	A	-
HCM 95th %tile Q(veh)	-	4.1	1.3	0.5	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Appendix E
Mitigation Analysis Worksheets

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	15	220	85	155	330	5	90	10	145	1	5	10
Future Volume (vph)	15	220	85	155	330	5	90	10	145	1	5	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		9.0			34.3			39.5			17.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	26.0	26.0		11.0	37.0		23.0	23.0		23.0	23.0	
Total Split (%)	43.3%	43.3%		18.3%	61.7%		38.3%	38.3%		38.3%	38.3%	
Maximum Green (s)	21.5	21.5		6.5	32.5		18.5	18.5		18.5	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 44.5	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↱		↰	↱			✣			✣	
Traffic Volume (veh/h)	15	220	85	155	330	5	90	10	145	1	5	10
Future Volume (veh/h)	15	220	85	155	330	5	90	10	145	1	5	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1796	1796	1796	1767	1767	1767	1781	1781	1781
Adj Flow Rate, veh/h	18	259	0	182	388	6	106	12	171	1	6	12
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	7	7	7	9	9	9	8	8	8
Cap, veh/h	431	415		522	840	13	254	46	226	117	147	261
Arrive On Green	0.22	0.22	0.00	0.12	0.48	0.48	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	982	1856	0	1711	1764	27	423	176	868	22	563	1003
Grp Volume(v), veh/h	18	259	0	182	0	394	289	0	0	19	0	0
Grp Sat Flow(s),veh/h/ln	982	1856	0	1711	0	1791	1466	0	0	1589	0	0
Q Serve(g_s), s	0.5	4.3	0.0	2.4	0.0	5.0	4.4	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.5	4.3	0.0	2.4	0.0	5.0	6.1	0.0	0.0	0.3	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.02	0.37		0.59	0.05		0.63
Lane Grp Cap(c), veh/h	431	415		522	0	853	526	0	0	525	0	0
V/C Ratio(X)	0.04	0.62		0.35	0.00	0.46	0.55	0.00	0.00	0.04	0.00	0.00
Avail Cap(c_a), veh/h	830	1169		642	0	1706	930	0	0	964	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.5	12.0	0.0	7.5	0.0	6.0	11.5	0.0	0.0	9.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.5	0.0	0.4	0.0	0.4	0.9	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	1.5	0.0	0.6	0.0	1.1	1.6	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.5	13.5	0.0	7.9	0.0	6.4	12.4	0.0	0.0	9.5	0.0	0.0
LnGrp LOS	B	B		A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		277	A		576			289			19	
Approach Delay, s/veh		13.3			6.9			12.4			9.5	
Approach LOS		B			A			B			A	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		20.7		13.4	8.6	12.1		13.4				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		32.5		18.5	6.5	21.5		18.5				
Max Q Clear Time (g_c+I1), s		7.0		8.1	4.4	6.3		2.3				
Green Ext Time (p_c), s		2.5		1.3	0.1	1.3		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		9.8
HCM 6th LOS		A

Notes

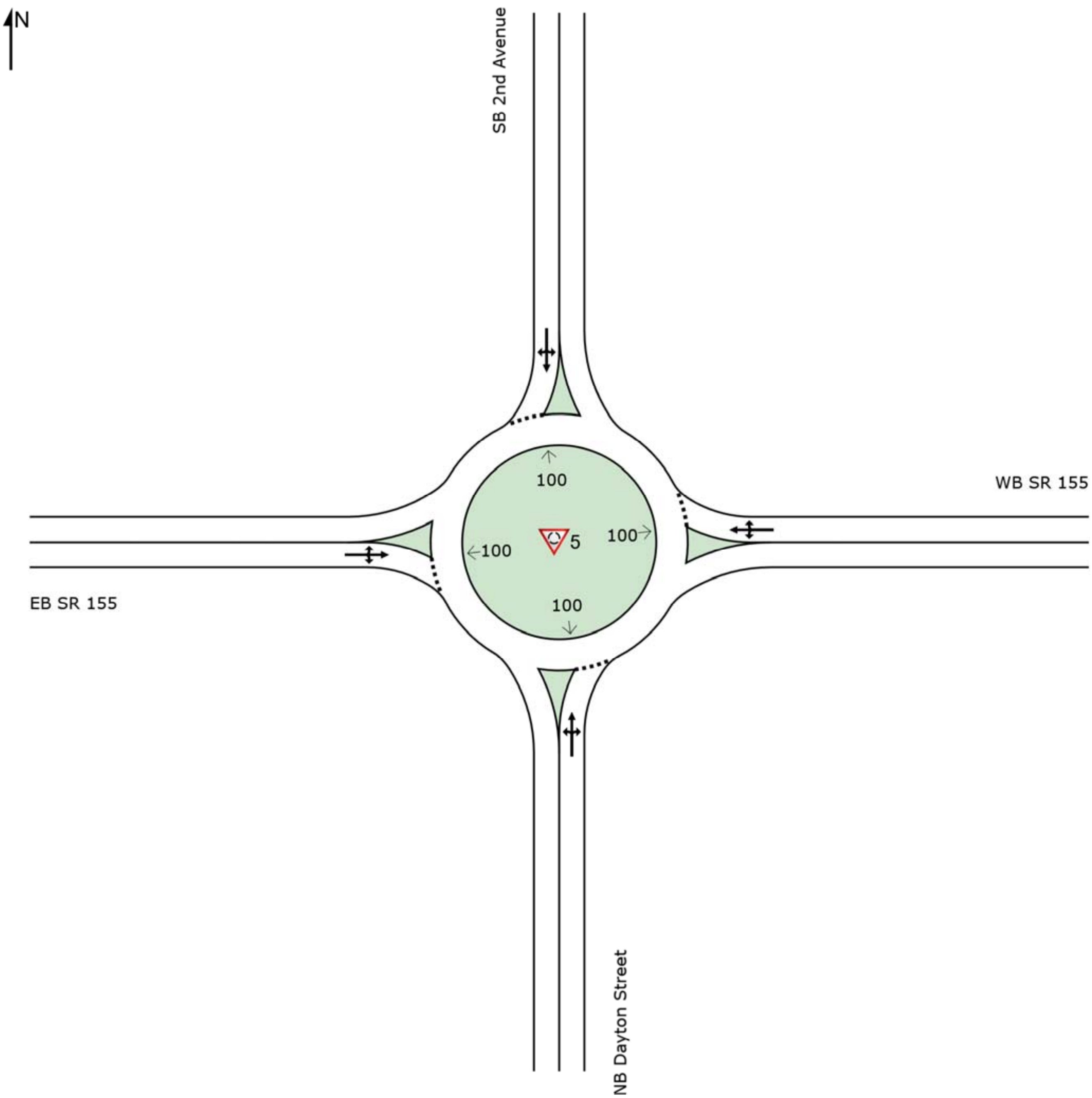
Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

SITE LAYOUT

Site: 5 [Alternative 3 (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

Site: 5 [No Build (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	50	12.0	59	12.0	0.229	11.7	LOS B	1.3	36.8	0.51	0.63	0.51	35.7
8	T1	1	12.0	1	12.0	0.229	5.7	LOS A	1.3	36.8	0.51	0.63	0.51	35.8
18	R2	145	12.0	171	12.0	0.229	5.8	LOS A	1.3	36.8	0.51	0.63	0.51	34.6
Approach		196	12.0	231	12.0	0.229	7.3	LOS A	1.3	36.8	0.51	0.63	0.51	34.9
East: WB SR 155														
1	L2	110	5.0	129	5.0	0.306	10.2	LOS B	2.1	54.2	0.28	0.49	0.28	36.2
6	T1	225	5.0	265	5.0	0.306	4.3	LOS A	2.1	54.2	0.28	0.49	0.28	36.2
16	R2	5	5.0	6	5.0	0.306	4.3	LOS A	2.1	54.2	0.28	0.49	0.28	35.1
Approach		340	5.0	400	5.0	0.306	6.2	LOS A	2.1	54.2	0.28	0.49	0.28	36.2
North: SB 2nd Avenue														
7	L2	5	33.0	6	33.0	0.012	13.3	LOS B	0.1	1.8	0.57	0.63	0.57	33.1
4	T1	1	33.0	1	33.0	0.012	7.3	LOS A	0.1	1.8	0.57	0.63	0.57	33.5
14	R2	1	33.0	1	33.0	0.012	7.4	LOS A	0.1	1.8	0.57	0.63	0.57	32.4
Approach		7	33.0	8	33.0	0.012	11.6	LOS B	0.1	1.8	0.57	0.63	0.57	33.1
West: EB SR 155														
5	L2	5	3.0	6	3.0	0.280	10.6	LOS B	1.7	44.2	0.37	0.46	0.37	36.9
2	T1	235	3.0	276	3.0	0.280	4.6	LOS A	1.7	44.2	0.37	0.46	0.37	36.8
12	R2	60	3.0	71	3.0	0.280	4.7	LOS A	1.7	44.2	0.37	0.46	0.37	35.7
Approach		300	3.0	353	3.0	0.280	4.7	LOS A	1.7	44.2	0.37	0.46	0.37	36.6
All Vehicles		843	6.1	992	6.1	0.306	6.0	LOS A	2.1	54.2	0.37	0.51	0.37	36.0

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	265	70	140	230	5	55	1	265	5	1	1
Future Volume (vph)	5	265	70	140	230	5	55	1	265	5	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		9.0			34.3			39.5			17.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	27.0	27.0		10.0	37.0		23.0	23.0		23.0	23.0	
Total Split (%)	45.0%	45.0%		16.7%	61.7%		38.3%	38.3%		38.3%	38.3%	
Maximum Green (s)	22.5	22.5		5.5	32.5		18.5	18.5		18.5	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 41.2	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	5	265	70	140	230	5	55	1	265	5	1	1
Future Volume (veh/h)	5	265	70	140	230	5	55	1	265	5	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1826	1826	1826	1722	1722	1722	1411	1411	1411
Adj Flow Rate, veh/h	6	312	0	165	271	6	65	1	312	6	1	1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	5	5	5	12	12	12	33	33	33
Cap, veh/h	443	449		453	816	18	157	29	382	335	50	33
Arrive On Green	0.24	0.24	0.00	0.10	0.46	0.46	0.32	0.32	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1093	1856	0	1739	1779	39	163	91	1200	560	156	102
Grp Volume(v), veh/h	6	312	0	165	0	277	378	0	0	8	0	0
Grp Sat Flow(s),veh/h/ln	1093	1856	0	1739	0	1819	1454	0	0	819	0	0
Q Serve(g_s), s	0.2	6.2	0.0	2.5	0.0	3.9	5.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.2	6.2	0.0	2.5	0.0	3.9	9.6	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.02	0.17		0.83	0.75		0.12
Lane Grp Cap(c), veh/h	443	449		453	0	834	567	0	0	417	0	0
V/C Ratio(X)	0.01	0.70		0.36	0.00	0.33	0.67	0.00	0.00	0.02	0.00	0.00
Avail Cap(c_a), veh/h	791	1038		509	0	1470	770	0	0	543	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.6	13.9	0.0	9.1	0.0	7.0	12.6	0.0	0.0	9.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	2.0	0.0	0.5	0.0	0.2	1.4	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.3	0.0	0.8	0.0	1.1	2.6	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.6	15.8	0.0	9.6	0.0	7.2	13.9	0.0	0.0	9.4	0.0	0.0
LnGrp LOS	B	B		A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		318	A		442			378			8	
Approach Delay, s/veh		15.8			8.1			13.9			9.4	
Approach LOS		B			A			B			A	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		22.9		17.3	8.7	14.2		17.3				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		32.5		18.5	5.5	22.5		18.5				
Max Q Clear Time (g_c+I1), s		5.9		11.6	4.5	8.2		2.2				
Green Ext Time (p_c), s		1.7		1.4	0.0	1.6		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		12.2
HCM 6th LOS		B

Notes

Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

MOVEMENT SUMMARY

Site: 5 [Alternative 1 (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	55	12.0	65	12.0	0.390	12.3	LOS B	2.6	71.8	0.62	0.68	0.62	35.6
8	T1	1	12.0	1	12.0	0.390	6.3	LOS A	2.6	71.8	0.62	0.68	0.62	35.7
18	R2	265	12.0	312	12.0	0.390	6.3	LOS A	2.6	71.8	0.62	0.68	0.62	34.6
Approach		321	12.0	378	12.0	0.390	7.4	LOS A	2.6	71.8	0.62	0.68	0.62	34.8
East: WB SR 155														
1	L2	140	5.0	165	5.0	0.341	10.3	LOS B	2.5	64.2	0.32	0.51	0.32	36.0
6	T1	230	5.0	271	5.0	0.341	4.3	LOS A	2.5	64.2	0.32	0.51	0.32	35.9
16	R2	5	5.0	6	5.0	0.341	4.4	LOS A	2.5	64.2	0.32	0.51	0.32	34.8
Approach		375	5.0	441	5.0	0.341	6.6	LOS A	2.5	64.2	0.32	0.51	0.32	35.9
North: SB 2nd Avenue														
7	L2	5	33.0	6	33.0	0.012	13.7	LOS B	0.1	1.9	0.59	0.64	0.59	32.9
4	T1	1	33.0	1	33.0	0.012	7.7	LOS A	0.1	1.9	0.59	0.64	0.59	33.4
14	R2	1	33.0	1	33.0	0.012	7.8	LOS A	0.1	1.9	0.59	0.64	0.59	32.2
Approach		7	33.0	8	33.0	0.012	12.0	LOS B	0.1	1.9	0.59	0.64	0.59	32.9
West: EB SR 155														
5	L2	5	3.0	6	3.0	0.328	10.8	LOS B	2.1	54.3	0.43	0.50	0.43	36.7
2	T1	265	3.0	312	3.0	0.328	4.9	LOS A	2.1	54.3	0.43	0.50	0.43	36.6
12	R2	70	3.0	82	3.0	0.328	4.9	LOS A	2.1	54.3	0.43	0.50	0.43	35.5
Approach		340	3.0	400	3.0	0.328	5.0	LOS A	2.1	54.3	0.43	0.50	0.43	36.4
All Vehicles		1043	6.7	1227	6.7	0.390	6.3	LOS A	2.6	71.8	0.45	0.56	0.45	35.7

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	270	60	130	235	5	55	1	210	5	1	1
Future Volume (vph)	5	270	60	130	235	5	55	1	210	5	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		9.0			34.3			39.5			17.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.9	22.9		9.6	32.5		22.5	22.5		22.5	22.5	
Total Split (%)	41.6%	41.6%		17.5%	59.1%		40.9%	40.9%		40.9%	40.9%	
Maximum Green (s)	18.4	18.4		5.1	28.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 40.3	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Projected 2045 With Project Alt 2 With Mitigation
AM Peak Hour

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	5	270	60	130	235	5	55	1	210	5	1	1
Future Volume (veh/h)	5	270	60	130	235	5	55	1	210	5	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1826	1826	1826	1722	1722	1722	1411	1411	1411
Adj Flow Rate, veh/h	6	318	0	153	276	6	65	1	247	6	1	1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	5	5	5	12	12	12	33	33	33
Cap, veh/h	466	459		479	851	19	174	29	316	354	52	33
Arrive On Green	0.25	0.25	0.00	0.11	0.48	0.48	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1088	1856	0	1739	1780	39	202	104	1145	658	189	121
Grp Volume(v), veh/h	6	318	0	153	0	282	313	0	0	8	0	0
Grp Sat Flow(s),veh/h/ln	1088	1856	0	1739	0	1819	1451	0	0	968	0	0
Q Serve(g_s), s	0.2	5.7	0.0	2.1	0.0	3.5	4.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.2	5.7	0.0	2.1	0.0	3.5	7.2	0.0	0.0	0.2	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.02	0.21		0.79	0.75		0.12
Lane Grp Cap(c), veh/h	466	459		479	0	870	519	0	0	439	0	0
V/C Ratio(X)	0.01	0.69		0.32	0.00	0.32	0.60	0.00	0.00	0.02	0.00	0.00
Avail Cap(c_a), veh/h	743	932		534	0	1391	826	0	0	640	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.4	12.5	0.0	7.9	0.0	5.9	12.2	0.0	0.0	9.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.9	0.0	0.4	0.0	0.2	1.1	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	2.1	0.0	0.6	0.0	0.9	1.9	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.4	14.4	0.0	8.3	0.0	6.1	13.3	0.0	0.0	9.7	0.0	0.0
LnGrp LOS	B	B		A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		324	A		435			313			8	
Approach Delay, s/veh		14.3			6.9			13.3			9.7	
Approach LOS		B			A			B			A	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		22.0		14.6	8.4	13.6		14.6				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		28.0		18.0	5.1	18.4		18.0				
Max Q Clear Time (g_c+I1), s		5.5		9.2	4.1	7.7		2.2				
Green Ext Time (p_c), s		1.6		1.3	0.0	1.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			11.0									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

MOVEMENT SUMMARY

Site: 5 [Alternative 2 (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	55	12.0	65	12.0	0.324	12.2	LOS B	2.1	56.4	0.59	0.67	0.59	35.6
8	T1	1	12.0	1	12.0	0.324	6.2	LOS A	2.1	56.4	0.59	0.67	0.59	35.7
18	R2	210	12.0	247	12.0	0.324	6.2	LOS A	2.1	56.4	0.59	0.67	0.59	34.6
Approach		266	12.0	313	12.0	0.324	7.5	LOS A	2.1	56.4	0.59	0.67	0.59	34.8
East: WB SR 155														
1	L2	130	5.0	153	5.0	0.336	10.3	LOS B	2.4	62.5	0.31	0.50	0.31	36.0
6	T1	235	5.0	276	5.0	0.336	4.3	LOS A	2.4	62.5	0.31	0.50	0.31	36.0
16	R2	5	5.0	6	5.0	0.336	4.4	LOS A	2.4	62.5	0.31	0.50	0.31	34.9
Approach		370	5.0	435	5.0	0.336	6.4	LOS A	2.4	62.5	0.31	0.50	0.31	36.0
North: SB 2nd Avenue														
7	L2	5	33.0	6	33.0	0.012	13.7	LOS B	0.1	1.9	0.59	0.64	0.59	33.0
4	T1	1	33.0	1	33.0	0.012	7.6	LOS A	0.1	1.9	0.59	0.64	0.59	33.4
14	R2	1	33.0	1	33.0	0.012	7.7	LOS A	0.1	1.9	0.59	0.64	0.59	32.3
Approach		7	33.0	8	33.0	0.012	12.0	LOS B	0.1	1.9	0.59	0.64	0.59	32.9
West: EB SR 155														
5	L2	5	3.0	6	3.0	0.320	10.8	LOS B	2.1	52.6	0.41	0.49	0.41	36.7
2	T1	270	3.0	318	3.0	0.320	4.8	LOS A	2.1	52.6	0.41	0.49	0.41	36.6
12	R2	60	3.0	71	3.0	0.320	4.8	LOS A	2.1	52.6	0.41	0.49	0.41	35.5
Approach		335	3.0	394	3.0	0.320	4.9	LOS A	2.1	52.6	0.41	0.49	0.41	36.4
All Vehicles		978	6.4	1151	6.4	0.336	6.2	LOS A	2.4	62.5	0.43	0.54	0.43	35.8

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	265	60	110	235	5	55	1	145	5	1	1
Future Volume (vph)	5	265	60	110	235	5	55	1	145	5	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		9.0			34.3			39.5			17.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.9	22.9		9.6	32.5		22.5	22.5		22.5	22.5	
Total Split (%)	41.6%	41.6%		17.5%	59.1%		40.9%	40.9%		40.9%	40.9%	
Maximum Green (s)	18.4	18.4		5.1	28.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 41.4	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	5	265	60	110	235	5	55	1	145	5	1	1
Future Volume (veh/h)	5	265	60	110	235	5	55	1	145	5	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1826	1826	1826	1722	1722	1722	1411	1411	1411
Adj Flow Rate, veh/h	6	312	0	129	276	6	65	1	171	6	1	1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	5	5	5	12	12	12	33	33	33
Cap, veh/h	502	475		518	893	19	205	25	228	370	54	33
Arrive On Green	0.26	0.26	0.00	0.11	0.50	0.50	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	1088	1856	0	1739	1780	39	287	114	1041	799	247	149
Grp Volume(v), veh/h	6	312	0	129	0	282	237	0	0	8	0	0
Grp Sat Flow(s),veh/h/ln	1088	1856	0	1739	0	1819	1442	0	0	1195	0	0
Q Serve(g_s), s	0.1	4.8	0.0	1.5	0.0	2.9	3.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	4.8	0.0	1.5	0.0	2.9	4.9	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.02	0.27		0.72	0.75		0.12
Lane Grp Cap(c), veh/h	502	475		518	0	913	458	0	0	457	0	0
V/C Ratio(X)	0.01	0.66		0.25	0.00	0.31	0.52	0.00	0.00	0.02	0.00	0.00
Avail Cap(c_a), veh/h	845	1060		609	0	1581	938	0	0	793	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.0	10.7	0.0	6.6	0.0	4.7	11.7	0.0	0.0	9.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.6	0.0	0.2	0.0	0.2	0.9	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.6	0.0	0.3	0.0	0.6	1.3	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.0	12.3	0.0	6.8	0.0	4.9	12.6	0.0	0.0	9.9	0.0	0.0
LnGrp LOS	A	B		A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		318	A		411			237			8	
Approach Delay, s/veh		12.2			5.5			12.6			9.9	
Approach LOS		B			A			B			A	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		20.7		11.6	7.9	12.7		11.6				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		28.0		18.0	5.1	18.4		18.0				
Max Q Clear Time (g_c+I1), s		4.9		6.9	3.5	6.8		2.1				
Green Ext Time (p_c), s		1.6		1.0	0.0	1.4		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			9.5									
HCM 6th LOS			A									

Notes

Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

MOVEMENT SUMMARY

Site: 5 [Alternative 3 (Site Folder: General)]

Projected 2045
AM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	55	12.0	65	12.0	0.242	11.9	LOS B	1.4	39.4	0.55	0.65	0.55	35.5
8	T1	1	12.0	1	12.0	0.242	6.0	LOS A	1.4	39.4	0.55	0.65	0.55	35.6
18	R2	145	12.0	171	12.0	0.242	6.0	LOS A	1.4	39.4	0.55	0.65	0.55	34.5
Approach		201	12.0	236	12.0	0.242	7.6	LOS A	1.4	39.4	0.55	0.65	0.55	34.8
East: WB SR 155														
1	L2	110	5.0	129	5.0	0.317	10.3	LOS B	2.2	57.2	0.30	0.49	0.30	36.2
6	T1	235	5.0	276	5.0	0.317	4.3	LOS A	2.2	57.2	0.30	0.49	0.30	36.1
16	R2	5	5.0	6	5.0	0.317	4.4	LOS A	2.2	57.2	0.30	0.49	0.30	35.0
Approach		350	5.0	412	5.0	0.317	6.2	LOS A	2.2	57.2	0.30	0.49	0.30	36.1
North: SB 2nd Avenue														
7	L2	5	33.0	6	33.0	0.012	13.5	LOS B	0.1	1.9	0.58	0.63	0.58	33.0
4	T1	1	33.0	1	33.0	0.012	7.4	LOS A	0.1	1.9	0.58	0.63	0.58	33.5
14	R2	1	33.0	1	33.0	0.012	7.5	LOS A	0.1	1.9	0.58	0.63	0.58	32.3
Approach		7	33.0	8	33.0	0.012	11.8	LOS B	0.1	1.9	0.58	0.63	0.58	33.0
West: EB SR 155														
5	L2	5	3.0	6	3.0	0.308	10.6	LOS B	2.0	50.3	0.38	0.47	0.38	36.8
2	T1	265	3.0	312	3.0	0.308	4.7	LOS A	2.0	50.3	0.38	0.47	0.38	36.8
12	R2	60	3.0	71	3.0	0.308	4.7	LOS A	2.0	50.3	0.38	0.47	0.38	35.6
Approach		330	3.0	388	3.0	0.308	4.8	LOS A	2.0	50.3	0.38	0.47	0.38	36.6
All Vehicles		888	6.1	1045	6.1	0.317	6.0	LOS A	2.2	57.2	0.39	0.52	0.39	35.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	5	235	60	110	225	5	50	1	145	5	1	1
Future Volume (vph)	5	235	60	110	225	5	50	1	145	5	1	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		9.0			34.3			39.5			17.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.9	22.9		9.6	32.5		22.5	22.5		22.5	22.5	
Total Split (%)	41.6%	41.6%		17.5%	59.1%		40.9%	40.9%		40.9%	40.9%	
Maximum Green (s)	18.4	18.4		5.1	28.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 40.3	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	5	235	60	110	225	5	50	1	145	5	1	1
Future Volume (veh/h)	5	235	60	110	225	5	50	1	145	5	1	1
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1826	1826	1826	1722	1722	1722	1411	1411	1411
Adj Flow Rate, veh/h	6	276	0	129	265	6	59	1	171	6	1	1
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	5	5	5	12	12	12	33	33	33
Cap, veh/h	496	442		536	877	20	204	24	229	381	55	33
Arrive On Green	0.24	0.24	0.00	0.11	0.49	0.49	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1099	1856	0	1739	1778	40	265	111	1069	823	258	154
Grp Volume(v), veh/h	6	276	0	129	0	271	231	0	0	8	0	0
Grp Sat Flow(s),veh/h/ln	1099	1856	0	1739	0	1819	1445	0	0	1235	0	0
Q Serve(g_s), s	0.1	4.1	0.0	1.5	0.0	2.7	2.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.1	4.1	0.0	1.5	0.0	2.7	4.6	0.0	0.0	0.1	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.02	0.26		0.74	0.75		0.12
Lane Grp Cap(c), veh/h	496	442		536	0	897	457	0	0	470	0	0
V/C Ratio(X)	0.01	0.62		0.24	0.00	0.30	0.51	0.00	0.00	0.02	0.00	0.00
Avail Cap(c_a), veh/h	891	1109		635	0	1654	981	0	0	835	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	9.0	10.5	0.0	6.4	0.0	4.6	11.2	0.0	0.0	9.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.4	0.0	0.2	0.0	0.2	0.9	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	1.4	0.0	0.3	0.0	0.5	1.2	0.0	0.0	0.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.0	11.9	0.0	6.7	0.0	4.8	12.1	0.0	0.0	9.6	0.0	0.0
LnGrp LOS	A	B		A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		282	A		400			231			8	
Approach Delay, s/veh		11.9			5.4			12.1			9.6	
Approach LOS		B			A			B			A	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		19.7		11.1	7.8	11.8		11.1				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		28.0		18.0	5.1	18.4		18.0				
Max Q Clear Time (g_c+I1), s		4.7		6.6	3.5	6.1		2.1				
Green Ext Time (p_c), s		1.6		1.0	0.0	1.2		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		9.1
HCM 6th LOS		A

Notes

Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

MOVEMENT SUMMARY

Site: 5 [No Build (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	90	9.0	106	9.0	0.278	11.6	LOS B	1.7	46.3	0.53	0.64	0.53	35.4
8	T1	10	9.0	12	9.0	0.278	5.6	LOS A	1.7	46.3	0.53	0.64	0.53	35.5
18	R2	145	9.0	171	9.0	0.278	5.7	LOS A	1.7	46.3	0.53	0.64	0.53	34.4
Approach		245	9.0	288	9.0	0.278	7.8	LOS A	1.7	46.3	0.53	0.64	0.53	34.8
East: WB SR 155														
1	L2	155	7.0	182	7.0	0.483	11.0	LOS B	3.9	102.1	0.49	0.55	0.49	35.5
6	T1	330	7.0	388	7.0	0.483	5.0	LOS A	3.9	102.1	0.49	0.55	0.49	35.6
16	R2	5	7.0	6	7.0	0.483	5.0	LOS A	3.9	102.1	0.49	0.55	0.49	34.5
Approach		490	7.0	576	7.0	0.483	6.9	LOS A	3.9	102.1	0.49	0.55	0.49	35.5
North: SB 2nd Avenue														
7	L2	1	8.0	1	8.0	0.020	13.9	LOS B	0.1	3.0	0.70	0.63	0.70	35.3
4	T1	1	8.0	1	8.0	0.020	7.9	LOS A	0.1	3.0	0.70	0.63	0.70	35.3
14	R2	10	8.0	12	8.0	0.020	7.9	LOS A	0.1	3.0	0.70	0.63	0.70	34.2
Approach		12	8.0	14	8.0	0.020	8.4	LOS A	0.1	3.0	0.70	0.63	0.70	34.4
West: EB SR 155														
5	L2	15	3.0	18	3.0	0.315	10.9	LOS B	2.1	53.4	0.46	0.52	0.46	36.5
2	T1	220	3.0	259	3.0	0.315	5.0	LOS A	2.1	53.4	0.46	0.52	0.46	36.4
12	R2	85	3.0	100	3.0	0.315	5.0	LOS A	2.1	53.4	0.46	0.52	0.46	35.3
Approach		320	3.0	376	3.0	0.315	5.2	LOS A	2.1	53.4	0.46	0.52	0.46	36.1
All Vehicles		1067	6.3	1255	6.3	0.483	6.6	LOS A	3.9	102.1	0.49	0.56	0.49	35.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	15	225	95	230	350	5	105	10	175	1	5	10
Future Volume (vph)	15	225	95	230	350	5	105	10	175	1	5	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		10.8			41.1			47.4			20.5	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	24.0	24.0		13.0	37.0		23.0	23.0		23.0	23.0	
Total Split (%)	40.0%	40.0%		21.7%	61.7%		38.3%	38.3%		38.3%	38.3%	
Maximum Green (s)	19.5	19.5		8.5	32.5		18.5	18.5		18.5	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		Min	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 49.9	
Natural Cycle: 60	
Control Type: Actuated-Uncoordinated	

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	15	225	95	230	350	5	105	10	175	1	5	10
Future Volume (veh/h)	15	225	95	230	350	5	105	10	175	1	5	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1796	1796	1796	1767	1767	1767	1781	1781	1781
Adj Flow Rate, veh/h	18	265	0	271	412	6	124	12	206	1	6	12
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	7	7	7	9	9	9	8	8	8
Cap, veh/h	382	394		542	858	12	246	45	257	99	166	293
Arrive On Green	0.21	0.21	0.00	0.16	0.49	0.49	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	961	1856	0	1711	1766	26	428	154	881	18	568	1004
Grp Volume(v), veh/h	18	265	0	271	0	418	342	0	0	19	0	0
Grp Sat Flow(s),veh/h/ln	961	1856	0	1711	0	1792	1462	0	0	1590	0	0
Q Serve(g_s), s	0.6	5.3	0.0	4.4	0.0	6.3	6.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	5.3	0.0	4.4	0.0	6.3	8.7	0.0	0.0	0.3	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.01	0.36		0.60	0.05		0.63
Lane Grp Cap(c), veh/h	382	394		542	0	870	548	0	0	558	0	0
V/C Ratio(X)	0.05	0.67		0.50	0.00	0.48	0.62	0.00	0.00	0.03	0.00	0.00
Avail Cap(c_a), veh/h	640	893		623	0	1437	784	0	0	814	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.8	14.7	0.0	8.9	0.0	7.0	13.1	0.0	0.0	10.3	0.0	0.0
Incr Delay (d2), s/veh	0.1	2.0	0.0	0.7	0.0	0.4	1.2	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	2.1	0.0	1.3	0.0	1.8	2.5	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.9	16.7	0.0	9.6	0.0	7.4	14.3	0.0	0.0	10.3	0.0	0.0
LnGrp LOS	B	B		A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		283	A		689			342			19	
Approach Delay, s/veh		16.4			8.3			14.3			10.3	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		24.2		16.3	11.1	13.1		16.3				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		32.5		18.5	8.5	19.5		18.5				
Max Q Clear Time (g_c+I1), s		8.3		10.7	6.4	7.3		2.3				
Green Ext Time (p_c), s		2.8		1.4	0.2	1.3		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			11.6
HCM 6th LOS			B

Notes

Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

MOVEMENT SUMMARY

Site: 5 [Alternative 1 (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	105	9.0	124	9.0	0.333	11.7	LOS B	2.2	59.3	0.57	0.66	0.57	35.3
8	T1	10	9.0	12	9.0	0.333	5.7	LOS A	2.2	59.3	0.57	0.66	0.57	35.4
18	R2	175	9.0	206	9.0	0.333	5.8	LOS A	2.2	59.3	0.57	0.66	0.57	34.3
Approach		290	9.0	341	9.0	0.333	7.9	LOS A	2.2	59.3	0.57	0.66	0.57	34.7
East: WB SR 155														
1	L2	230	7.0	271	7.0	0.578	11.3	LOS B	5.2	137.7	0.58	0.59	0.58	35.1
6	T1	340	7.0	400	7.0	0.578	5.3	LOS A	5.2	137.7	0.58	0.59	0.58	35.1
16	R2	5	7.0	6	7.0	0.578	5.4	LOS A	5.2	137.7	0.58	0.59	0.58	34.0
Approach		575	7.0	676	7.0	0.578	7.7	LOS A	5.2	137.7	0.58	0.59	0.58	35.1
North: SB 2nd Avenue														
7	L2	1	8.0	1	8.0	0.023	15.1	LOS B	0.1	3.8	0.78	0.67	0.78	34.6
4	T1	1	8.0	1	8.0	0.023	9.2	LOS A	0.1	3.8	0.78	0.67	0.78	34.6
14	R2	10	8.0	12	8.0	0.023	9.2	LOS A	0.1	3.8	0.78	0.67	0.78	33.6
Approach		12	8.0	14	8.0	0.023	9.7	LOS A	0.1	3.8	0.78	0.67	0.78	33.7
West: EB SR 155														
5	L2	15	3.0	18	3.0	0.359	11.5	LOS B	2.5	63.6	0.58	0.58	0.58	36.1
2	T1	225	3.0	265	3.0	0.359	5.6	LOS A	2.5	63.6	0.58	0.58	0.58	36.1
12	R2	95	3.0	112	3.0	0.359	5.6	LOS A	2.5	63.6	0.58	0.58	0.58	35.0
Approach		335	3.0	394	3.0	0.359	5.8	LOS A	2.5	63.6	0.58	0.58	0.58	35.8
All Vehicles		1212	6.4	1426	6.4	0.578	7.3	LOS A	5.2	137.7	0.58	0.61	0.58	35.2

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	15	230	95	200	355	5	95	10	170	1	5	10
Future Volume (vph)	15	230	95	200	355	5	95	10	170	1	5	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		9.0			34.3			39.5			17.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	25.0	25.0		12.0	37.0		23.0	23.0		23.0	23.0	
Total Split (%)	41.7%	41.7%		20.0%	61.7%		38.3%	38.3%		38.3%	38.3%	
Maximum Green (s)	20.5	20.5		7.5	32.5		18.5	18.5		18.5	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary
Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 46.1
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	15	230	95	200	355	5	95	10	170	1	5	10
Future Volume (veh/h)	15	230	95	200	355	5	95	10	170	1	5	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1796	1796	1796	1767	1767	1767	1781	1781	1781
Adj Flow Rate, veh/h	18	271	0	235	418	6	112	12	200	1	6	12
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	7	7	7	9	9	9	8	8	8
Cap, veh/h	403	411		521	846	12	241	46	255	106	160	283
Arrive On Green	0.22	0.22	0.00	0.14	0.48	0.48	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	956	1856	0	1711	1766	25	398	163	906	19	566	1004
Grp Volume(v), veh/h	18	271	0	235	0	424	324	0	0	19	0	0
Grp Sat Flow(s),veh/h/ln	956	1856	0	1711	0	1792	1468	0	0	1589	0	0
Q Serve(g_s), s	0.6	5.0	0.0	3.5	0.0	6.1	5.5	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.6	5.0	0.0	3.5	0.0	6.1	7.6	0.0	0.0	0.3	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.01	0.35		0.62	0.05		0.63
Lane Grp Cap(c), veh/h	403	411		521	0	858	543	0	0	549	0	0
V/C Ratio(X)	0.04	0.66		0.45	0.00	0.49	0.60	0.00	0.00	0.03	0.00	0.00
Avail Cap(c_a), veh/h	712	1011		627	0	1548	844	0	0	875	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	11.6	13.3	0.0	8.4	0.0	6.7	12.3	0.0	0.0	9.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.8	0.0	0.6	0.0	0.4	1.1	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	1.9	0.0	1.0	0.0	1.5	2.1	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.7	15.1	0.0	9.0	0.0	7.1	13.4	0.0	0.0	9.8	0.0	0.0
LnGrp LOS	B	B		A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		289	A		659			324			19	
Approach Delay, s/veh		14.9			7.8			13.4			9.8	
Approach LOS		B			A			B			A	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		22.5		15.1	9.7	12.8		15.1				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		32.5		18.5	7.5	20.5		18.5				
Max Q Clear Time (g_c+I1), s		8.1		9.6	5.5	7.0		2.3				
Green Ext Time (p_c), s		2.7		1.3	0.1	1.3		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			10.8
HCM 6th LOS			B

Notes

Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

MOVEMENT SUMMARY

Site: 5 [Alternative 2 (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	95	9.0	112	9.0	0.317	11.7	LOS B	2.1	55.2	0.56	0.66	0.56	35.4
8	T1	10	9.0	12	9.0	0.317	5.7	LOS A	2.1	55.2	0.56	0.66	0.56	35.4
18	R2	170	9.0	200	9.0	0.317	5.8	LOS A	2.1	55.2	0.56	0.66	0.56	34.3
Approach		275	9.0	324	9.0	0.317	7.8	LOS A	2.1	55.2	0.56	0.66	0.56	34.7
East: WB SR 155														
1	L2	200	7.0	235	7.0	0.556	11.2	LOS B	4.9	129.7	0.55	0.57	0.55	35.3
6	T1	355	7.0	418	7.0	0.556	5.2	LOS A	4.9	129.7	0.55	0.57	0.55	35.3
16	R2	5	7.0	6	7.0	0.556	5.2	LOS A	4.9	129.7	0.55	0.57	0.55	34.2
Approach		560	7.0	659	7.0	0.556	7.3	LOS A	4.9	129.7	0.55	0.57	0.55	35.3
North: SB 2nd Avenue														
7	L2	1	8.0	1	8.0	0.022	14.8	LOS B	0.1	3.6	0.76	0.66	0.76	34.8
4	T1	1	8.0	1	8.0	0.022	8.8	LOS A	0.1	3.6	0.76	0.66	0.76	34.8
14	R2	10	8.0	12	8.0	0.022	8.9	LOS A	0.1	3.6	0.76	0.66	0.76	33.8
Approach		12	8.0	14	8.0	0.022	9.3	LOS A	0.1	3.6	0.76	0.66	0.76	33.9
West: EB SR 155														
5	L2	15	3.0	18	3.0	0.353	11.3	LOS B	2.4	61.9	0.54	0.55	0.54	36.3
2	T1	230	3.0	271	3.0	0.353	5.3	LOS A	2.4	61.9	0.54	0.55	0.54	36.2
12	R2	95	3.0	112	3.0	0.353	5.4	LOS A	2.4	61.9	0.54	0.55	0.54	35.1
Approach		340	3.0	400	3.0	0.353	5.6	LOS A	2.4	61.9	0.54	0.55	0.54	35.9
All Vehicles		1187	6.3	1396	6.3	0.556	7.0	LOS A	4.9	129.7	0.55	0.59	0.55	35.3

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	15	230	95	155	350	5	95	10	145	1	5	10
Future Volume (vph)	15	230	95	155	350	5	95	10	145	1	5	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		0	100		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		395			1508			1739			750	
Travel Time (s)		9.0			34.3			39.5			17.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		6		5	2			4			8	
Permitted Phases	6			2			4			8		
Detector Phase	6	6		5	2		4	4		8	8	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	26.0	26.0		11.0	37.0		23.0	23.0		23.0	23.0	
Total Split (%)	43.3%	43.3%		18.3%	61.7%		38.3%	38.3%		38.3%	38.3%	
Maximum Green (s)	21.5	21.5		6.5	32.5		18.5	18.5		18.5	18.5	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0			0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5			4.5			4.5	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	Min	Min		None	Min		None	None		None	None	
Walk Time (s)	7.0	7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	

Intersection Summary
Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 45.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 5: Dayton St/2nd Ave & SR 155

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	15	230	95	155	350	5	95	10	145	1	5	10
Future Volume (veh/h)	15	230	95	155	350	5	95	10	145	1	5	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1796	1796	1796	1767	1767	1767	1781	1781	1781
Adj Flow Rate, veh/h	18	271	0	182	412	6	112	12	171	1	6	12
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	3	3	3	7	7	7	9	9	9	8	8	8
Cap, veh/h	427	426		514	843	12	259	46	224	114	149	265
Arrive On Green	0.23	0.23	0.00	0.12	0.48	0.48	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	961	1856	0	1711	1766	26	442	173	848	22	564	1003
Grp Volume(v), veh/h	18	271	0	182	0	418	295	0	0	19	0	0
Grp Sat Flow(s),veh/h/ln	961	1856	0	1711	0	1792	1463	0	0	1589	0	0
Q Serve(g_s), s	0.5	4.6	0.0	2.5	0.0	5.5	4.7	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.5	4.6	0.0	2.5	0.0	5.5	6.4	0.0	0.0	0.3	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.01	0.38		0.58	0.05		0.63
Lane Grp Cap(c), veh/h	427	426		514	0	855	529	0	0	529	0	0
V/C Ratio(X)	0.04	0.64		0.35	0.00	0.49	0.56	0.00	0.00	0.04	0.00	0.00
Avail Cap(c_a), veh/h	799	1145		630	0	1671	911	0	0	944	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	10.5	12.1	0.0	7.6	0.0	6.2	11.7	0.0	0.0	9.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	1.6	0.0	0.4	0.0	0.4	0.9	0.0	0.0	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	1.6	0.0	0.6	0.0	1.3	1.7	0.0	0.0	0.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.6	13.7	0.0	8.1	0.0	6.6	12.6	0.0	0.0	9.6	0.0	0.0
LnGrp LOS	B	B		A	A	A	B	A	A	A	A	A
Approach Vol, veh/h		289	A		600			295			19	
Approach Delay, s/veh		13.5			7.1			12.6			9.6	
Approach LOS		B			A			B			A	

Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		21.1		13.7	8.6	12.5		13.7				
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s		32.5		18.5	6.5	21.5		18.5				
Max Q Clear Time (g_c+I1), s		7.5		8.4	4.5	6.6		2.3				
Green Ext Time (p_c), s		2.7		1.3	0.1	1.4		0.0				

Intersection Summary			
HCM 6th Ctrl Delay			10.0
HCM 6th LOS			B

Notes

Unsignalized Delay for [SER] is excluded from calculations of the approach delay and intersection delay.

MOVEMENT SUMMARY

Site: 5 [Alternative 3 (Site Folder: General)]

Projected 2045
PM Peak Hour
Site Category: (None)
Roundabout

Vehicle Movement Performance

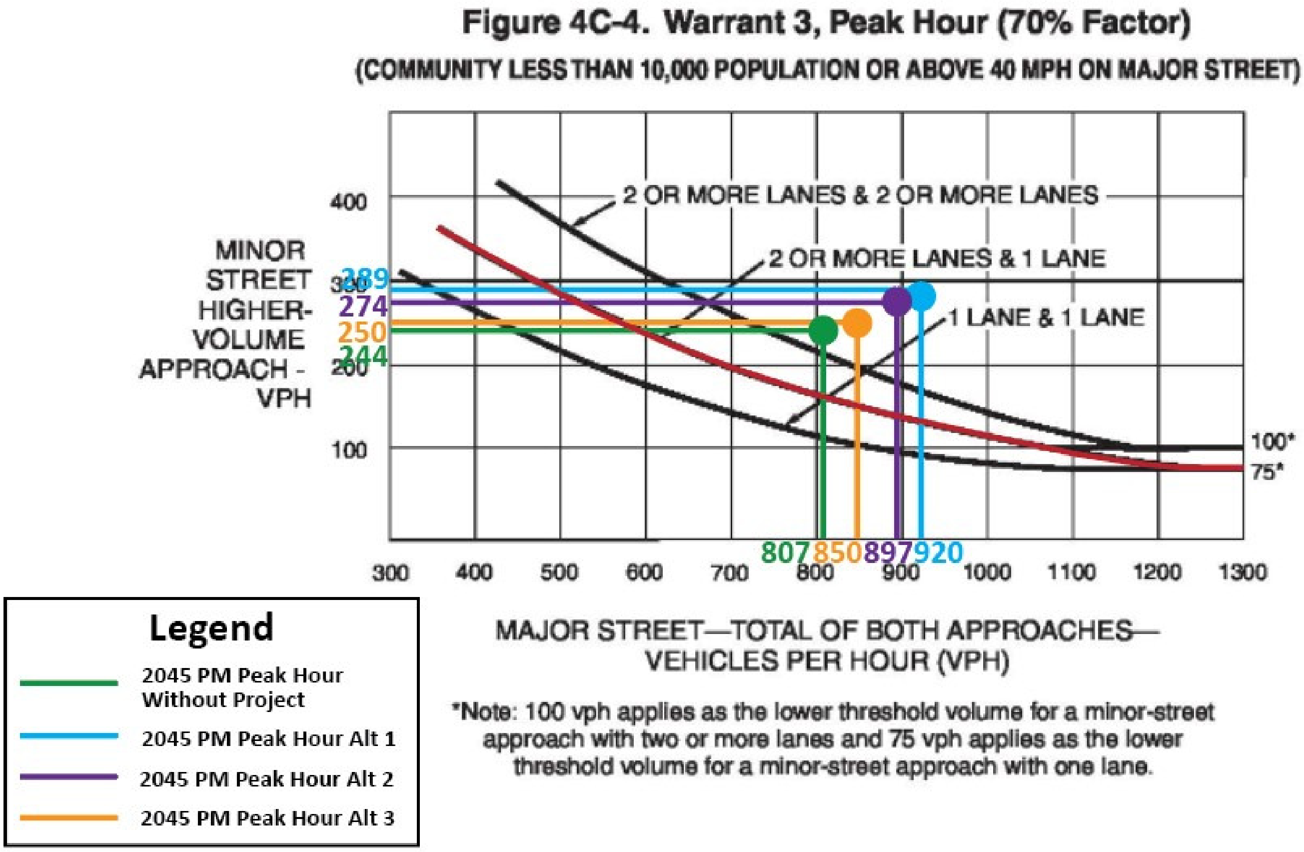
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: NB Dayton Street														
3	L2	95	9.0	112	9.0	0.286	11.7	LOS B	1.8	48.1	0.54	0.65	0.54	35.3
8	T1	10	9.0	12	9.0	0.286	5.7	LOS A	1.8	48.1	0.54	0.65	0.54	35.4
18	R2	145	9.0	171	9.0	0.286	5.7	LOS A	1.8	48.1	0.54	0.65	0.54	34.3
Approach		250	9.0	294	9.0	0.286	8.0	LOS A	1.8	48.1	0.54	0.65	0.54	34.7
East: WB SR 155														
1	L2	155	7.0	182	7.0	0.506	11.1	LOS B	4.2	110.0	0.51	0.56	0.51	35.5
6	T1	350	7.0	412	7.0	0.506	5.1	LOS A	4.2	110.0	0.51	0.56	0.51	35.5
16	R2	5	7.0	6	7.0	0.506	5.1	LOS A	4.2	110.0	0.51	0.56	0.51	34.4
Approach		510	7.0	600	7.0	0.506	6.9	LOS A	4.2	110.0	0.51	0.56	0.51	35.5
North: SB 2nd Avenue														
7	L2	1	8.0	1	8.0	0.020	14.2	LOS B	0.1	3.2	0.72	0.64	0.72	35.1
4	T1	1	8.0	1	8.0	0.020	8.2	LOS A	0.1	3.2	0.72	0.64	0.72	35.2
14	R2	10	8.0	12	8.0	0.020	8.2	LOS A	0.1	3.2	0.72	0.64	0.72	34.1
Approach		12	8.0	14	8.0	0.020	8.7	LOS A	0.1	3.2	0.72	0.64	0.72	34.2
West: EB SR 155														
5	L2	15	3.0	18	3.0	0.336	10.9	LOS B	2.3	58.3	0.47	0.52	0.47	36.5
2	T1	230	3.0	271	3.0	0.336	5.0	LOS A	2.3	58.3	0.47	0.52	0.47	36.4
12	R2	95	3.0	112	3.0	0.336	5.0	LOS A	2.3	58.3	0.47	0.52	0.47	35.3
Approach		340	3.0	400	3.0	0.336	5.3	LOS A	2.3	58.3	0.47	0.52	0.47	36.1
All Vehicles		1112	6.2	1308	6.2	0.506	6.7	LOS A	4.2	110.0	0.51	0.57	0.51	35.5

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
Intersection and Approach LOS values are based on average delay for all movements (v/c not used).
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix F

Warrant Analysis

SIGNAL WARRANT ANALYSIS FOR INTERSECTION OF SR 155 AT DAYTON STREET



Appendix G

Cost Estimate Worksheets

Project Name: **East Omak Industrial Site Master Plan with Railroad Crossing**
Client Name: **Confederated Tribes of the Colville Reservation**
SCJ Project No.: **23-000139**
Estimate Level: **Conceptual_Final**

SCJ ALLIANCE
CONSULTING SERVICES

Roadway Construction Cost Estimate

BID ITEM NO.	SPEC. SECTION	DESCRIPTION	UNIT	UNIT PRICE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
1	1-04	MINOR CHANGE	CALC	$ 1.00	10000.0	10000.0	10000.0
2	1-05	ROADWAY SURVEYING	L.S.	$ 24,000.00	1.0	1.0	1.0
3	1-07	SPCC PLAN	L.S.	$ 5,000.00	1.0	1.0	1.0
4	1-09	MOBILIZATION	L.S.	$ 1.00	168000.0	530100.0	686700.0
5	1-10	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	$ 1.00	102450.0	312720.0	401495.0
6	2-01	CLEARING AND GRUBBING	ACRE	$ 35.00	0.0	0.0	0.8
7	2-01	ROADSIDE CLEANUP	EST.	$ 1.00	5000.0	10000.0	10000.0
8	2-02	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	$ 1.00	15000.0	25000.0	25000.0
9	2-03	ROADWAY EXCAVATION INCL. HAUL	C.Y.	$ 36.50	3525.0	35125.0	40730.0
10	2-03	GRAVEL BORROW INCL. HAUL	TON	$ 40.00	2440.0	10440.0	15255.0
11	2-09	STRUCTURE EXCAVATION CLASS B INCL. HAUL	C.Y.	$ 25.00	910.0	2750.0	3805.0
12	2-09	SHORING OR EXTRA EXCAVATION CLASS B	S.F.	$ 0.50	7020.0	21210.0	29335.0
13	4-04	CRUSHED SURFACING BASE COURSE	TON	$ 45.00	6430.0	17065.0	19550.0
14	5-04	HMA CL. 1/2 IN. PG 64H-28	TON	$ 140.00	2800.0	7195.0	9680.0
15	7-04	SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	L.F.	$ 90.00	1404.0	4242.0	5867.0
16	7-05	CATCH BASIN TYPE 1	EACH	$ 2,000.00	9.0	28.0	39.0
17	7-05	CATCH BASIN TYPE 2 48 IN. DIAM.	EACH	$ 4,500.00	3.0	8.0	12.0
18	8-01	ESC LEAD	DAY	$ 200.00	20.0	50.0	60.0
19	8-01	INLET PROTECTION	EACH	$ 110.00	12.0	36.0	51.0
20	8-01	SILT FENCE	L.F.	$ 5.50	2831.0	4380.0	4550.0
21	8-02	SEEDING AND FERTILIZING	S.Y.	$ 5.00	1520.0	3380.0	11890.0
22	8-02	TOPSOIL TYPE C	S.Y.	$ 11.00	1520.0	3380.0	11890.0
23	8-02	STREET TREES	EACH	$ 100.00	64.0	128.0	128.0
24	8-04	CEMENT CONC. TRAFFIC CURB AND GUTTER	L.F.	$ 80.00	3415.0	8225.0	11245.0
25	8-14	CEMENT CONC. SIDEWALK	S.Y.	$ 120.00	4510.0	11055.0	11820.0
26	8-14	CEMENT CONC. CURB RAMP TYPE - TBD	EACH	$ 3,300.00	4.0	16.0	23.0

Client Name: Confederated Tribes of the Colville Reservation

SCJ Project No.: 23-000139

Estimate Level: Conceptual_Final

SCJ ALLIANCE
CONSULTING SERVICES

Roadway Construction Cost Estimate

BID ITEM NO.	SPEC. SECTION	DESCRIPTION	UNIT	UNIT PRICE	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
27	8-21	PERMANENT SIGNING	L.S.	$ 1.00	3000.0	1.0	1.0
28	8-22	PAINT LINE	L.F.	$ 0.25	1985.0	3515.0	5350.0
29	8-22	PLASTIC STOP LINE	L.F.	$ 20.00	26.0	130.0	167.0
				CONSTRUCTION COST	$ 2,304,409.25	$ 7,090,652.25	$ 8,908,092.25
				CONTINGENCY 30%	$ 691,322.78	$ 2,127,195.68	$ 2,672,427.68
				TOTAL CONSTRUCTION COST	$ 2,995,732.00	$ 9,217,848.00	$ 11,580,520.00

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HORIZONTAL SCALE:	AS SHOWN
DATE:	JUNE 2023
JOB No.:	23-000139
DRAWING FILE No.:	23-000139-EXH-PV ALT 3.DWG

EAST OMAK INDUSTRIAL MASTER PLAN
EXHIBIT PAVING OVERVIEW

EXHIBIT No: EX-01
SHEET No: 01

Jun 23, 2023 5:33:12am – User sam.rowswell
G:\SHARED DRIVES\23-000139 EAST OMAK INDUSTRIAL MASTER PLAN\CADD\23-000139-EXH-PV ALT 3.DWG

Project Name:	**Roundabout - East Omak Industrial Site Master Plan**
Client Name:	**Confederated Tribes of the Colville Reservation**
SCJ Project No.:	**23-000139**
Estimate Level:	**Concept**
Date:	**6/28/2023**

SCJ ALLIANCE
CONSULTING SERVICES

BID ITEM NO.	WSDOT STD ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	Schedule A Roadway	Schedule B WITH TREES	TOTAL
		PREPARATION						
1	0001	MOBILIZATION	L.S.	$ 117,600.00	1.0	1.0		$ 117,600
2	0025	CLEARING AND GRUBBING	ACRE	$ 35.00	0.0	0.0		$ -
3	0050	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	$ 25,000.00	1.0	1.0		$ 25,000
					Subtotal:	**$142,600**	**$0**	**$ 142,600**
		GRADING						
4	0310	ROADWAY EXCAVATION INCL. HAUL	C.Y.	$ 36.50	1710.0	1710.0		$ 62,415
5	0431	GRAVEL BORROW INCL. HAUL	TON	$ 40.00	1315.0	1315.0		$ 52,600
					Subtotal:	**$115,015**	**$0**	**$ 115,015**
		STORM SEWER						
6	3091	CATCH BASIN TYPE 1	EACH	$ 2,000.00	7.0	7.0		$ 14,000
7	3105	CATCH BASIN TYPE 2 48 IN. DIAM.	EACH	$ 4,500.00	2.0	2.0		$ 9,000
8	3541	SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	L.F.	$ 90.00	1090.0	1090.0		$ 98,100
					Subtotal:	**$121,100**	**$0**	**$ 121,100**
		SURFACING						
9	5100	CRUSHED SURFACING BASE COURSE	TON	$ 45.00	3960.0	3960.0		$ 178,200
					Subtotal:	**$178,200**	**$0**	**$ 178,200**
		HOT MIX ASPHALT						
10	5767	HMA CL. 1/2 IN. PG 64H-28	TON	$ 140.00	1530.0	1530.0		$ 214,200
					Subtotal:	**$214,200**	**$0**	**$ 214,200**
		EROSION CONTROL AND ROADSIDE PLANTING						
11	6488	EROSION CONTROL AND WATER POLLUTION PREVENTION	L.S.	$ 50,000.00	1.0	1.0		$ 50,000
					Subtotal:	**$50,000**	**$0**	**$ 50,000**
		TRAFFIC						
12	6700	CEMENT CONC. TRAFFIC CURB AND GUTTER	L.F.	$ 80.00	1865.0	1865.0		$ 149,200
13	6708	ROUNDABOUT CENTRAL ISLAND CEMENT CONCRETE CURB	L.F.	$ 120.00	245.0	245.0		$ 29,400
14	6709	ROUNDABOUT TRUCK APRON CEM. CONC. CURB AND GUTTER	L.F.	$ 85.00	358.0	358.0		$ 30,430
15	6806	PAINT LINE	L.F.	$ 0.25	905.0	905.0		$ 226
16	6857	PLASTIC CROSSWALK LINE	S.F.	$ 15.00	480.0	480.0		$ 7,200
17	9238	PLASTIC YIELD LINE SYMBOL	EACH	$ 92.00	27.0	27.0		$ 2,484
18	6890	PERMANENT SIGNING	L.S.	$ 19,200.00	1.0	1.0		$ 19,200
19	6971	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	$ 60,335.00	1.0	1.0		$ 60,335

Client Name: 0

SCJ Project No.: 23-000139

Estimate Level: Concept

Date: 6/28/2023

SCJ ALLIANCE CONSULTING SERVICES

BID ITEM NO.	WSDOT STD ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	Schedule A Roadway	Schedule B WITH TREES	TOTAL
20	NS-811	TEXTURED PIGMENTED CEMENT CONC.	S.Y.	$ 200.00	1165.0	1165.0		$ 233,000
					Subtotal:	**$531,475**	**$0**	**$ 531,475**
		OTHER ITEMS						
21	7006	STRUCTURE EXCAVATION CLASS B INCL. HAUL	C.Y.	$ 25.00	710.0	710.0		$ 17,750
22	7008	SHORING OR EXTRA EXCAVATION CLASS B	S.F.	$ 0.50	5450.0	5450.0		$ 2,725
23	7038	ROADWAY SURVEYING	L.S.	$ 24,000.00	1.0	1.0		$ 24,000
24	7055	CEMENT CONC. SIDEWALK	S.Y.	$ 120.00	1410.0	1410.0		$ 169,200
25	7058	CEMENT CONC. CURB RAMP TYPE - TBD	EACH	$ 3,300.00	8.0	8.0		$ 26,400
26	7480	ROADSIDE CLEANUP	EST.	$ 1.00	10000.0	10000.0		$ 10,000
27	7728	MINOR CHANGE	CALC	$ 1.00	10000.0	10000.0		$ 10,000
28	7736	SPCC PLAN	L.S.	$ 5,000.00	1.0	1.0		$ 5,000
					Subtotal:	**$265,075**	**$0**	**$ 265,075**

	Schedule A	Schedule B	TOTAL
Subtotal Construction:	**$1,617,665**	**$0**	**$ 1,617,665**
Contingency @ 30%	**$485,300**	**$0**	**$ 485,300**
TOTAL CONSTRUCTION:	**$2,102,965**	**$0**	**$ 2,102,965**

Jun 28, 2023 11:29:32am – User sam.rowswell
G:\SHARED DRIVES\23-000139 EAST OMAK INDUSTRIAL MASTER PLAN\CAD\23-000139-EXH-PV RAB.DWG

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HORIZONTAL SCALE:	AS SHOWN
DATE:	JUNE 2023
JOB No.:	23-000139
DRAWING FILE No.:	23-000139-EXH-PV RAB.DWG

EAST OMAK INDUSTRIAL MASTER PLAN

EXHIBIT ROUNDABOUT

EXHIBIT No: EX-03

SHEET No: 03

Project Name: Sidewalk- East Omak Industrial Site Master Plan

Client Name: Confederated Tribes of the Colville Reservation

SCJ Project No.: 23-000139

Estimate Level: Concept

Date: 6/28/2023

SCJ ALLIANCE
CONSULTING SERVICES

BID ITEM NO.	WSDOT STD ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	Schedule A Roadway	Schedule B WITH TREES	TOTAL
		PREPARATION						
1	0001	MOBILIZATION	L.S.	$ 71,600.00	1.0	1.0		$ 71,600
2	0035	CLEARING AND GRUBBING	L.S.	$ 5,000.00	1.0	1.0		$ 5,000
3	0050	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	$ 25,000.00	1.0	1.0		$ 25,000
					Subtotal:	**$101,600**	**$0**	**$ 101,600**
		GRADING						
4	0310	ROADWAY EXCAVATION INCL. HAUL	C.Y.	$ 36.50	245.0	245.0		$ 8,943
5	0431	GRAVEL BORROW INCL. HAUL	TON	$ 40.00	2390.0	2390.0		$ 95,600
					Subtotal:	**$104,543**	**$0**	**$ 104,543**
		STORM SEWER						
6	3091	CATCH BASIN TYPE 1	EACH	$ 2,000.00	13.0	13.0		$ 26,000
7	3105	CATCH BASIN TYPE 2 48 IN. DIAM.	EACH	$ 4,500.00	4.0	4.0		$ 18,000
8	3541	SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	L.F.	$ 90.00	1990.0	1990.0		$ 179,100
					Subtotal:	**$223,100**	**$0**	**$ 223,100**
		SURFACING						
9	5100	CRUSHED SURFACING BASE COURSE	TON	$ 45.00	3845.0	3845.0		$ 173,025
					Subtotal:	**$173,025**	**$0**	**$ 173,025**
		HOT MIX ASPHALT						
10	5767	HMA CL. 1/2 IN. PG 64H-28	TON	$ 140.00	275.0	275.0		$ 38,500
					Subtotal:	**$38,500**	**$0**	**$ 38,500**
		EROSION CONTROL AND ROADSIDE PLANTING						
11	6403	ESC LEAD	DAY	$ 200.00	12.0	12.0		$ 2,400
12	6471	INLET PROTECTION	EACH	$ 110.00	17.0	17.0		$ 1,870
13	6373	SILT FENCE	L.F.	$ 5.50	2000.0	2000.0		$ 11,000
					Subtotal:	**$15,270**	**$0**	**$ 15,270**
		TRAFFIC						
14	6700	CEMENT CONC. TRAFFIC CURB AND GUTTER	L.F.	$ 80.00	2125.0	2125.0		$ 170,000
15	6806	PAINT LINE	L.F.	$ 0.25	1715.0	1715.0		$ 429
16	6859	PLASTIC STOP LINE	L.F.	$ 20.00	0.0	0.0		$ -
17	6890	PERMANENT SIGNING	L.S.	$ 3,600.00	1.0	1.0		$ 3,600
18	6971	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	$ 54,105.00	1.0	1.0		$ 54,105
					Subtotal:	**$228,134**	**$0**	**$ 228,134**

Client Name: 0

SCJ Project No.: 23-000139

Estimate Level: Concept

Date: 6/13/2023

SCJ ALLIANCE
CONSULTING SERVICES

BID ITEM NO.	WSDOT STD ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	Schedule A Roadway	Schedule B WITH TREES	TOTAL
		OTHER ITEMS						
19	7006	STRUCTURE EXCAVATION CLASS B INCL. HAUL	C.Y.	$ 25.00	1290.0	1290.0		$ 32,250
20	7008	SHORING OR EXTRA EXCAVATION CLASS B	S.F.	$ 0.50	9950.0	9950.0		$ 4,975
21	7038	ROADWAY SURVEYING	L.S.	$ 24,000.00	1.0	1.0		$ 24,000
22	7055	CEMENT CONC. SIDEWALK	S.Y.	$ 120.00	1470.0	1470.0		$ 176,400
23	7058	CEMENT CONC. CURB RAMP TYPE - TBD	EACH	$ 3,300.00	20.0	20.0		$ 66,000
24	7480	ROADSIDE CLEANUP	EST.	$ 1.00	10000.0	10000.0		$ 10,000
25	7728	MINOR CHANGE	CALC	$ 1.00	10000.0	10000.0		$ 10,000
26	7736	SPCC PLAN	L.S.	$ 5,000.00	1.0	1.0		$ 5,000
					Subtotal:	**$328,625**	**$0**	**$ 328,625**

	Schedule A	Schedule B	TOTAL
Subtotal Construction:	**$1,212,796**	**$0**	**$ 1,212,796**
Contingency @ 30%	**$363,839**	**$0**	**$ 363,839**
TOTAL CONSTRUCTION:	**$1,576,635**	**$0**	**$ 1,576,635**

Project Name: Elementary School Crossing - East Omak Industrial Site Master Plan

Client Name: Confederated Tribes of the Colville Reservation

SCJ Project No.: 23-000139

Estimate Level: Concept

Date: 6/28/2023

SCJ ALLIANCE
CONSULTING SERVICES

BID ITEM NO.	WSDOT STD ITEM NO.	ITEM DESCRIPTION	UNIT	UNIT PRICE	TOTAL QUANTITY	Schedule A Roadway	Schedule B WITH TREES	TOTAL
		PREPARATION						
1	0001	MOBILIZATION	L.S.	$ 9,800.00	1.0	1.0		$ 9,800
2	0050	REMOVAL OF STRUCTURES AND OBSTRUCTIONS	L.S.	$ 5,000.00	1.0	1.0		$ 5,000
					Subtotal:	**$14,800**	**$0**	**$ 14,800**
		EROSION CONTROL AND ROADSIDE PLANTING						
3	6488	EROSION CONTROL AND WATER POLLUTION PREVENTION	L.S.	$ 5,000.00	1.0	1.0		$ 5,000
					Subtotal:	**$5,000**	**$0**	**$ 5,000**
		TRAFFIC						
4	6857	PLASTIC CROSSWALK LINE	S.F.	$ 15.00	256.0	256.0		$ 3,840
5	6971	PROJECT TEMPORARY TRAFFIC CONTROL	L.S.	$ 8,770.00	1.0	1.0		$ 8,770
6	NS-811	RRFB	L.S.	$ 50,000.00	1.0	1.0		$ 50,000
					Subtotal:	**$62,610**	**$0**	**$ 62,610**
		OTHER ITEMS						
7	7038	ROADWAY SURVEYING	L.S.	$ 10,000.00	1.0	1.0		$ 10,000
8	7480	ROADSIDE CLEANUP	EST.	$ 1.00	5000.0	5000.0		$ 5,000
9	7728	MINOR CHANGE	CALC	$ 1.00	10000.0	10000.0		$ 10,000
10	7736	SPCC PLAN	L.S.	$ 5,000.00	1.0	1.0		$ 5,000
					Subtotal:	**$30,000**	**$0**	**$ 30,000**

	Schedule A	Schedule B	TOTAL
Subtotal Construction:	**$112,410**	**$0**	**$ 112,410**
Contingency @ 30%	**$33,723**	**$0**	**$ 33,723**
TOTAL CONSTRUCTION:	**$146,133**	**$0**	**$ 146,133**

Project Name: East Omak Industrail Site Master Plan with Railroad Crossing
Client Name: Confederated Tribe of the Colville Reservation
SCJ Project No.: 23-000139
Estimate Level: Conceptual_Final

WISER RAIL ENGINEERING

Rail Construction Cost Estimate

BID ITEM NO.		DESCRIPTION	UNIT	UNIT PRICE	QUANTITY	TOTAL
1		CSCD Mainline Crossing, including engineering, flagging, construction observations	L.S.	$ 1,414,800.00	1	$ 1,414,800.00
2		CSCD Mainline No. 11 Turnout	L.S.	$ 200,000.00	1	$ 200,000.00
3			L.S.	$ 900,000.00	1	$ 900,000.00
4		Omak Industrial Facility Rail - Lead Track				$ -
5		- No. 9 Turnouts	EACH	$ 125,000.00	0	$ -
6		- Track	TF	$ 250.00	793	$ 198,250.00
7		- Road Crossing	TF	$ 2,320.00	90	$ 208,800.00
8		Omak Industrial Facility Rail - Intermodal Tracks				$ -
9		- No. 9 Turnouts	EACH	$ 125,000.00	1	$ 125,000.00
10		- Track	TF	$ 250.00	1713	$ 428,250.00
11		- Road Crossing	TF	$ 1,500.00	161.75	$ 242,625.00
12		- Earthen Bump Post	EACH	$ 2,500.00	2	$ 5,000.00
13		Omak Industrial Facility Rail - Industrial Tracks				$ -
14		- No. 9 Turnouts	EACH	$ 125,000.00	1	$ 125,000.00
15		- Track	TF	$ 250.00	1087	$ 271,750.00
16		- Road Crossing	TF	$ 1,500.00	171	$ 256,500.00
17		- Earthen Bump Post	EACH	$ 2,500.00	1	$ 2,500.00
18		Remove existing lead Turnout	L.S.	$ 7,500.00	1	$ 7,500.00
19		- Reconstruct Mainline Track	TF	$ 300.00	120	$ 36,000.00
20		Remove existing lead track	TF	$ 20.00	2100	$ 42,000.00
21						$ -
22		Misc. Utilities: connect perf pipe to drainage facility for each crossing	L.S.	$ 7,500.00	1	$ 7,500.00
29						$ -
				CONSTRUCTION COST		$ 4,471,475.00
				CONTINGENCY 30%		$ 1,341,442.50
				TOTAL CONSTRUCTION COST		$ 5,812,918.00

Appendix D
Water Supply Report

Water Supply Assessment

Confederated Tribes of the Colville Reservation
East Omak, Colville Reservation, Washington

Prepared For:
Confederated Tribes of the Colville Reservation

Prepared By:
SCJ Alliance
Jason Froelich, PE, Project Engineer
Scott Rivas, PE, Civil Manager
108 N Washington, Suite 300
Spokane, WA 99201
509.835.3770

June 2023

SCJ ALLIANCE
CONSULTING SERVICES

Water Supply Assessment

Project Information

Project:	East Omak Industrial Site
Prepared for:	Confederated Tribes of the Colville Reservation Agency Campus, 21 Colville Street Nespelem, WA 99155

Grant Program

Agency:	WA State Department of Commerce Office of Economic Development & Competitiveness 2001 6th Avenue Suite 2600. Seattle, WA 98121
Contact:	Kirk Esmond, Sustainable Business Development

Project Representative

Prepared by:	SCJ Alliance 108 N Washington, Suite 300 Spokane, WA 99201 509.835.3770 scjalliance.com
Contact:	Jason Froelich, PE, Project Engineer Scott Rivas, PE, Principal
Project Reference:	SCJ #23-000139

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1 Project Description and Understanding

SCJ Alliance (SCJ) was engaged by the Confederated Tribes of the Colville Reservation (CCT) to assess the existing water system infrastructure available to service the proposed 386-acre East Omak Industrial Site at full buildout. The vicinity of the site is equipped with water system infrastructure owned and operated by the CCT in varying states of service readiness. This includes a booster station to provide water to the existing Casino to the south and a now-defunct water system for the former wood products facility (destroyed by fire). A review of the Master Plan for Omak Business and Industrial Park (2011) was performed to serve as a basis for the Existing Water System Assessment (Section 3).

The City of Omak water system was assessed in addition to the CCT-owned water system, since a portion of the site exists within the City of Omak water system's service area (See Figure 2), making the city system available for use as a potential source for water service for the industrial site. City of Omak Public Works and Engineering staff were engaged by SCJ to help identify service constraints (Section 3.3 and determine available water capacity (Section 4) from the City system.

Two previous Master Plans were prepared for the approximately 60-acre portion of the East Omak Industrial Site situated between the former site of the Colville Indian Plywood and Veneer Plant (CIPV) and the north/south stretch of Highway 87 that runs east of the Tribal Trails gas station (see Figure 1). The 2011 Master Plan update was published in response to changes in the operating status of the CIPV and declines in the regional and national economies, the combination of which made the original 2004 Master Plan outdated. This report seeks to address more recent changes (such as the destruction of the wood products facility) to the site that have impacted the water supply system since the 2011 Master Plan was developed and highlight characteristics of the adjacent City of Omak water system which may impact or limit development at the proposed industrial site.

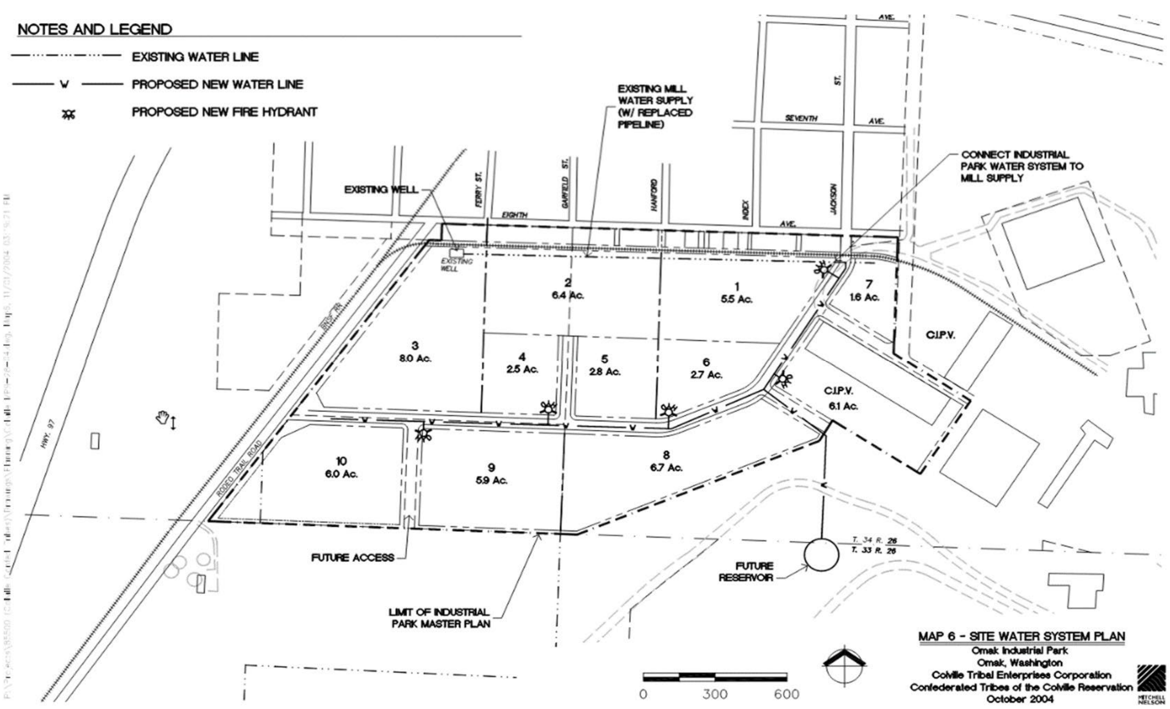


Figure 1. Proposed Site Water System Plan from Original 2004 Omak Industrial Park Master Plan

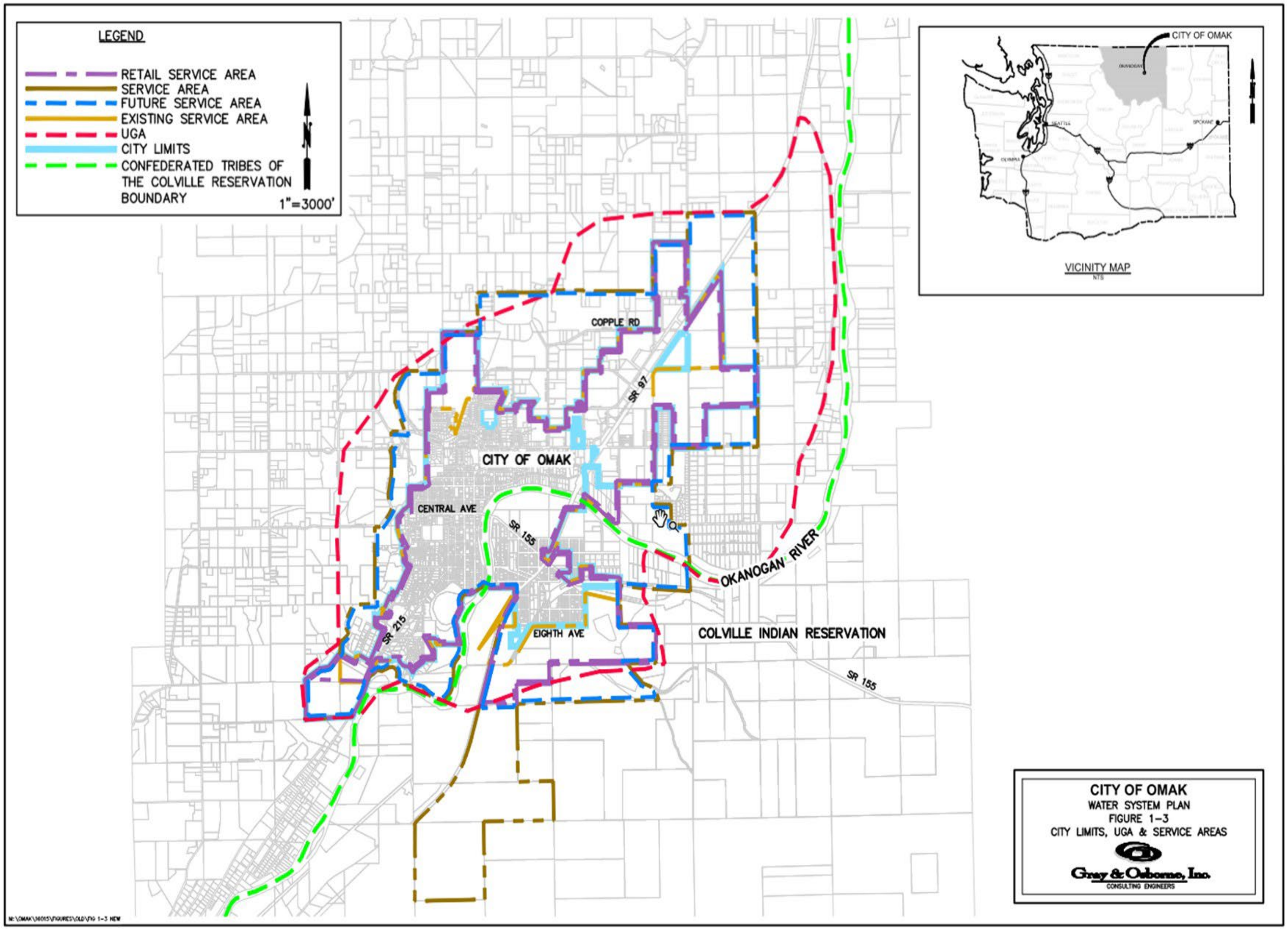


Figure 2. City of Omak Water System Plan – City Limits, UGA & Service Areas

1.1 Site Conditions

The 386-acre industrial site is located at the southeast corner of the intersection of Okanogan-Omak East Road and 8th Avenue, at the south end of the City of Omak. A pump house booster station owned and operated by the CCT exists 50 feet southeast of the intersection (see Figure 3). The booster station ties into the city system via a 12-inch main that runs from the booster station north and connects to the municipal system at an 8-inch main that runs along 8th Avenue. Currently, the booster station only serves the Colville Tribal Federation Corporation's owned and operated 12 Tribes Casino Hotel, which is located roughly 1.4 miles to the southwest (see Figure 4).

Approximately 80 feet southeast of the booster station is the City of Omak's OWP Well Number 2. The Well was originally constructed to serve the CIPV site via a 20-inch main that has since been put out of service after the closure of the CIPV. Currently, the well is owned by the CCT and operated under a lease by the City of Omak.

Figure 3. Proposed Industrial Site Existing Water Infrastructure

Also located on the industrial site directly north of the former CIPV site, the construction of a Head Start daycare center and health services clinic is underway. The new facilities are served with water via a new 12-inch main extension that tees off of the City's water system near a ductile iron chlorination gallery at the intersection of 8th Street and Edmonds Street, immediately west of the nearby railroad that runs parallel to Okanogan-Omak East Road. Construction is underway on at least one of these buildings, and this report assumes the 12-inch line will be installed (by the CCT's contractor) during 2023.

Figure 4. Omak Resort and Casino Location

2 Existing Water System Assessment

2.1 CCT System

2.1.1 Sources

Though the CCT possesses substantial water rights at the industrial site, no wells which are both active and independently CCT-owned exist at the site. During a recent site visit, evidence was found of a water system on the former CIPV site. The portions observed were in a vault and appeared not to be functioning. The existence of a well was corroborated by data on the DOE's Well Log Viewer. Further investigation should be made to determine the location of the wells and whether the well can be returned to a functioning state, and whether it is the well found on the DOE Well Log Viewer.

2.1.2 Booster Pumps

The CCT owns and operates a single booster station 50 feet southeast of the corner of the intersection of Okanogan-Omak East Road and Eighth Avenue. The booster station resides in a 21'-4" by 21' x 4" pump house building. The water from the municipal system is drawn up into the pump house via a 12-inch main connected to the city system (see Figure 5) as discussed in Section 3.1.1. Flow from the pipe splits at the entry to the pump house to serve the fire booster system (see Figure 6) described in Section 3.1.4 . The tee also serves a packaged pump system with three pumps arranged in parallel. It appears that the three pumps provide domestic water to the existing casino. Key specifications about the domestic pumping system are listed :

System Manufacturer	*Armstrong*
Booster Model	*25032 S*
Booster Connection Size	*4"*
Max Pressure	*200 PSI*
Booster Capacity	*300 GPM / 96 PSI*
Total Motor Power	*30 hp*
Installation Year	*2014*

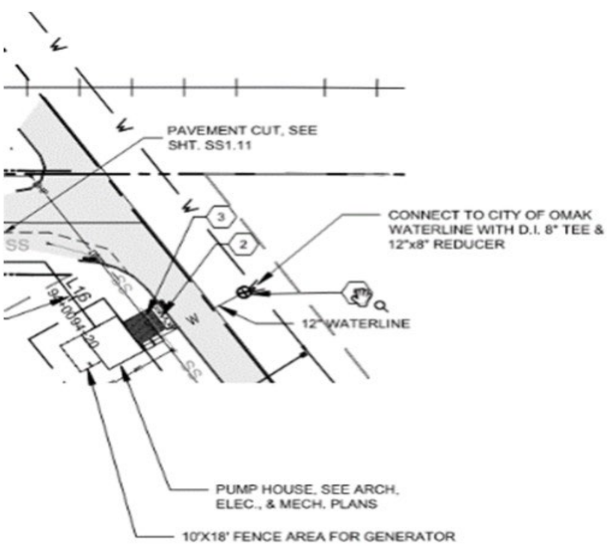


Figure 5. Booster Station point of connection (From sheet W1.8 of Omak Resort Plans, 9/8/2014)

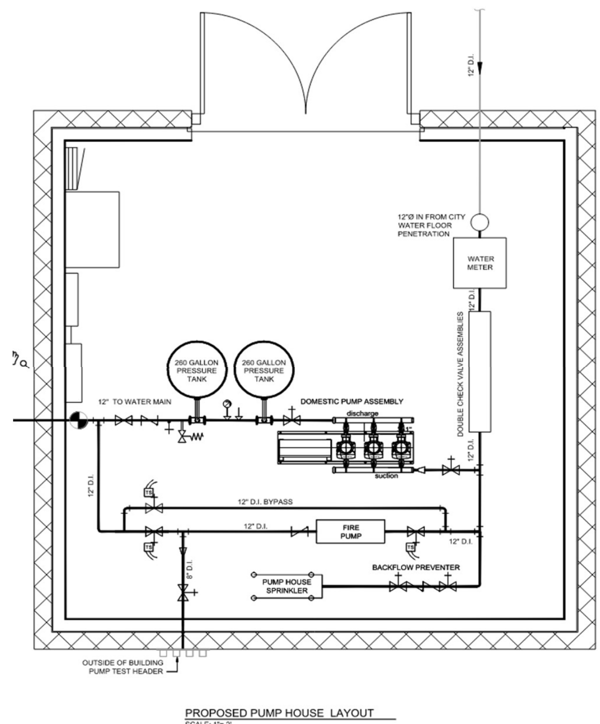


Figure 6. Proposed Pump House Layout (From sheet W1.11 of Omak Resort Plans, 9/8/2014)

2.1.3 Storage Facilities

No active storage facilities exist on the industrial site. A fire pond was constructed concurrently with the CPIV facility in 1994. The reservoir is located south of the former CIPV mill site and currently sits empty but can be investigated for potential future use. Whether distribution facilities from the pond to the former CIPV site still exist in working conditions is unknown.

2.1.4 Fire Booster

A fire pump system was installed concurrent with the rest of the booster station (see Sec on 3.1.2 above) as part of the construction of the Omak Resort. The system includes a large centrifugal pump and accompanying backflow prevention systems. The pump is served by 12-inch suction and discharge pipes. The system was constructed in parallel to a 12-inch DI bypass. See Figures 5 and 6 for system layouts. Key specifications about the fire suppression pump are also listed :

System Manufacturer	*Aurora*
Booster Model	*8-491-18A*
Booster Connection Size	*12"*
Max Pressure	*215 PSI*
Booster Capacity	*2500 GPM / 135 PSI*
Total Motor Power	*300 hp*
Installation Year	*2014*

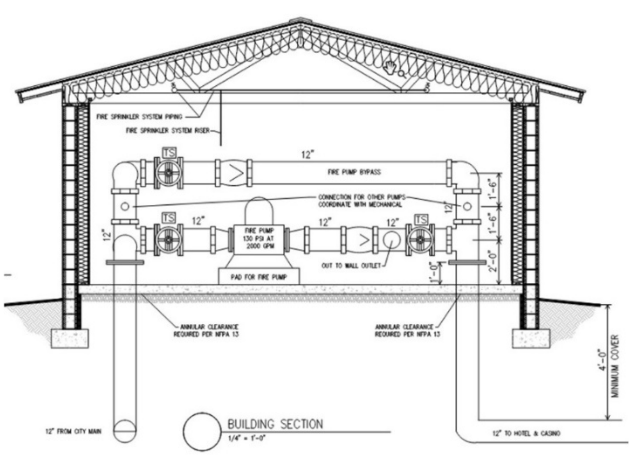


Figure 8. Fire Protection Building Section (From sheet FP1.0 of Omak Resort Plans, 9/8/2014)

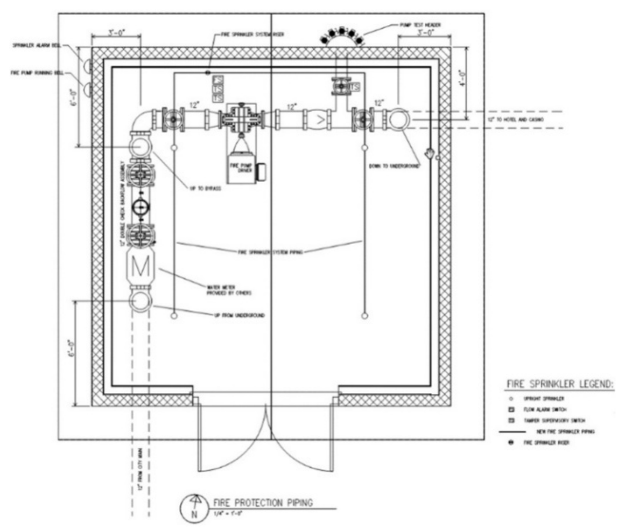


Figure 7. Fire Protection Piping Layout (From Sheet FP1.0 of Omak Resort Plans, 9/8/2014)

2.1.5 Pressures

The CCT booster station's suction end draws from the City of Omak Pressure Zone 1, which is known to operate at pressures that are inadequate by typical operating conventions. The standard minimum static pressure for a municipal system similar to the City of Omak's is 40 psi. However, a hydraulic capacity analysis cited in the 2018 City of Omak Water System Plan lists a static pressure at the corner of 7th Avenue and Jackson Street of 38 psi (See Section 3.2.5 for additional details about the City of Omak System). Fire flow tests at the booster station's point of connection with the city system conducted at the time the booster station was added indicate a static pressure of 50 psi with a residual pressure of 20 psi, which narrowly exceeds both the residual minimums. The booster station that serves the Omak Resort location was likely added to offset pressure loss from the increase in elevation as the water main runs south to the location of the Omak Resort. According to the construction documents for the infrastructure serving the Omak Resort Casino, the total elevation change from the booster station to the valve nearest the Casino is 115 feet. This equates to a pressure loss of approximately 50 psi.

As stated in Section 3.1.2, the booster station's capacity pressure is rated at 96 psi. This is understood to mean that the booster pump adds 96 psi to the pressure in the city water system, for a pressure on the downstream side of the pump station of over 130 psi. This is more than sufficient for most applications, and most applications require pressure reduction depending on the service application's elevation relative to the booster station.

2.1.6 Water Rights

Department of Ecology records indicate that the CCT has significant active water rights in the vicinity of the site. There are records for at least three CCT-owned wells on site. Two of the wells are located near the water main running from the City of Omak's system to the Omak Resort. These two wells are identified in the City of Omak's 2018 Water System Plan as OWP No. 2 Well and OWP No. 3 Well. OWP No. 2 Well is currently leased and operated by the City of Omak. DOE Records indicate CCT water rights with an instantaneous flow rate of 5,000 GPM and a volume of 8,065 ac-ft.

OWP No 3. Well is not in operation, but CCT and City representatives reported that it is used as a city shop and storage facility. The third well is located at the former CIPV site and is discussed in Section 2. Its status is unclear and further investigation should be done to determine whether it can be brought back to a functioning state. See Figure 9 for the locations of OWP Well No. 2 and OWP Well No. 3.

2.1.7 Distribution

There are few CCT-owned water distribution facilities near the site. On the west boundary of the project site, a 12-inch main runs along Okanogan-Omak East Road between the booster station and the Omak Resort.

2.1.8 Water Quality and Treatment Facilities

The CCT does not own or operate any treatment facilities at the project site. Water quality testing in the vicinity of the industrial site is known to have elevated readings for measures of hardness. Refer to Section 3.2.14 for information about the City of Omak's water system water quality.

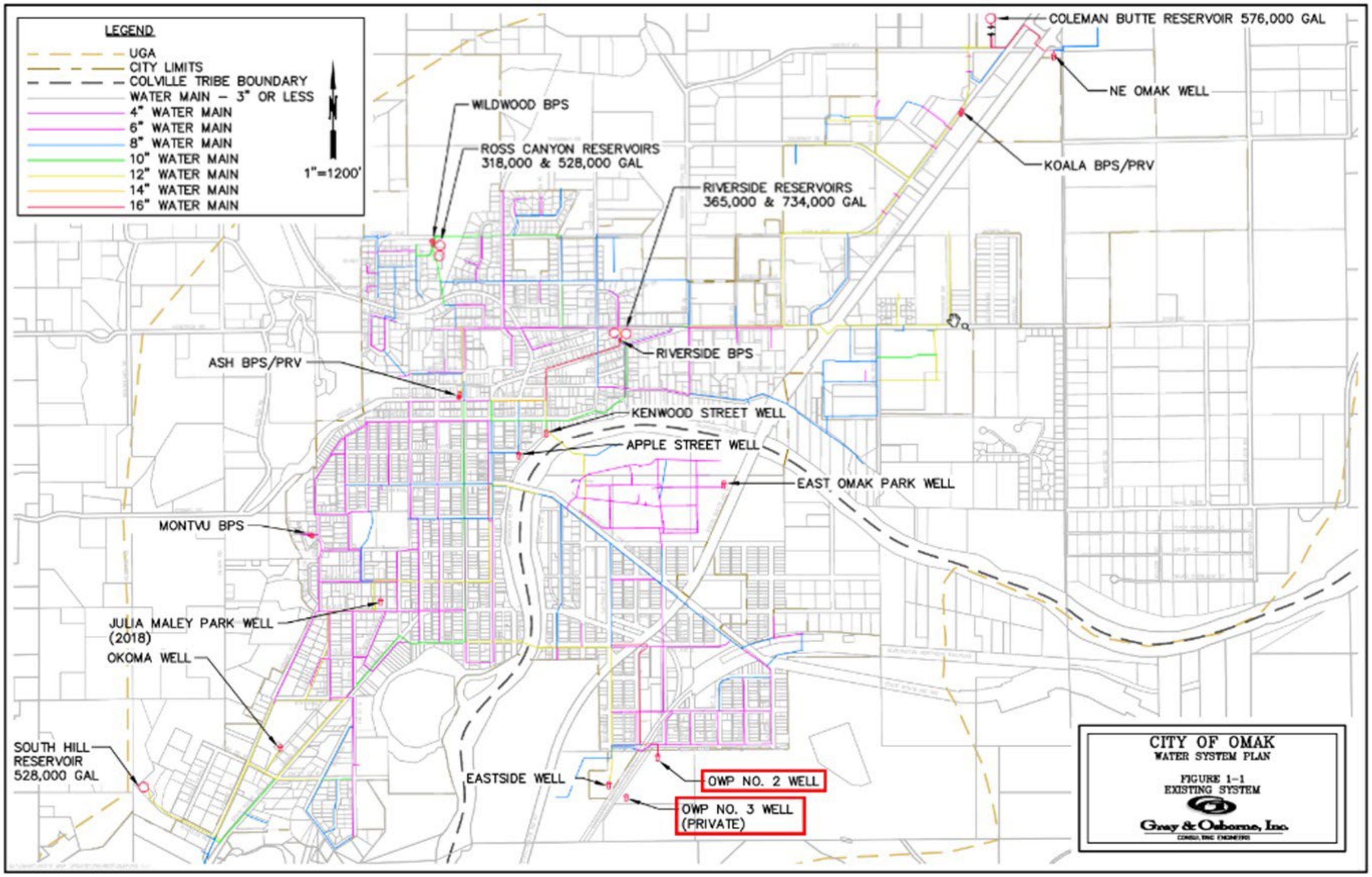


Figure 9. City of Omak's Existing Water System

2.2 City of Omak System

2.2.1 Sources

The 2018 City of Omak Water System Plan summarizes the City's water source facilities in Figure 10. There are eight water sources drawn by the City of Omak, one of which is located on the East Omak Industrial Site. OWP No. 2 is the well leased to the city by the CCT. The well is 69ft in depth and rated at a flow of 2,200 gallons per minute (gpm) although the actual rate is less at 1,750gpm. The gallon-per-minute rate impacts fire flow and hydrant requirements.

Existing Water System - Sources

Parameter	Eastside	Apple	Kenwood	Okoma	Park	OWP No. 2	NE Omak	Julia Maley
DOH Source Well Tag No.	SO1 AGJ179	SO2 N/A	SO3 N/A	SO4 ABR843	SO6 AGJ178	SO7 AAR993	SO8 AEC887	TBD BIF542
DOH status/ usage	Active Permanent	Active Emergency /out of service	Active Emergency	Active Emergency	Inactive Irrigation-use only	Active Permanent	Active Permanent	TBD
Year drilled	1958	1958	1931	1988-1989	1968	1978	2001	2016
Ground surface	850 ft. msl	844 ft. msl	843 ft. msl	836 ft. msl	848 ft. msl	861 ft. msl	1048 ft. msl	842 ft. msl
Well depth	30 ft.	30 ft.	20 ft.	90 ft.	28 ft.	69 ft.	295 ft.	400 ft.
SWL	28.5 ft. bgs	10 ft. bgs	16.5 ft. bgs	9 ft. bgs	14 ft. bgs	36.1 ft. bgs	203 ft. bgs	7 ft. bgs
Well Casing	14' dia. (dug well)	11' dia. (dug well)	11'-14' dia. (dug well)	16" WCS (0-90' bgs.)	48" (0-28' bgs)	24" WCS (0-44' bgs)	12" WCS (0-295' bgs)	16" WCS (0-380' bgs)
Well screen	N/A	N/A	N/A	16" SS 40-slot (53-88' bgs)	Perforated casing 12" OC each way 1" dia. (15-28' bgs)	22" SS 150/250-slot (44-60' bgs) 18" SS 65-slot (47-69' bgs)	12" SS 35-slot (268-282' bgs)	16" SS tel. 5-slot (375'-380' bgs) 16" SS tel. 80-slot (380-400' bgs)
Gravel pack	N/A	N/A	N/A	10x20 (43-90' bgs)	Natural formation	Natural/6x9 (37-69' bgs)	10x20 (200-295' bgs)	Natural formation
Pump type	VT	VT	VT	VT	VT	VT	S	VT
Pump manuf./model	2-Peerless 2-Fairbanks Morse	Sterling	Fairbanks Morse	Peerless 10LB 5 stage, 1760 rpm	N/A	Peerless 12HXH 6 stage, 1770 rpm	Goulds CLC1564C	Hydroflo 11MDL 8 stage
Pump motor	30/50/50/75 hp	US Motors 40 hp	40 hp	US Motors 40 hp	40 hp	US Motors 150 hp	20 hp	150 HP
Rated/ Actual Flow	600/800/700/ 1550 gpm	300 gpm	350 gpm	500 gpm 300 gpm	300 gpm	2200 gpm 1750 gpm	120 gpm 105 gpm	800 gpm
Rated Head	130 ft.	150 ft.	150 ft.	150 ft.	205 ft.	210 ft.	400 ft.	480

1-6 *City of Omak*
January 2018 *Water System Plan*

Figure 10. City of Omak Existing Water System Sources

2.2.2 Booster Pumps

The 2018 City of Omak Water System Plan summarizes the City's booster pump station facilities in Figure 11. There are four booster stations providing pressure zones in the middle and upper portions of the city. The stations do not provide an improved pressure zone in East Omak.

Existing Water System – Booster Pumping Stations

Parameter	Ash Street Booster Station	Koala Booster Station	Riverside Booster Station	Wildwood Booster Station
Pressure zone	Middle	Upper	Middle	Closed-zone
Year installed	1972	2000	2008	1996
Pump	Byron Jackson	Peerless	Paco	N/A
Rated capacity, gpm	670/670/670	700	1,500	175/175/400/400
TDH, ft	235	150	180	150
Motor horsepower, hp	60/60/60	25	78	10/10/20/20

Figure 11. City of Omak Booster Pumping Stations

2.2.3 Storage Facilities

There are six water storage facilities in the City of Omak's water system. They provide water reservoirs that primarily service Omak across the river and not East Omak. Altogether, the city has about 3 million gallons of water storage. In the past, the lack of water reservoirs servicing East Omak was apparent during wildfire years in 2015 and 2016 that burnt down the CCT's lumber mill and some homes in the surrounding neighborhood.

Existing Water System – Storage

Parameter	Riverside No. 1	Riverside No. 2	South Hill	Ross Canyon No. 1	Ross Canyon No. 2	Coleman Butte
Pressure zone	Lower	Lower	Lower	Middle	Middle	Upper
Type of construction	Concrete	Concrete	Concrete	Concrete	Concrete	Steel
Nominal storage capacity, gal	365,000	734,000	528,000	318,000	528,000	576,000
Diameter, ft	N/A	79	67	52	67	70
Height, ft	15	20	20	20	20	20
Base elevation, ft msl	954	949	949	1,100	1,100	1,185
Overflow elev., ft msl	969	969	969	1,120	1,120	1,205

Figure 12. City of Omak Existing Water System Storage

Storage Volume Components by Pressure Zone[1]

Year	Operational Storage[2] (gal)	Equalization Storage[3] (gal)	Standby Storage 1[4] (gal)	Standby Storage 2[4] (gal)	Fire Suppression Storage[5] (gal)	Total Required Storage[6] (gal)	Total Available Storage[7] (gal)	Surplus (Deficit) (gal)
Lower Pressure Zone								
2016	175,000	0	0	318,000	1,320,000	1,495,000	1,495,000	0
2027	175,000	0	0	332,000	1,320,000	1,495,000	1,495,000	0
2037	175,000	0	0	345,000	1,320,000	1,495,000	1,495,000	0
Middle Pressure Zone								
2016	85,000	0	195,000	251,000	960,000	1,045,000	761,000	(284,000)
2027	85,000	0	248,000	262,000	960,000	1,045,000	761,000	(284,000)
2037	85,000	0	296,000	272,000	960,000	1,045,000	761,000	(284,000)
Upper Pressure Zone								
2016	58,000	0	0	26,000	120,000	178,000	519,000	341,000
2027	58,000	0	0	27,000	120,000	178,000	519,000	341,000
2037	58,000	0	0	28,000	120,000	178,000	519,000	341,000

Figure 13. City of Omak Storage Volume Components by Pressure Zone

In addition to these facilities, CCT representatives expressed a desire to add a reservoir south of the industrial facility. The justification for the additional reservoir is to augment the booster station's ability to provide adequate fire suppression in Pressure Zone 1. See Figure 14 for pressure zone locations.

2.2.4 Fire Suppression, Distribution, and Pressures (Adjacent Systems Only)

As noted above, the north end of the industrial site is fronted by 8th Street and is also located near a main that runs north-south within Jackson Street. Hydrants are located along both streets and field fire flow tests have shown that hydrant flow is insufficient even for residential fire suppression minimums (generally about 1000 gpm), at just 750 gpm. The construction of the 12-inch main running to the new head start building will likely improve the situation, but how much will not be able to be quantified until after construction is complete or modeling is performed.

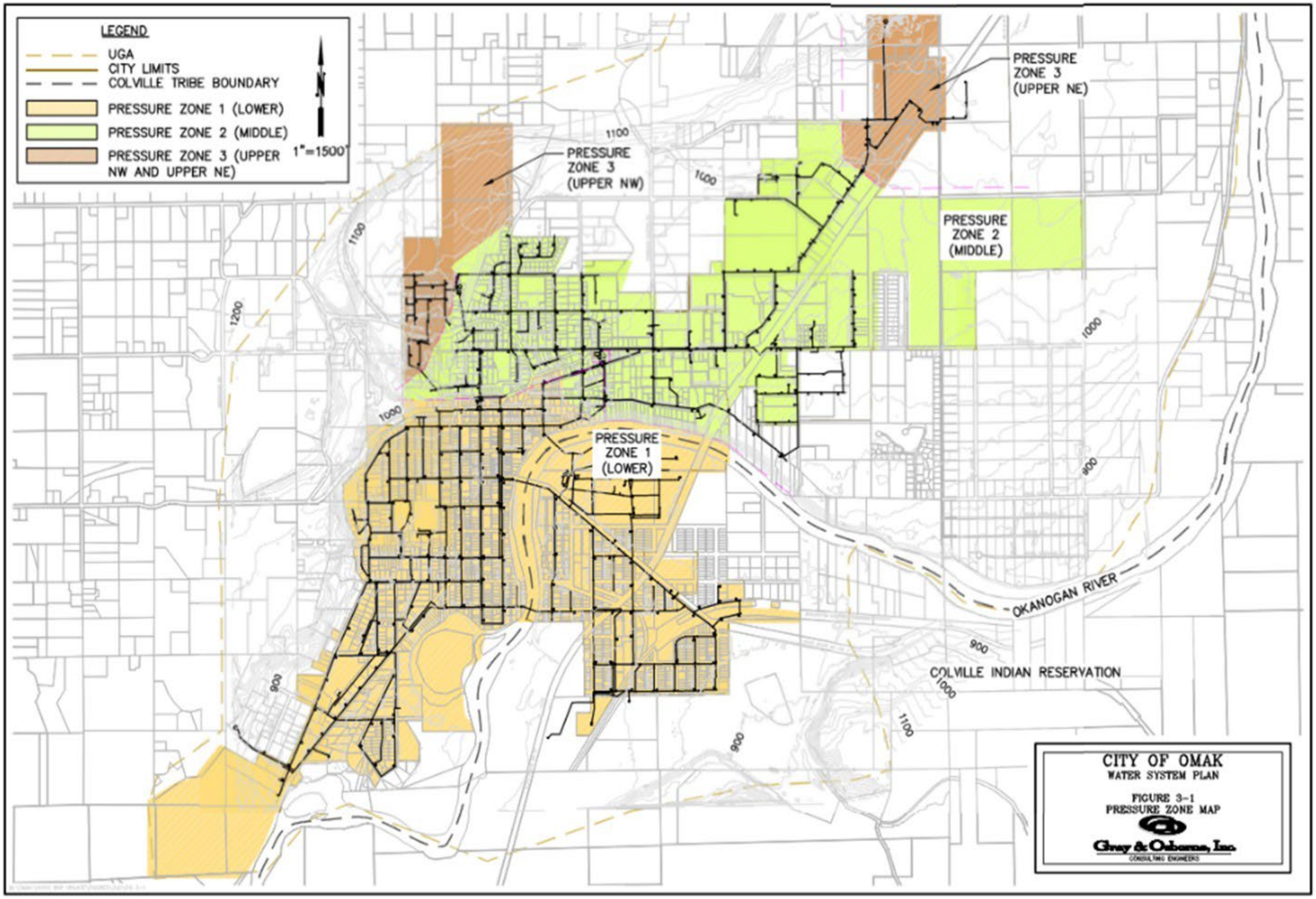


Figure 14. City of Omak Existing Water System Pressure Zones

2.2.5 Water Rights

The 2018 City of Omak Water System Plan summarizes the City's current water rights in Figure 15 . Source OWP#2/S07 is leased from the CCT.

Water Rights Self-Assessment

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary/ Alternate	Existing Water Rights		Existing Water Use From Source		Current Water Right Status (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi, gpm)	Maximum Annual Volume (Qa, ac-ft)	Maximum Instantaneous Flow Rate (Qi, gpm)	Maximum Annual Volume (Qa, ac-ft)	Maximum Instantaneous Flow Rate (Qi, gpm)	Maximum Annual Volume (Qa, ac-ft)
CG4-GWC445-D@1 (1)	Omak	12/1913	Kenwood/S03	Primary	500	600	0	0	+ 500	+ 600
CG4-GWC446-D@3 (2)	Omak	3/1936	Apple/S02	Primary	800	96	0	0	+ 800	+ 96
CG4-GWC1082-D@1 (3, 4)	Omak	5/1944	Eastside/S01	Primary	1,630	1,430	250	115	+ 1,380	+ 1,315
CG4-GWC3655-A@1 (5)	Omak	3/20/1958	Eastside/S01	Primary & Alt.	1,300	2,080 (6)	1,300	640	+ 0	+ 1,440
CG$-GWC3656-A@1 (2)	Omak	3/20/1958	Apple/S02	Primary & Alt.	375	600 (7)	0	0	+ 375	+ 600
CG4-GWC7332-A@1 (8)	Omak	7/19/1971	Okoma/S04	Primary & Alt.	600	560 (9)	0	0	+ 600	+ 560
G4-31525P (10)	Omak	11/23/1992	OWP #2/S07	Primary & Alt.	5,000	3,500	1,750	800	+ 3,250	+ 2,700
CG4-GWC 446-D@1 (11)	Omak	Dec-'00	NE Omak/S08 (11)	Alternate	500	96	105	5	+ 395	+ 91
TOTAL DOMESTIC RIGHTS					**10,205 (12)**	**3,500 (12)**	**3,405**	**1,560**	**+ 6,800**	**+ 1,940**
Other City of Omak Water Rights										
6412-A (13)	Omak	3/28/1968	Cemetery	Primary	70	24	70	23.6	+ 0	+ 0.4
6530-A (14)	Omak	3/1968	E. Omak	Primary	400	185	300	0	+ 100	+ 185
G4-28244P	Omak	6/1983	E. Omak	Alternate	500	278	0	0	+ 500	+ 278
G4-81058JWRIS	Omak	10/9/1959	Airport	Primary	10	3	6	0.5	+ 4	+ 2.5

Figure 15. City of Omak Active Water Rights

2.2.6 Water Quality and Treatment Facilities

The EPA sets drinking water regulations and contaminants thresholds that apply to public water systems. Over the years the WA State Department of Health's Office of Drinking Water has reported the following contamination exceedances above the national standard for the City of Omak water system:

Exceedance	Frequency
Arsenic	8 exceedances were recorded between 2011 and 2019
Conductivity	7 exceedances were recorded between 1989 and 2003
E. Coli	1 exceedance recorded in 1999
Iron	4 exceedances were recorded between 1999 and 2022
Manganese	1 exceedance recorded in 2003
Total Coliform	7 exceedances were recorded between 1998 and 2011

Figure 16. Department of Health Drinking Water Report

The city provides chlorination for each of the active sources connected to the City System. In addition, the Julia Maley Well is currently undergoing upgrades to allow for the treatment of excess arsenic and iron.

2.3 Deficiencies Summary

2.3.1 Lower Zone Pressure and Fire Flow

As discussed in Section 3.1.12, insufficient fire flow and lack of pressure in Pressure Zone 1 are problems for the areas near the proposed industrial site.

- Expanding a system that does not currently meet common fire flow standards will only exacerbate the existing issues. Bringing the system into compliance and making sure the system has the capacity for additional facilities will help assure future investors that their assets will be adequately protected.

2.3.2 Booster Station Maintenance Issues

CCT representatives indicated the following equipment issues at the booster station pump house building walkthrough:

- Domestic Pump #1 was not operational at the time of the walkthrough. CCT representatives had not identified the issue at the time of the discussion, but the pump had been out of service for an unknown period.
- Domestic Pump #3 was making a noise that indicated it required repair. No mechanical investigation had been performed on the pump at the time of the walkthrough, and the representative did not know of any deterioration in the pump's performance.

CCT representatives also reported that it is currently difficult to find contractors to work on the existing fire suppression system because it is not up to code. Bringing the fire suppression system up to code to ensure that the systems are properly maintained.

2.3.3 Water Hardness

The City of Omak's City Water operator indicated that water quality testing in the vicinity of the industrial site is known to have elevated hardness readings. Remediating elevated hardness in water intended to serve the industrial site may be important for some industrial processes and can be installed by the tenant at their site if needed. Backwash from any water softening or similar systems should not be discharged to the sanitary sewer system unless the sanitary sewer system (including treatment and disposal) is designed accordingly. Onsite infiltration (by tenant) of backwash water may be an option.

2.3.4 Lack of Sources

Though water rights exist at the site, the CCT does not own and operate any sources that are independent of the City of Omak. Though CCT does have substantial water rights at the project site, its sole active well (OWP No. 2 Well) is leased to the City of Omak.

2.3.5 City of Omak's Known Deficiencies

The 2018 City of Omak Water System Plan summarizes the City's current water rights in the following table:

Summary of System Deficiencies and Proposed Improvements

SYSTEM DEFICIENCY	PROPOSED IMPROVEMENT	SCHEDULE
Water Rights		
The City has sufficient instantaneous and annual withdrawal water rights to meet its 10- and 20-year demands.	The City plans file change applications to consolidate its existing water rights to give the City greater flexibility in managing its water resources.	10-year
Source Protection		
The City is in compliance with source protection, i.e., wellhead protection requirements, except for protective covenants for each of the City's wells.	Pursue protective covenants for the City's wells.	10-year
Telemetry		
There are no deficiencies with the City's telemetry system, which was updated in 2016.	N/A	N/A
Source Improvements		
To increase source reliability the City plans to develop an additional source.	Drill a new well.	10-year
No backup power for the City's sources except for the Julia Maley Park Well (2017).	Provide all active wells with automatic transfer switches for hook up to trailer-mounted generator to be purchased in 2017.	
Eastside Well pump failure.	Rebuild pump no. 4.	
The Okoma well is currently out of service due to diminished well capacity.	Provide downhole video inspection to investigate possible rehabilitation. Rehabilitate well in accordance with report recommendations.	10- and 20-year
Treatment		
Arsenic levels in Julia Maley Park Well may exceed mcl.	Feasibility study to investigate alternatives for arsenic treatment at the Julia Maley Park well if arsenic levels exceed the MCL.	10-year
	Construct arsenic treatment facility in accordance with feasibility study recommendations, if required.	

Figure 17. City of Omak Existing Deficiencies and Proposed Improvements

Summary of System Deficiencies and Proposed Improvements

SYSTEM DEFICIENCY	PROPOSED IMPROVEMENT	SCHEDULE
Storage		
Ross Canyon reservoirs weeping water.	Investigate cause and provide appropriate corrective action.	10-year
Water puddles on rectangular Riverside reservoir roof.	City to investigate whether the roof leaks and develop an action plan to address.	
South Hill reservoir altitude valve non-operational.	Altitude valve repair.	10-year
Distribution System		
Lack of water line and hydrants required for fire flow on Columbia Street.	Construct new 12" water line and hydrants on Omak Ave. to Columbia and South on Columbia to 5th Ave.	10-year
Garfield Street water line not looped and lacks sufficient hydrants.	Construct new 8" water line and hydrants on Garfield Street between Omak Ave. and 5th Ave.	
Riverside Reservoir transmission line valves leaking/non-operational.	Replace valves.	
Ash Street booster pump station pump failure and problematic pressure reducing valve.	Upgrade booster pump station with new pumps with VFD drive, valves, piping, and appurtenances.	
Old water lines in numerous locations throughout the City with significant repair history.	Replace problematic water lines identified by the City.	
Insufficient fire flow and undersized water lines in numerous locations.	Upsize water lines and provide system looping in locations of insufficient fire flow.	10- and 20-year
Operations and Maintenance		
Ash, Birch, and Cedar Streets water mains lack isolation valves between Central and 3rd Ave.	Install InsertaValves.	10-year
City unable to read residential meters during winter.	Replace standard residential meters with radio-read.	

Figure 18. City of Omak Existing Deficiencies and Proposed Improvements (Continued)

The deficiencies identified in the City of Omak's City Water plan have varying levels of impact on the proposed industrial site. The deficiencies that appear to have the greatest level of impact are described :

- **Well Backup Power –** Some of the potential industrial site uses require round-the-clock water consumption. Ensuring the source locations are active during power outages is attractive to potential users.
- **South Hill Reservoir Operation –** The South Hill Reservoir serves Pressure Zone 1 of the City's water system, which is the portion of the water system that lies adjacent to the proposed industrial site. Ensuring the South Hill Reservoir is fully operational to provide consistent water service.
- **Insufficient Fire Flow and Undersized Water Lines –** See Section 3.2.1.

3 Service Capacity Estimate

3.1 Future Land Uses

As part of the East Omak Industrial Site Readiness Report, Leland Consulting Group (LCG) prepared a Market Analysis and Industry Study for full the 386-acre mixed-use site. This water supply assessment focuses on the following uses, which were singled out by CCT representatives as the uses which are most likely to be targeted for development soon:

- Intermodal Facilities / Transloading Terminal – Approximately 6 to 10 acres of transloading from rail to truck. See page 66 of LCG's Site Readiness Report.
- Craft Industrial – Approximately 1 acre of craft industrial space, commonly referred to as "makerspace". See page 44 of LCG's Site Readiness Report.
- Prefabricated Housing – A 4 to 7-acre production facility to produce prefabricated housing. See page 68 of LCG's site readiness report.
- Rail-Using Industry – 1.5 to 5 acres of industrial facilities adjacent to rail. See page 62 of LCG's site readiness report.
- Warehousing – 5 to 20 acres of warehousing for flexible use lease space. See page 67 of LCG's readiness report.
- Retail – 5 acres of retail adjacent to the industrial site West of Okanogan-Omak East Road.
- Flex light-industrial – 1.5+ acres of multiple-tenant facilities not requiring rail access – See page 61 of LCG's site readiness report.

Figure 19. Preferred Land Uses

3.2 Water Demand Calculations

The LCG Market Analysis and Industry Study was used as a basis to produce anticipated water demand figures for each industrial use under consideration.

- The LCG Market Analysis and Industry Study included estimated employment figures for each industrial use. The estimated employee figure for each industrial use was used in conjunction with Table 23.10 of the Water Resources Handbook by Larry W. Mays to estimate total domestic water demand.
- The LCG Market Analysis and Industry Study included estimates of Gross Rentable Area (GRA) for each industrial use. The GRA figures provided by LCG were then further broken down to estimate the largest anticipated floor area for a single building for each industrial use. These figures are used to calculate the fire flow requirement for each use.
- The calculations resulting from the above assumptions are presented in Figure 20. These calculations assume no reduction in fire flow from the use of a sprinkler fire suppression system. The proposed buildings will likely trigger the use of sprinkler fire suppression. However, since the land is in "Tribal Trust" it is possible that the CCT may waive that requirement, therefore no reduction was used. It is recommended that the CCT comply with current building and fire codes at the time of development. The use of fire suppression sprinklers and proper fire hydrant coverage reduces the fire flow requirement by as much as 75%.
- The building types shown in Figure 20 are assumed values based on a typical fire resistance rating for a building of that use.

Use	Estimated Building Size (sq. ft.)(1)	Estimated Employees(2) (ea)	Consumption per Employee(3) (Gal/Emp*d)	Daily Consumption(4) (gpd)	Annual Consumption(5) (gallons)	Annual Consumption(6) (ac-ft)	Q_{peak}(7) (gph)	FS * Q_{peak} hour(8) (gph)	Q_{peak}(9) (gpm)	Assumed Building Type(10)	Fire Flow(11) (gpm)	Fire Flow Duration(12) (hr)	Total Fire Flow Requirement(13) (gal)
Intermodal Facilities	25,000	26	85	2,210	806,650	2.48	184	645	11	IIA	2,500	2	300,000
Craft Industrial	35,000	49	164	8,036	2,933,140	9.00	1,005	3,516	59	IIB	4,000	4	960,000
Prefabricated Housing	122,000	26	49	1,274	465,010	1.43	159	557	9	IIA	5,000	4	1,200,000
Rail-Using Industry	40,000	35	85	2,975	1,085,875	3.33	372	1,302	22	IIA	3,000	3	540,000
Warehousing	100,000	33	85	2,805	1,023,825	3.14	351	1,227	20	IIA	4,500	4	1,080,000
Retail	25,000	27	93	2,511	916,515	2.81	314	1,099	18	IIB	3,250	3	585,000
Flex Light Industrial	25,000	78	36	2,808	1,024,920	3.15	351	1,229	20	IIB	3,250	3	585,000
			Max	**8,036**	**2,933,140**	**9**					**5,000**	**4**	**1,200,000**
			Total	**22,619**	**8,255,935**	**25**	**2,735**	**9,574**	**160**				

Figure 20. Anticipated Water Demand Calculations Summary

(1) Estimated largest single building square footage for each use-case from LCG Market Analysis.
(2) Estimated quantity of employees per use-case from LCG Market Analysis.
(3) From 2023 Water Resources Handbook, Table 23.1.
(4) Product of consumption per employee (Column 4) by estimated employees (Column 2).
(5) Product of Daily Consumption (Column 5) by 365 days.
(6) Converted from gallon figure in (Column 6)
(7) All peak flow rates assume daily consumption are spread across an 8-hour shift except intermodal facilities, which assumes a 12-hour shift.
(8) Conservative factor of safety (FS) of 3.5 applied to account for uncertainty about variation in consumption rate across time.
(9) Converted from Q_{peak} figure (Column 7).
(10) Fire-resistance rating from Table 601 of 2018 IBC.
(11) Required fire flow duration from IFC Table B105.1(2).
(12) Total fire flow volume requirement based on product of required fire flow (Column 12) and fire flow duration (Column 13).

3.3 CCT Systems

For the buildout proposed by LCG's Market Analysis and Industry Study, the following key demand figures were used to assess system readiness for both the CCT-owned water supply facilities and the City of Omak municipal water system:

- A total annual domestic consumption of **25 ac-ft**.
- A peak flow rate (**Q_{peak}**) of **160 gpm**.
- A total fire flow requirement of **1,200,000 gallons** (5,000 gpm over 4 hours).

The 160-gpm peak demand should be considered a low number for several reasons. First, the CCT selected potential uses that required less water. If potential developers/tenants propose a facility with a different type of use, higher peak demand may be necessary to allow the development. Instead of turning away a potential tenant due to a lack of water for peak demand, adding extra capacity initially allows more flexibility. Second, the water use calculation assumes little to no irrigation. Since this is an industrial site, it is anticipated that the need for irrigated landscapes will be very small. Third, the 160 gpm does not account for the development of the full 386 acres. Adding extra capacity now will allow for future development within the 386 acres. Therefore, it is recommended that the water system be designed with a value closer to 500 gpm. For capacity calculations, this report uses 160 gpm.

3.3.1 Domestic Water Supply Capacity

Domestic Water Supply Capacity

Flow

The existing CCT booster station was likely sized to meet the demands of the Casino, and additional added facilities for the proposed project require that the domestic pumps (and potentially fire pumps) be upsized.

Pressure

The existing CCT booster station appears to be designed to provide a static pressure that is high enough to accommodate the elevated position of the *12 Tribes Casino* relative to where the pressure zone of the casino draws water. The booster station appears to provide a 96-psi increase over the City's static pressure in the lower zone. Any new development connected to this pressure zone requires installing pressure-reducing valves to avoid damage to newly installed fittings since most are designed to operate 80 psi.

Storage

Operating Storage

Equalizing Storage

The CCT water system has no independent storage capacity. See Section 4.3.2 discussion on the City of Omak water system's Operating Storage capacity.

Water Rights

Specifications for the CCT's water rights are included in the 2021 City of Omak Water System Plan Amendment, which summarizes the City's current water rights in Figures 18 and 19 .

TABLE 3-4a
Water Rights Self Assessment (2021)

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary/ Alternate	Existing Water Rights: Maximum Instantaneous Flow Rate (Qi, gpm)	Existing Water Rights: Maximum Annual Volume (Qa, ac-ft)	Existing Water Use From Source: Maximum Instantaneous Flow Rate (Qi, gpm)	Existing Water Use From Source: Maximum Annual Volume (Qa, ac-ft)	Current Water Right Status (Excess/Deficiency): Maximum Instantaneous Flow Rate (Qi, gpm)	Current Water Right Status (Excess/Deficiency): Maximum Annual Volume (Qa, ac-ft)
CG4-GWC445-D@1 (1)	Omak	12/1913	Kenwood/S03	Primary	500	600	0	0	+ 500	+ 600
CG4-GWC446-D@3 (2)	Omak	3/1936	Apple/S02	Primary	800	96	0	0	+ 800	+ 96
CG4-GWC1082-D@1 (3, 4)	Omak	5/1944	Eastside/S01	Primary	1,630	1,430	1,255	135	+ 375	+ 1,295
CG4-GWC3655-A@1 (5)	Omak	3/20/1958	Eastside/S01	Primary & Alt.	1,300	2,080 (6)	1,300	640	+ 0	+ 1,440
CG$-GWC3656-A@1 (2)	Omak	3/20/1958	Apple/S02	Primary & Alt.	375	600 (7)	0	0	+ 375	+ 600
CG4-GWC7332-A@1 (8)	Omak	7/19/1971	Okoma/S04	Primary & Alt.	600	560 (9)	0	0	+ 600	+ 560
G4-31525P (10)	Omak	11/23/1992	OWP #2/S07	Primary & Alt.	5,000	3,500	1,750	800	+ 3,250	+ 2,700
CG4-GWC 446-D@1 (11)	Omak	Dec-'00	NE Omak/S08 (11)	Alternate	500	96	105	5	+ 395	+ 91
TOTAL DOMESTIC RIGHTS					**10,205 (12)**	**3,500 (12)**	**4,410**	**1,580**	**+ 5,795**	**+ 1,920**
Other City of Omak Water Rights										
6412-A (13)	Omak	3/28/1968	Cemetery	Primary	70	24	70	23.6	+ 0	+ 0.4
6530-A (14)	Omak	3/1968	E. Omak Pk./S06	Primary	400	185	300	0	+ 100	+ 185
G4-28244P	Omak	6/1983	E. Omak Pk./S06	Alternate	500	278	0	0	+ 500	+ 278
G4-81058JWRIS	Omak	10/9/1959	Airport	Primary	10	3	6	0.5	+ 4	+ 2.5

Figure 21. City of Omak Water Rights Self-Assessment (2021)

The 2037 City of Omak Water System Plan Amendment summarizes the City's current water rights in the following table:

Water Rights Self Assessment (2037)

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary/ Alternate	Existing Water Rights: Maximum Instantaneous Flow Rate (Qi, gpm)	Existing Water Rights: Maximum Annual Volume (Qa, ac-ft)	Forecasted Water Use From Sources (20-Year Demand): Maximum Instantaneous Flow Rate (Qi, gpm)	Forecasted Water Use From Sources (20-Year Demand): Maximum Annual Volume (Qa, ac-ft)	Forecasted Water Right Status (Excess/Deficiency): Maximum Instantaneous Flow Rate (Qi, gpm)	Forecasted Water Right Status (Excess/Deficiency): Maximum Annual Volume (Qa, ac-ft)
CG4-GWC445-D@1 (1)	Omak	12/1913	Kenwood/S03	Primary	500	600	0	0	+ 500	+ 600
CG4-GWC446-D@3 (2)	Omak	3/1936	Apple/S02	Primary	800	96	0	0	+ 800	+ 96
CG4-GWC1082-D@1 (3, 4)	Omak	5/1944	Eastside/S01	Primary	1,630	1,430	1,602	255	+ 28	+ 1,175
CG4-GWC3655-A@1 (5)	Omak	3/20/1958	Eastside/S01	Primary & Alt.	1,300	2,080 (6)	1,300	640	+ 0	+ 1,440
CG$-GWC3656-A@1 (2)	Omak	3/20/1958	Apple/S02	Primary & Alt.	375	600 (7)	0	0	+ 375	+ 600
CG4-GWC7332-A@1 (8)	Omak	7/19/1971	Okoma/S04	Primary & Alt.	600	560 (9)	0	0	+ 600	+ 560
G4-31525P (10)	Omak	11/23/1992	OWP #2/S07	Primary & Alt.	5,000	3,500	1,750	800	+ 3,250	+ 2,700
CG4-GWC 446-D@1 (11)	Omak	Dec-'00	NE Omak/S08 (11)	Alternate	500	96	105	5	+ 395	+ 91
TOTAL DOMESTIC RIGHTS					**10,205 (12)**	**3,500 (12)**	**4,757**	**1,700**	**+ 5,448**	**+ 1,800**
Other City of Omak Water Rights										
6412-A (13)	Omak	3/28/1968	Cemetery	Primary	70	24	70	23.6	+ 0	+ 0.4
6530-A (14)	Omak	3/1968	E. Omak Pk./S06	Primary	400	185	300	0	+ 100	+ 185
G4-28244P	Omak	6/1983	E. Omak Pk./S06	Alternate	500	278	0	0	+ 500	+ 278
G4-81058JWRIS	Omak	10/9/1959	Airport	Primary	10	3	6	0.5	+ 4	+ 2.5

Figure 22. City of Omak Water Rights Self-Assessment (2037)

The highlighted row in the table above shows the water rights for OWP #2 Well, which is owned by the CCT and leased to the City of Omak. The water rights for both the excess instantaneous capacity and annual volume for OWP #2 Well far exceed the anticipated demand from the proposed industrial site of 160 gpm instantaneous and 25 ac-ft. After accounting for the anticipated demand from the industrial site, the remaining excess water rights are as follows:

Year	*Excess Maximum Instantaneous Flow Rate* *(Q_i, gpm)*	*Excess Maximum Annual Flow Rate* *(Q_a, ac-ft)*
2021	*3,090*	*2,675*
2037	*3,090*	*2,675*

Water Quality

The existing CCT system draws entirely from the City of Omak municipal water system and includes no independent water treatment facilities. See Section 4.4.1 for a discussion on available system capacity concerning water quality.

3.3.2 Fire Supply Capacity

Flow

The existing CCT booster station's fire pump has a pump capacity of 2,500 gpm. *Table 2* in Section 4.2 lists the anticipated fire demand for each of the industrial uses under consideration. The 2,500-gpm pump capacity is exceeded by all but one of the anticipated fire demands listed. However, if the proposed buildings are equipped with automatic sprinkler systems, the minimum fire flow can be reduced by up to 75% according to Table B105.2 of the 2021 IFC. If this reduction is applied to the highest anticipated fire flow (5,000 gpm for Prefabricated Housing), the resulting anticipated fire flow of 1,250 gpm is comfortably   the capacity of the fire booster pump.

Pressure

The existing CCT fire booster pump appears to be designed to provide a static pressure that is high enough to accommodate the elevated position of the *12 Tribes Casino* relative to the pressure zone where the casino draws water. Since the proposed development is located at a lower elevation than the casino, the new facilities will likely have sufficient pressure assuming the proposed distribution lines are sized properly so that excess pressure loss to due friction is avoided.

Fire Storage

The CCT water system has no independent storage capacity. See Section 4.4.1 discussion on the City of Omak water system's fire suppression storage capacity.

3.4 The City of Omak System

3.4.1 Domestic Water Supply Capacity

Flow

A Water Facilities Inventory (WFI) provided in the City of Omak's 2021 Water System Plan is provided (Figure 23). The WFI lists the pump capacity in gpm for each of the pumps on the City of Omak system.

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
63750 K	OMAK CITY OF	OKANOGAN	A	Comm

15	16 SOURCE NAME	17 INTERTIE	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22 DEPTH	23	24 SOURCE LOCATION			
Source Number	LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	Eastside Well - AGJ179		X										X			Y		X					30	2800	SW NE	35	34N	26E
S02	Apple Well		X												X	Y		X					20	300	SW SE	26	34N	26E
S03	Kenwood		X												X	Y		X					30	350	SW SE	26	34N	26E
S04	Okoma Well - ABR843		X												X	Y		X					90	300	NE SE	34	34N	26E
S06	InAct 10/15/2009 Park Well - AGJ178		X											X		Y	X						44	250	SW SW	25	34N	26E
S07	OWP Well - AAR993		X										X			Y		X					44	2300	SW NE	35	34N	26E
S08	NE Omak Well - AEC887		X										X			Y		X					268	120	SE SE	24	34N	26E
S09	Julia Maley Park Well BIF542		X										X		X	Y		X					375	800	SW NW	35	34N	26E

Per Jeff Johnson

Figure 23. City of Omak Water Facilities Inventory

The system's total non-emergency pump capacity is summarized :

- Non-Emergency Pump Capacity (Year-Round, gpm) = 6,020 gpm
- Non-Emergency Pump Capacity (Including Seasonal, gpm) = 6,270 gpm

A system-wide peak hour demand (PHD) of 4,347 gpm was provided in the 2018 City of Omak Water System Plan. The difference between the PHD and the total non-emergency pump capacity is 1,173 gpm. Including the peak demand for the proposed industrial site leaves a remaining non-emergency pump capacity of 1,013 gpm.

Connect-ions

According to the City of Omak 2021 Water System Plan Amendment, the city is approved for 2,607 connections. As of 2021, the DOH-calculated active connections were 2,520. This leaves 87 remaining connections for the proposed industrial site. According to City representatives, the actual number of connections served by the city water system has increased since the 2021 Water System Plan amendment and the city is planning to increase the number of approved connections. As part of the improvements for the industrial plan, a water system plan amendment to increase the number of service connections allowed for the city system needs to be approved by the Department of Health.

Pressure

Fire flow testing near the industrial site was performed at the intersection of Jack Street and 7th Avenue in 2016 which recorded a static pressure of 38 psi. Static pressures at or above 30 psi satisfy the Department of Health minimums. However, static pressures between 40 psi and 80 psi are preferred by convention since most fittings operate best within this range. Since areas of the proposed industrial site are as much as 90 feet in elevation above the Jackson and 7th Avenue intersection, upgrades to the existing system will need to be made.

Storage

Operating Storage

The required operational storage is based on the total system pump capacity and without change by the demands added from the potential industrial site. A conservative calculation for operational storage is the total system pump capacity (6,020 gpm) multiplied by 2.5 minutes.
$OS_{Required}$ = (6,020 gpm) (2.5 minutes) = 15,050 gallons

According to the 2018 City of Omak Water System Plan, the system's current total operational storage is 318,000, which exceeds the required amount.

Equalizing Storage

The City of Omak's water system currently requires no equalizing storage to meet demand according to Table 3-7 of the City of Omak Water System Plan. Equalization Storage is calculated using Equation 7-1 from the DOH Water System Design Manual (WSDM). The equalizing storage volume required to meet the additional demands on the City's system from the industrial site is summarized :

$ES = ([PHD+Q_{IND}] - Q_s)$ (150 minutes)
Were,
ES = Equalizing storage (gallons)
PHD = Peak hourly demand (gpm) = 4,347 gpm
Q_{IND} = Estimated peak flow for the proposed industrial area. See Figure 13 in Section 4.2.
Q_{IND} = 160 gpm
Q_s = Sum of all non-emergency source capacities (gpm)
Q_s = 4,055 gpm (See Figure 7 in Section 3.2)
ES = ([4,347 gpm + 160gpm] – 6,020 gpm) (150min) = 0 gallons

The additional demand from the industrial park is unlikely to require additional equalizing storage to be added to the city system.

Water Rights

The 2021 City of Omak Water System Plan Amendment summarizes the City's current water rights in the following table:

TABLE 3-4a
Water Rights Self Assessment (2021)

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary/ Alternate	Existing Water Rights: Maximum Instantaneous Flow Rate (Qi, gpm)	Existing Water Rights: Maximum Annual Volume (Qa, ac-ft)	Existing Water Use From Source: Maximum Instantaneous Flow Rate (Qi, gpm)	Existing Water Use From Source: Maximum Annual Volume (Qa, ac-ft)	Current Water Right Status (Excess/Deficiency): Maximum Instantaneous Flow Rate (Qi, gpm)	Current Water Right Status (Excess/Deficiency): Maximum Annual Volume (Qa, ac-ft)
CG4-GWC445-D@1 (1)	Omak	12/1913	Kenwood/S03	Primary	500	600	0	0	+ 500	+ 600
CG4-GWC446-D@3 (2)	Omak	3/1936	Apple/S02	Primary	800	96	0	0	+ 800	+ 96
CG4-GWC1082-D@1 (3, 4)	Omak	5/1944	Eastside/S01	Primary	1,630	1,430	1,255	135	+ 375	+ 1,295
CG4-GWC3655-A@1 (5)	Omak	3/20/1958	Eastside/S01	Primary & Alt.	1,300	2,080 (6)	1,300	640	+ 0	+ 1,440
CG$-GWC3656-A@1 (2)	Omak	3/20/1958	Apple/S02	Primary & Alt.	375	600 (7)	0	0	+ 375	+ 600
CG4-GWC7332-A@1 (8)	Omak	7/19/1971	Okoma/S04	Primary & Alt.	600	560 (9)	0	0	+ 600	+ 560
G4-31525P (10)	Omak	11/23/1992	OWP #2/S07	Primary & Alt.	5,000	3,500	1,750	800	+ 3,250	+ 2,700
CG4-GWC 446-D@1 (11)	Omak	Dec-'00	NE Omak/S08 (11)	Alternate	500	96	105	5	+ 395	+ 91
TOTAL DOMESTIC RIGHTS					**10,205 (12)**	**3,500 (12)**	**4,410**	**1,580**	**+ 5,795**	**+ 1,920**
Other City of Omak Water Rights										
6412-A (13)	Omak	3/28/1968	Cemetery	Primary	70	24	70	23.6	+ 0	+ 0.4
6530-A (14)	Omak	3/1968	E. Omak Pk./S06	Primary	400	185	300	0	+ 100	+ 185
G4-28244P	Omak	6/1983	E. Omak Pk./S06	Alternate	500	278	0	0	+ 500	+ 278
G4-81058JWRIS	Omak	10/9/1959	Airport	Primary	10	3	6	0.5	+ 4	+ 2.5

Figure 24. City of Omak Water Rights Self-Assessment (2021). CCT Water rights emphasized

The 2021 City of Omak Water System Plan Amendment summarizes the City's projected water rights in the following table:

TABLE 3-4c
Water Rights Self Assessment (2037)

Permit Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary/ Alternate	Existing Water Rights		Forecasted Water Use From Sources (20-Year Demand)		Forecasted Water Right Status (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi, gpm)	Maximum Annual Volume (Qa, ac-ft)	Maximum Instantaneous Flow Rate (Qi, gpm)	Maximum Annual Volume (Qa, ac-ft)	Maximum Instantaneous Flow Rate (Qi, gpm)	Maximum Annual Volume (Qa, ac-ft)
CG4-GWC445-D@1 (1)	Omak	12/1913	Kenwood/S03	Primary	500	600	0	0	+ 500	+ 600
CG4-GWC446-D@3 (2)	Omak	3/1936	Apple/S02	Primary	800	96	0	0	+ 800	+ 96
CG4-GWC1082-D@1 (3, 4)	Omak	5/1944	Eastside/S01	Primary	1,630	1,430	1,602	255	+ 28	+ 1,175
CG4-GWC3655-A@1 (5)	Omak	3/20/1958	Eastside/S01	Primary & Alt.	1,300	2,080 (6)	1,300	640	+ 0	+ 1,440
CG$-GWC3656-A@1 (2)	Omak	3/20/1958	Apple/S02	Primary & Alt.	375	600 (7)	0	0	+ 375	+ 600
CG4-GWC7332-A@1 (8)	Omak	7/19/1971	Okoma/S04	Primary & Alt.	600	560 (9)	0	0	+ 600	+ 560
G4-31525P (10)	Omak	11/23/1992	OWP #2/S07	Primary & Alt.	5,000	3,500	1,750	800	+ 3,250	+ 2,700
CG4-GWC 446-D@1 (11)	Omak	Dec-'00	NE Omak/S08 (11)	Alternate	500	96	105	5	+ 395	+ 91
TOTAL DOMESTIC RIGHTS					**10,205 (12)**	**3,500 (12)**	**4,757**	**1,700**	**+ 5,448**	**+ 1,800**
Other City of Omak Water Rights										
6412-A (13)	Omak	3/28/1968	Cemetery	Primary	70	24	70	23.6	+ 0	+ 0.4
6530-A (14)	Omak	3/1968	E. Omak Pk./S06	Primary	400	185	300	0	+ 100	+ 185
G4-28244P	Omak	6/1983	E. Omak Pk./S06	Alternate	500	278	0	0	+ 500	+ 278
G4-81058JWRIS	Omak	10/9/1959	Airport	Primary	10	3	6	0.5	+ 4	+ 2.5

Figure 25. City of Omak Water Rights Self-Assessment (2037). CCT Water rights emphasized.

The Department of Health limits the total system instantaneous and annual water rights to 10,205 gpm and 3,500 ac-ft respectively. Tables 3-4a and 3-4c above present the total excess domestic water rights for 2021 and 2037. After accounting for the anticipated demand from the industrial site, the remaining excess water rights are as follows:

Year	*Excess Maximum Instantaneous Flow Rate* *(Q_i, gpm)*	*Excess Maximum Annual Flow Rate* *(Q_a, ac-ft)*
2021	*5,536*	*1,895*
2037	*5,288*	*1,775*

Figure 26. Surfeit Water Rights Summary

Water Quality

The intermittent exceedances recorded on the Department of Health's website (See Section 3.1.14) will likely not be disruptive to any of the proposed uses for the industrial site, but the variety of potential processes associated with each use was not evaluated. However, City representatives report that the OWP No. 2 Well occasionally reports high for measures of water hardness. Hard water may impact some industrial processes and should be further investigated.

3.4.2 Fire Supply Capacity

Flow

Fire flow testing near the industrial site was performed at the intersection of Jack Street and 7th Avenue in 2016. The tests resulted in a 750-gpm fire flow with a residual pressure of 20 psi. *Figure 13* in Section 4.2 lists the anticipated fire demand for each of the industrial uses under consideration. The 750-gpm fire flow test suggests that the city system can't meet the fire flow requirements for any of the industrial uses being considered. This remains true even if the proposed buildings are equipped with automatic sprinkler systems, which allow the minimum fire flow to be reduced by up to 75% according to Table B105.2 of the 2021 IFC.

Pressure

As stated above, fire flow testing near the industrial site was performed at the intersection of Jack Street and 7th Avenue resulting in a 750-gpm fire flow with a residual pressure of 20 psi. This suggests that the existing City system requires an

	upgrade to maintain a residual 20 psi for the full required fire flows as summarized in Figure 13 in Section 4.2.
Fire Storage	The proposed use with the highest fire suppression storage requirement is the prefabricated housing cluster, which requires a fire suppression storage volume of 1,200,000 gallons. According to the City's Water System Plan, Pressure Zone 1 already has 1,320,000 gallons of fire suppression storage, which exceed the industrial site's needs.

4 Alternatives

4.1 Introduction

After evaluating the capacity of the existing City and CCT water systems, potential alternatives for water improvements were developed to meet the projected water system demand for the study area. This section illustrates and summarizes the alternatives. Due to time constraints, the level of detail and analysis was limited and should be considered preliminary.

The CCT expressed interest in combining the casino water system with the water system for the proposed industrial area. For the alternatives that combine the casino water system with the proposed industrial area water system, it was assumed that the existing pressures at the casino maintained.

The alternatives   assume that the proposed will not be required to have a fire suppression system. The CCT may require all buildings to have sprinkler systems meeting the fire flow requirements and therefore reduce the tank size considerably.

For fire storage requirements when connected to the city system, the required storage includes receiving 750 gpm from the city system for the duration of the fire. This is based on the fire flow analysis in the City's Water System Plan.

The tank sizing is approximate and should be analyzed during the final design for other volume requirements including operational storage and equalizing storage. Standby storage is assumed to be nested within the fire storage volume.

The opinions of probable construction costs are "rough order magnitude" costs based on very preliminary estimates of required capacity. The costs have not been adjusted for inflation. A 20% contingency was used. The costs assume design fees will be approximately 15% of construction costs.

4.2 Alternative A: City System – New Pressure Zone

This alternative extends the city system into the proposed development area and creates a new pressure zone within the city system. The new pressure zone is dedicated to the proposed development and does not change the pressures in the existing city system (lower pressure zone). The casino water system remains as is and without connection to the proposed industrial area.

The water system improvements needed for this alternative include:

- New connection to the city water system on 8th street: Assume connection to the new 12" water main being installed by the CCT.
- New booster pump station in connection to the city water system.

- A new 1.0-million-gallon water tank is located on the bench to the south of the industrial area.
- Distribution system: 12” water mains and 8” water service stubs.

See Figure 25 for a schematic of proposed improvements.

The booster pump station is necessary to provide the required pressures across the entire 386-acre development. It is anticipated the static pressure on the west end of the development is about 80 psi and the east end is about 40 psi. Higher pressures will be available with pump sizing and placing the storage tank slightly higher on the hill.

The new water tank will provide the required equalizing and fire storage for the industrial area. The storage volume is not available to the rest of the city water system.

ADVANTAGES

- Lower capital cost.
- The water system is maintained by the city.
- Design should reduce or eliminate the need for pressure-reducing stations.
- No new wells.

DISADVANTAGES

- The city may not accept the new pressure zone.
- Requires DOH approval of an amendment to the City Water System Plan.
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- A single connection to the city water system increases vulnerability should the booster pump or connection fail or require maintenance shutdown.
- Preliminary Opinion of Probable Construction Cost: $3 million.

4.3 Alternative B: City System – Extend City Lower Pressure Zone

This alternative extends the city system into the proposed development area by extending the existing lower-pressure zone. As has been noted earlier the water pressure and fire flows in the residential area just north of the proposed project area (8th & Jackson etc.) are low. The available fire flow of 750 gpm is not sufficient and the static pressures in the area are just 40 psi. The required fire flow is not met in the new development area and the static pressures in the east end of the project area (380 acres) are likely close to zero psi (based on elevations from Google Earth). Although the new 12” water main being installed by the CCT on 8th Ave will improve available fire flow, it is anticipated that the static pressure will not substantially improve. The addition of a water storage tank in the project vicinity also addresses fire flow issues but does not address the pressure issue. As a result, this alternative is not recommended and was not developed further.

4.4 Alternative C: City System – Extend Casino Pressure Zone

This alternative extends the casino pressure zone into the proposed development area. Essentially upgrading the water service to the casino to provide water service to the proposed industrial area. The existing water service to the casino consists of a booster station near the connection to the water system on the 8th with a long water main south and slightly west of the casino. The water main is tapped south of the booster station and a new water main extended into the proposed industrial area.

Based on the existing information reviewed it appears the booster pump station is providing a discharge pressure of about 130 psi (96 psi discharge plus a static pressure in the city system). The existing drawings are interpreted as the total pressure on the discharge side of the pump is 96 psi. The booster station is located at an approximate elevation of 855 and the casino is at an approximate elevation of 975. Based on these elevations the casino has an existing water pressure of approximately 57 psi to 82 psi (depending on the interpretation of the pump discharge in the existing drawings). However, the pressures in the lower industrial zone are well above 80 psi (possibly over 100 psi) and therefore require pressure-reducing valves on each water service or a single large pressure-reducing valve where the new water main connects to the existing water main to the casino. If a pressure-reducing station was provided at the connection to the existing water main the storage tank would be located at the casino site to provide storage to both the casino and the proposed industrial area.

The water system improvements needed for this alternative include:

- Booster station upgrades: Replace domestic and fire pumps for increased demand, upgrade plumbing as needed.
- A new 1.0-million-gallon water tank is located at the top of the hill to the south of the industrial area or southeast of the casino.
- Distribution system: 12” water mains and 8” water service stubs
- Pressure reducing station(s)

See Figure 26 for a schematic of proposed improvements.

The new water tank will provide the required equalizing and fire storage for both the industrial area and the casino. The storage volume will not be available to the rest of the city water system.

ADVANTAGES

- No new wells.
- Provides water storage for both casino and proposed development.
- Provides for the upgrade of aging equipment in the existing booster pump station.
- Potential reuse of existing booster pump building.

DISADVANTAGES

- Requires DOH approval of an amendment to the City Water System Plan.
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- May require a larger booster pump station building.
- The need for pressure-reducing valves in the proposed industrial area increases cost, maintenance, and potential problems if service is installed without the pressure-reducing valve.
- A single connection to the city water system increases vulnerability should the booster pump or connection fail or require maintenance shutdown.
- An opinion of probable cost was not prepared for this alternative because of the increased cost and potential problems with having pressure-reducing stations in the industrial area.

4.5 Alternative D: CCT System – Industrial Area Water System

This alternative creates a new tribal water system to exclusively serve the proposed industrial area. The new water system includes two new wells (for redundancy) in the proposed industrial area. A new storage tank provides the required storage for the proposed development. The CCT may consider installing an emergency intertie to the city system (typically a valve vault). However, it should be noted that the city water system does not provide adequate pressure or fire flow for the entire system. The casino water system remains a separate water system.

The water system improvements needed for this alternative include:

- Two new wells: Assume a capacity of 250 gpm (500 gpm total) at each well to accommodate future growth.
- A new 1.2-million-gallon water tank is located on the bench to the south of the industrial area.
- Distribution system: 12” water mains and 8” water service stubs

See Figure 27 for a schematic of proposed improvements.

The new wells will need to be located at least 100’ (preferably more) away from the proposed wastewater treatment system and drain field. The availability of adequate groundwater should be studied by a hydrogeologist to reduce (but not eliminate) the risk of drilling wells that do not produce the required flow rate.

The new water tank will provide the required equalizing and fire storage for the industrial area.

Although the water system design is not reviewed by DOH, it is recommended that the system be designed and maintained following DOH requirements.

ADVANTAGES

- Self-contained water system under tribal control that can operate independently of the city and casino.
- The system does not rely on aging or outdated infrastructure.
- Does not require DOH approval of an amendment to the City Water System Plan
- Design should reduce or eliminate the need for pressure-reducing stations.

DISADVANTAGES

- Inherent risk with drilling new wells (depth to water, sustainable flow rate, etc.)
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- CCT is responsible for developing and maintaining water sources.
- Although CCT appears to hold adequate water rights, it is understood that the water rights might be in use by the City.
- Preliminary Opinion of Probable Construction Cost: $5.7 million.

4.6 Alternative E: CCT System - Industrial Area Casino Combined Water System

This alternative creates a new tribal water system to serve both the casino and the proposed industrial area. This scenario is similar to Alternative C except that the CCT will provide the water sources (wells). The new water system includes two new wells (for redundancy) in the proposed industrial area. A new storage tank provides the required storage for the proposed development and casino. The existing booster pump station for the casino serves as an emergency intertie with the city water system. This report assumes no upgrades to the booster pump station. As discussed in the Alternative C section all or portions of the proposed industrial area require pressure-reducing valves.

The water system improvements needed for this alternative include:

- Two new wells: Assume a capacity of 250 gpm at each well to accommodate future growth.
- A new 1.2-million-gallon water tank at the top of the hill to the south of the industrial area or southeast of the casino.
- Distribution system: 12” water mains and 8” water service stubs
- Pressure reducing station(s)

See Figure 28 for a schematic of proposed improvements.

The new wells will need to be located at least 100’ (preferably more) away from the proposed wastewater treatment system and drain field. The availability of adequate groundwater should be studied by a hydrogeologist to reduce (but not eliminate) the risk of drilling wells that do not produce the required flow rate.

The new water tank will provide the required equalizing and fire storage for both the casino and the proposed industrial area.

Although the water system design will not be reviewed by DOH, it is recommended that the system be designed and maintained following DOH requirements.

ADVANTAGES

- Self-contained water system under tribal control that can operate independently of the city and casino.
- The system does not rely on aging or outdated infrastructure.
- Does <u>not</u> require DOH approval of an amendment to the City Water System Plan

DISADVANTAGES

- Inherent risk with drilling new wells (depth to water, sustainable flow rate, etc.)
- Does not address pressure and fire flow issues in the area north of the proposed development (residential).
- CCT is responsible for developing and maintaining water sources.
- Although CCT appears to hold adequate water rights, it is understood that the water rights might be in use by the City.
- The need for pressure-reducing valves in the proposed industrial area increases cost, maintenance, and potential problems if service is installed without the pressure-reducing valve.
- It is understood that the adjacent property to the southeast of the casino may not be cooperative in the installation of the tank on their property.
- An opinion of probable cost was not prepared for this alternative because of the increased cost and potential problems with having pressure-reducing stations in the industrial area.

5 Next Steps

5.1 Next Steps

The work summarized in this report was limited by time and available information. Depending on the CCT's preferred alternative(s), further investigation in the following areas may be warranted. This list is not intended to be exhaustive.

- Fire flow test after new 12" installed.
- Verify existing CCT booster pump discharge pressure.
- Hydrogeologic study for potential new wells.
- Verify the location and potential reuse of the existing well from the CIPV site.
- Verify proposed land use within the project area relative to water demand.
- Water system modeling of existing City water system with estimated future water demands.
- Investigate the potential for incorporating a portion of the City's lower pressure zone into a new pressure zone that includes the proposed industrial area (extension of Alternative A).
- Investigate the potential for the retail site to receive water from the same system supplying the existing fueling station. This avoids railroad crossings. An opinion of probable cost was not prepared for this alternative because of the increased cost and potential problems with having pressure-reducing stations in the industrial area.

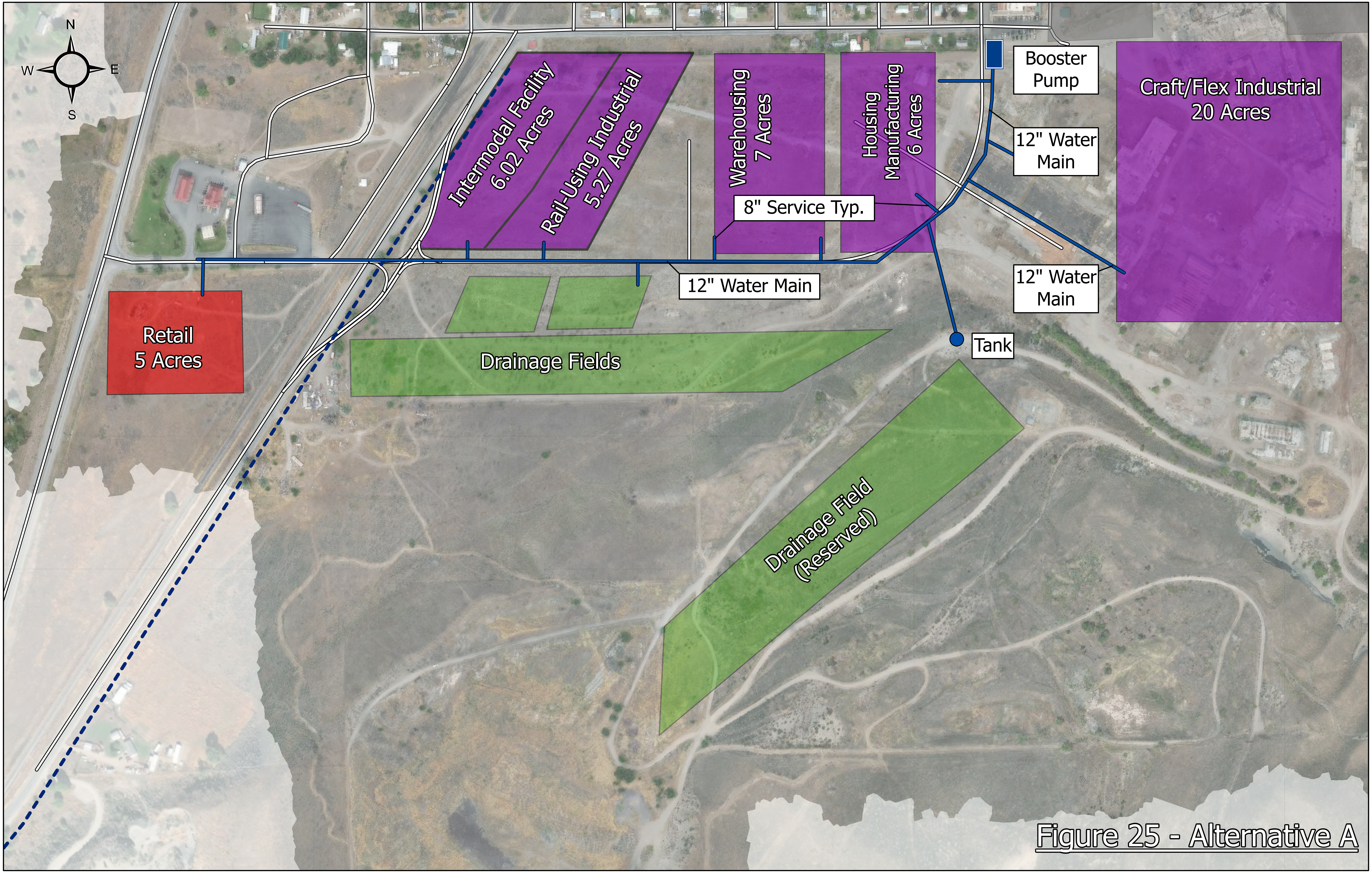


Figure 25 - Alternative A

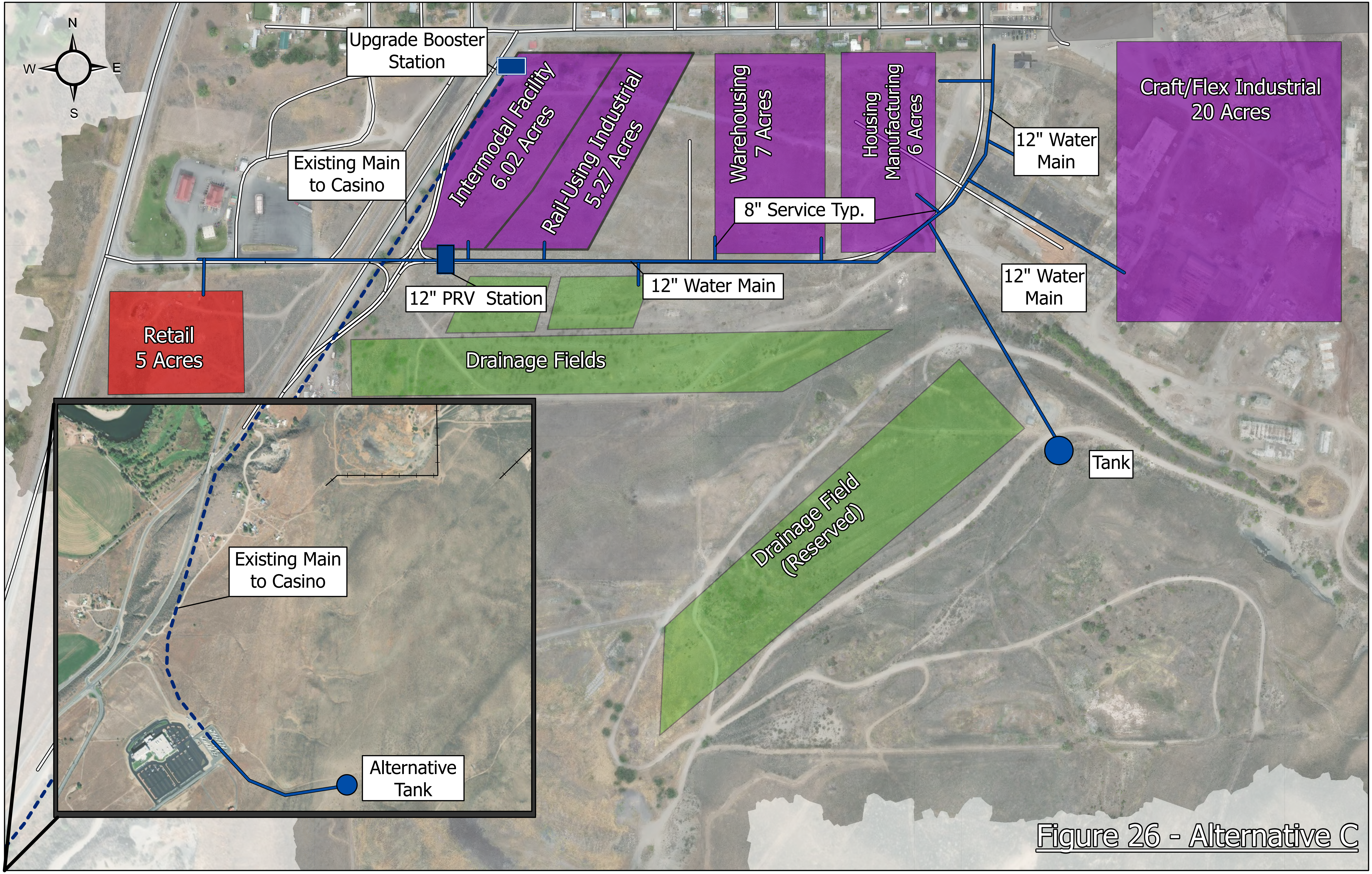


Figure 26 - Alternative C

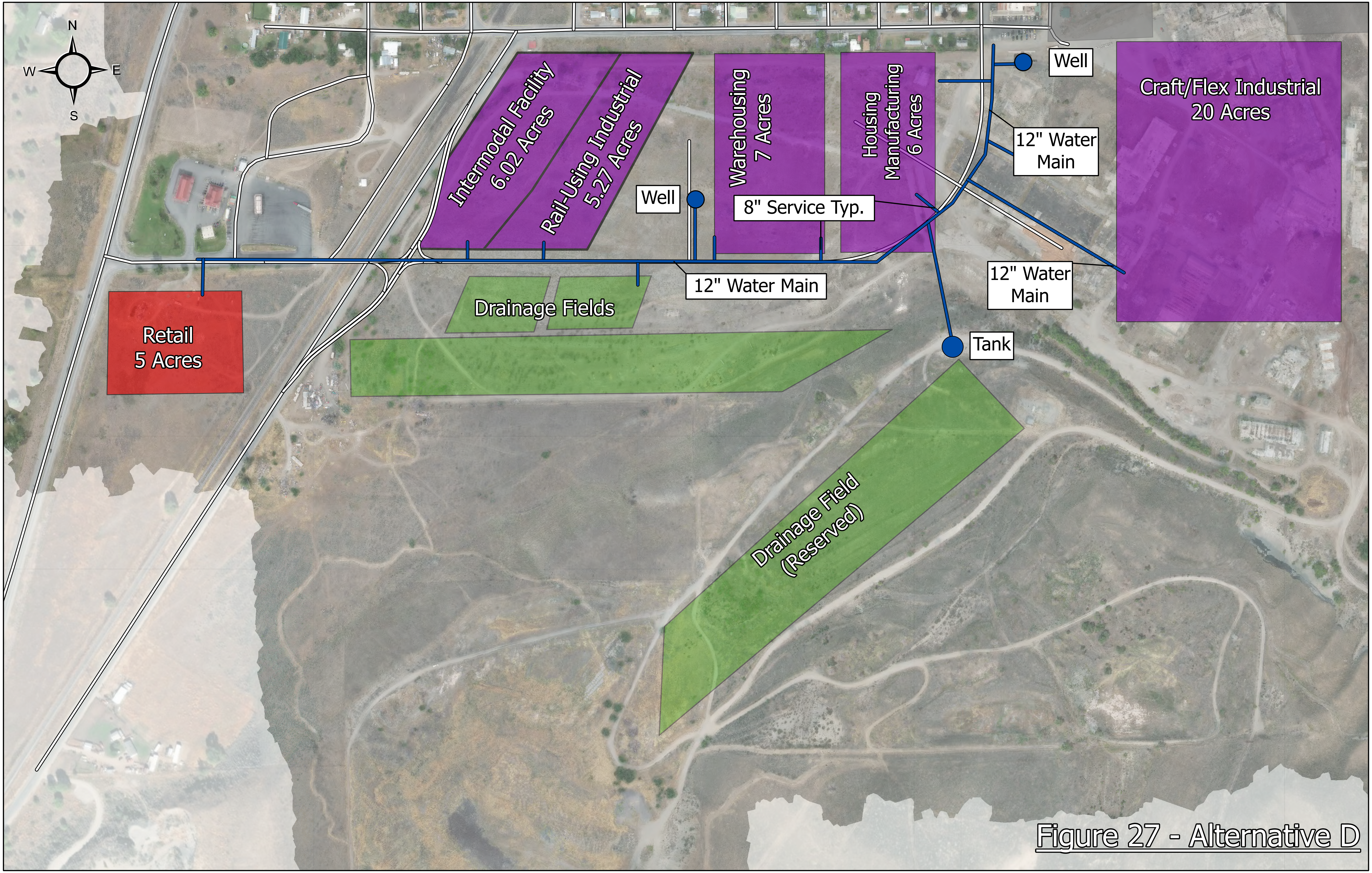


Figure 27 - Alternative D

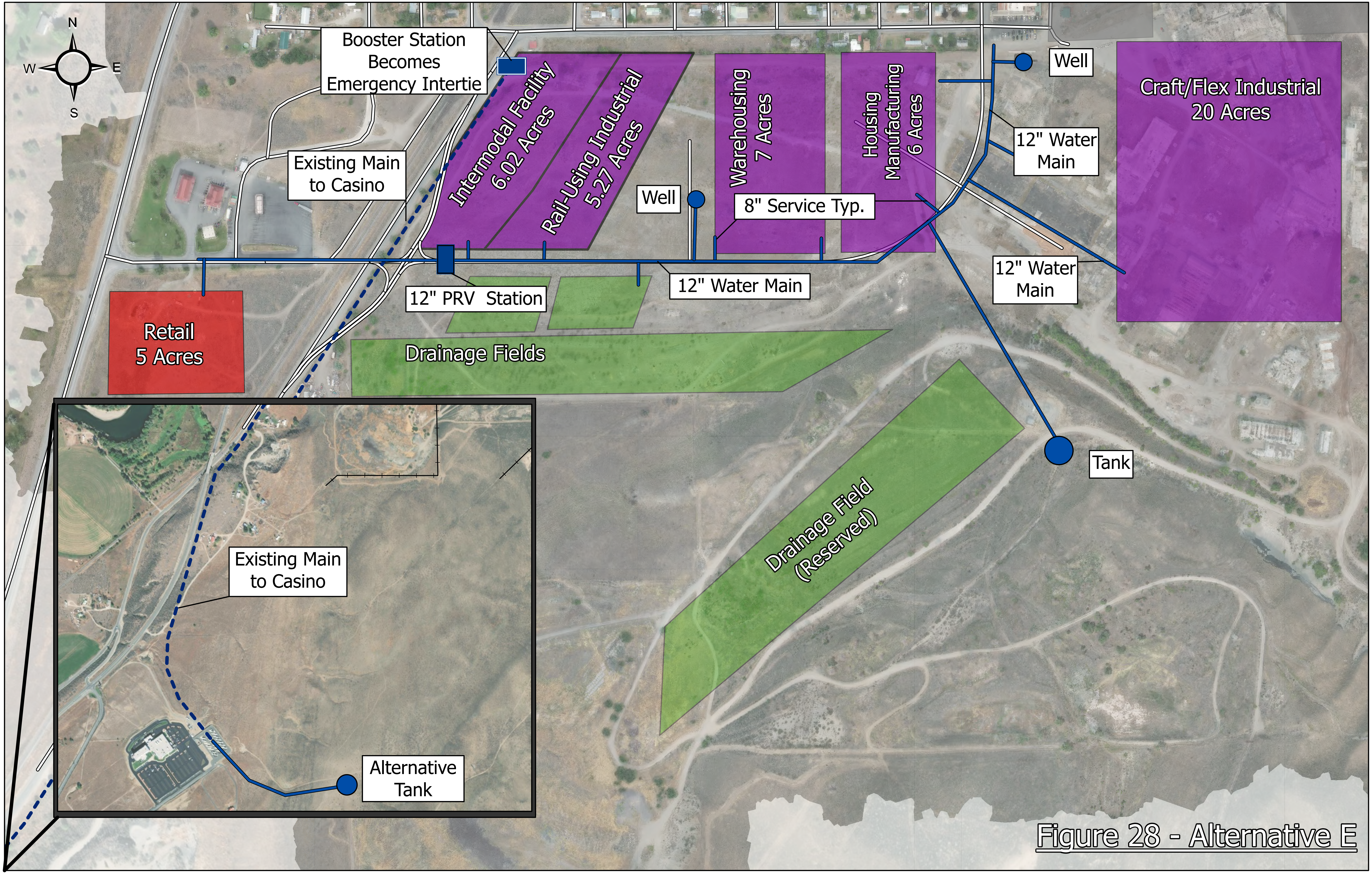


Figure 28 - Alternative E

Appendix E
Electrical Grid Assessment and Demand Report

LC Engineers

06302023

East Omak Industrial Site Readiness - Electrical

Project	East Omak Industrial Site
Author	LC Engineering, PLLC
Prepared For	Colville Confederated Tribes

OVERVIEW

This report is an analysis of the existing serving utility, voltage, and grid capacity for the East Omak Industrial Site. The site is a 386-acre area located on the Colville Reservation in East Omak; Okanogan County owned by the Colville Confederated Tribes (CCT). The analysis is an assessment of the current grid capacity without improvements, including current availability to build on-site and build option recommendations for the East Omak Industrial Site.

1. EXISTING ELECTRICAL SYSTEM

The Colville Confederated Tribes (CCT) East Omak Industrial Site is serviced by the Okanogan Public Utility District #1[1], which receives its power from three primary sources, Bonneville Power Administration (BPA), the Wells Dam, and Energy Northwest[2].

- Bonneville Power Administration: BPA delivers carbon-free hydropower produced in the Columbia River basin. Okanogan PUD #1 received approximately 66% of its power supply from BPA.
- Wells Dam: The Wells Dam is operated by Douglas County PUD of which Okanogan PUD #1 obtains approximately 8% of their power.
- Energy Northwest: Energy Northwest consists of 75 acres of wind turbines southeast of Kennewick Washington which comprises approximately 26% of Okanogan PUD #1's power.

The East Omak Industrial Site has (4) Transmission lines located on or near the site[3]. Maps of the utilities are provided in Appendix A.

LINE A
Owner: PUD No. 1 of Okanogan County
Status: Inactive
Substation: CCT Substation (Inactive)
Type: AC; Overhead
Volt Class: 100-161kV
Voltage: 115kV

LINE C
Owner: Bonneville Power Administration
Status: Active
Substation: Chief Joseph, East Omak
Type: AC; Overhead
Volt Class: 220-287kV
Voltage: 230kV

[1] Okanogan Public Utility District #1 also is referenced as PUD No.1 of Okanogan County and Okanogan PUD #1
[2] Okanogan PUD: Power Sources & Sales https://www.okanoganpud.org/Power-Sources
[3] U.S. Energy Atlas: Energy Infrastructure and Resources https://atlas.eia.gov/apps/all-energy-infrastructure-and-resources/explore referenced in Appendix A: Map of East Omak Existing Power Grid

LINE B
Owner: PUD No. 1 of Okanogan County
Status: Active
Substation: Omak
Type: AC; Overhead
Volt Class: 100-161kV
Voltage: 115kV

LINE D
Owner: Bonneville Power Administration
Status: Active
Substation: East Omak
Type: AC; Overhead
Volt Class: 100-161kV
Voltage: 115kV

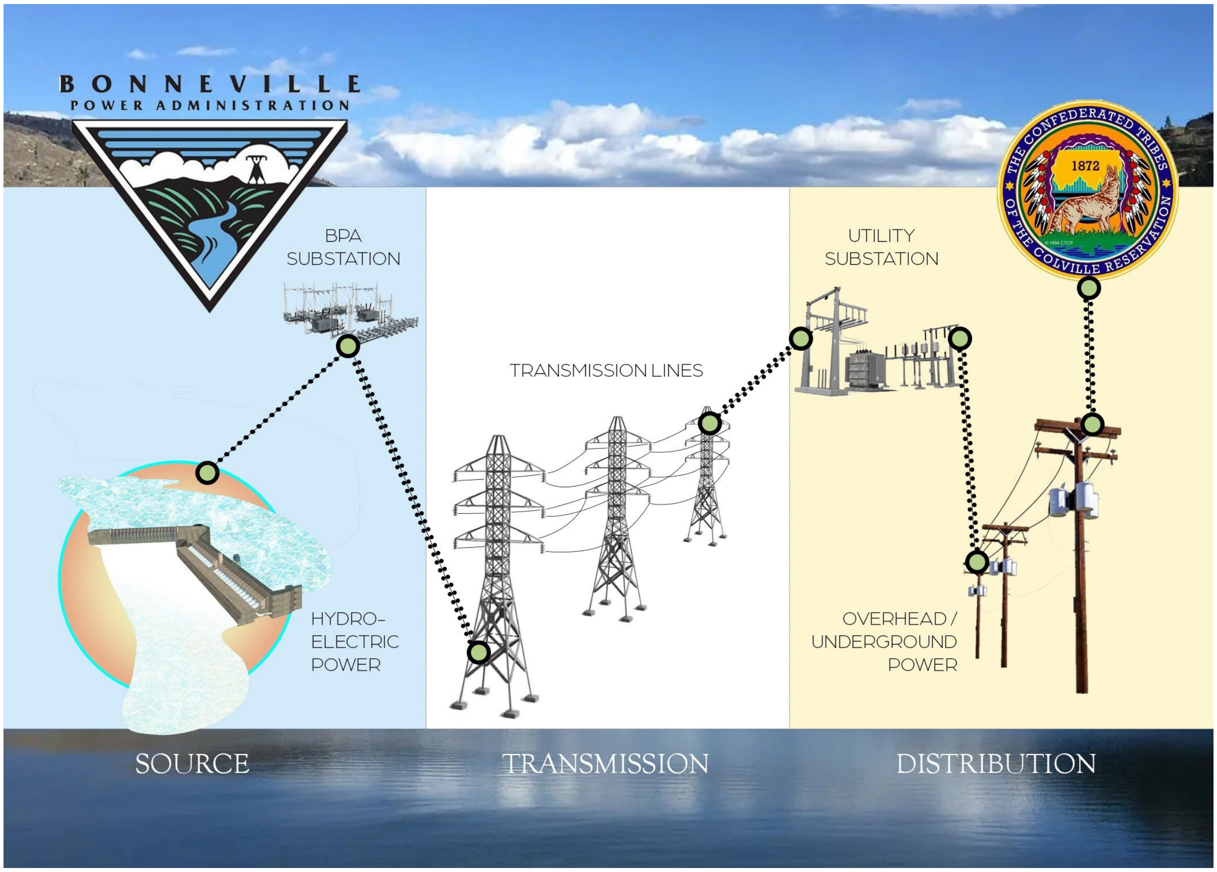
East Omak Industrial Site is overseen by (3) Substations.

SUBSTATION:	OWNER:	LOCATION:
CCT Substation (Decommissioned)	Colville Confederated Tribes	East Omak Industrial Site near former Colville Indian Power and Veneer (CIPV)
Omak (Active)	PUD No. 1 of Okanogan County	378 Omak River Road
East Omak (Active)	Bonneville Power Administration	77 Copple Road

As of June 2023, the East Omak Industrial Site has a standing power grid capacity of <1MW provided by Okanogan PUD #1; as the CCT Substation owned by the Colville Confederated Tribes and powered by BPA via Okanogan PUD #1 was destroyed in September 2021 by the Cold Springs Canyon fire and robbed of electrical conduit and equipment shortly thereafter. Before the damage and theft there existed a 115/13.8 kV Transformer Delta/Wye that provided 240V, 3-Phase and 120/208V, 3-Phase power to the site.

The nearest active substation (Omak Substation) is owned by Okanogan PUD #1 with a capacity of 20MW of which 15-25% on average is utilized monthly. Lastly, the East Omak Substation is operated by BPA and outside of the East Omak Industrial Site utility jurisdiction without an operating CCT-owned substation.

Depiction of Omak Electric Power Source



As depicted above, Colville Confederated Tribes East Omak Industrial Site is currently serviced by BPA Hydroelectric Power via Okanogan County #1 Substations.

NO-BUILD ELECTRICAL GRID CAPACITY

As a result of the 2021 Cold Springs Canyon Fire and the theft of the CCT Substation equipment, there is currently no standing available power to the CCT Substation. Okanogan PUD #1 confirms that they do have a transmission interconnection line[4] feeding the now-destroyed mill substation. Okanogan PUD #1 can feed <1MW, of the available 2-6MW, to the East Omak Industrial Site without infrastructure improvements. The available power to the East Omak Industrial Site overall system is based on their current capacity to secure their substation redundancies. Substation redundancies are implemented to secure power to utility customers should a substation suffer damage, or need maintenance and/or improvements. Before the theft, there was 240V, 3-Phase, and 120/208V, 3-Phase power available to the site. However, the pneumatic trip breakers had a standing history of faulty operation as a result of rust buildup. In turn, the breakers were inefficient at building up pressure and would trip due to low pressure, causing power interruptions. Current availability to re-build the substation on site requires the purchase of needed breakers estimated at $90,000.00 and if required a new transformer at a current market rate

[4] Appendix A: Map of East Omak Existing Power Grid – Transmission LINE A

starting at $15,000.00. Also due to market demand, transformers can be back-ordered for up to 18 months depending on the model, and should be considered in time estimates for future development.

As of 2022, Okanagan PUD has amended its *New Large Single Load* requirements to a maximum of 1MW, any power demands greater than the outlined 1MW would require a long-term bilateral contract to serve this load demand of which current power rates would not apply. This negotiated *New Large Single Load* power sales contract applies to:

> "Load associated with a new facility or expansion of an existing facility. This schedule applies to customers that would have an additional electrical system demand of one (1) megawatt (MW) or more in any calendar month of a year. Non-Recurring and Monthly Charges: New customer loads of one (1) megawatt (MW) or more in any calendar month of a year will require negotiation of a customized power sales contract between the customer and the District before the District is obligated to provide electrical service to the customer. The customer must provide the District with a detailed and verifiable estimate of the customer's electrical power requirements before the development of a power sales contract."[5]

Additionally, the Okanogan PUD #1 will address all client load requests as a system-wide request; adhering to the New Large Single Load requirements of <1MW. The aforementioned agreement, and conditions, would need to be met to utilize Okanogan PUD #1's available power to East Omak Industrial Site.

In addition to the Okanogan PUD #1's New Single Load requirements, all requests over 1 MW are subject to BPA's Transmission Service Request: TSR Study & Expansion Process (TSEP – formerly known as Network Open Season (NOS)).[6] The TSR Study & Expansion Process is BPA's business practice to manage and respond to long-term firm transmission requests on the BPA network[7]. Because Okanogan PUD #1 utilizes the BPA network, the TRS Study is required for any load request > 1MW and/or any request to develop or build a new substation to meet power demand. The Transmission Service Request Study (TSR Study) determines existing capacity, and reserve power capacity and outlines redundancy procedures for new requests. The cost of the TSR is subject to the new line load; the minimum cost is estimated at $15,000.00 with the study ranging from 24 months to approximately 5 years contingent on the Cluster Study, Engineering Design in conjunction with the Okanogan PUD #1 and Environmental Study. All costs related to the TSEP process, study, and equipment are the responsibility of the owner (CCT). TSEP approval is contingent upon no additional changes to the BPA network, i.e., if a second interested entity receives TSEP approval for their transmission load request the first entity to build regardless of the TSEP approval date is granted the expansion, and the remaining entity would have to re-apply for a new TSR Study as the BPA network would have since changed from their initial TSR Study.

BPA Transmission Study & Expansion Process - TSEP

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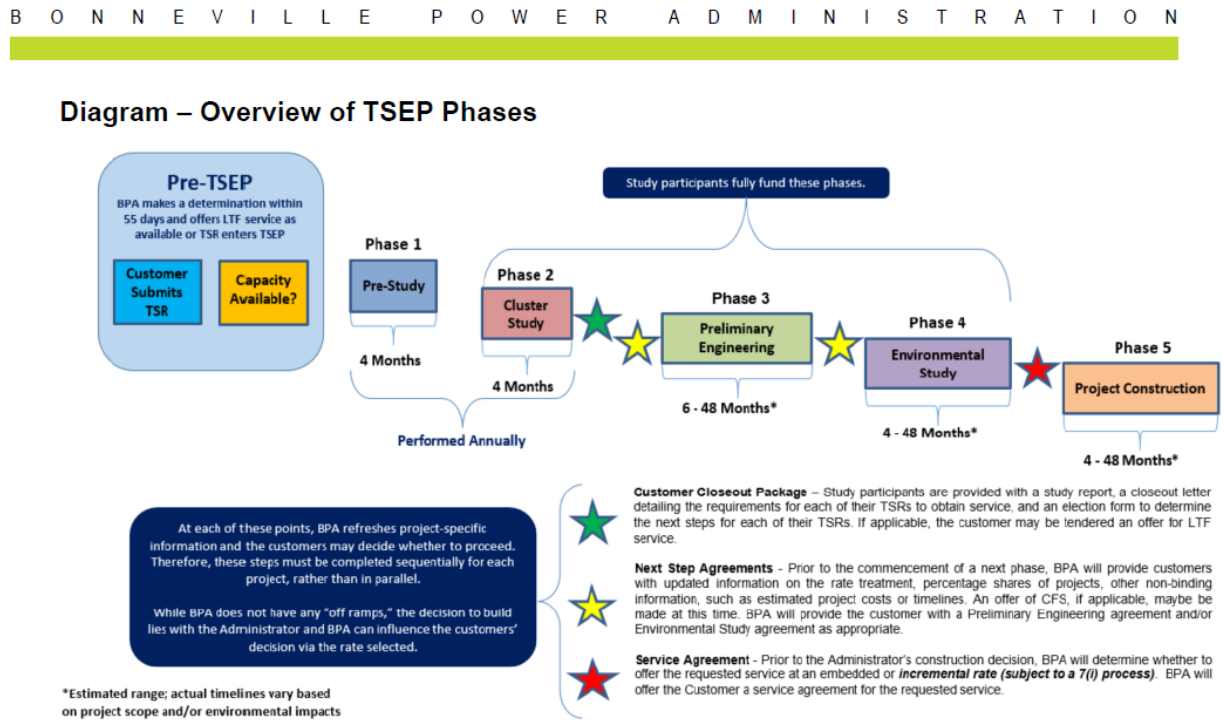
[5] Okanogan PUD Electric Rates: New Large Single Load https://www.okanoganpud.org/electric/rates
[6] Bonneville Power Administration https://www.bpa.gov/energy-and-services/transmission/acquiring-transmission/tsep
[7] Please reference Image: Depiction of Omak Electric Power Source

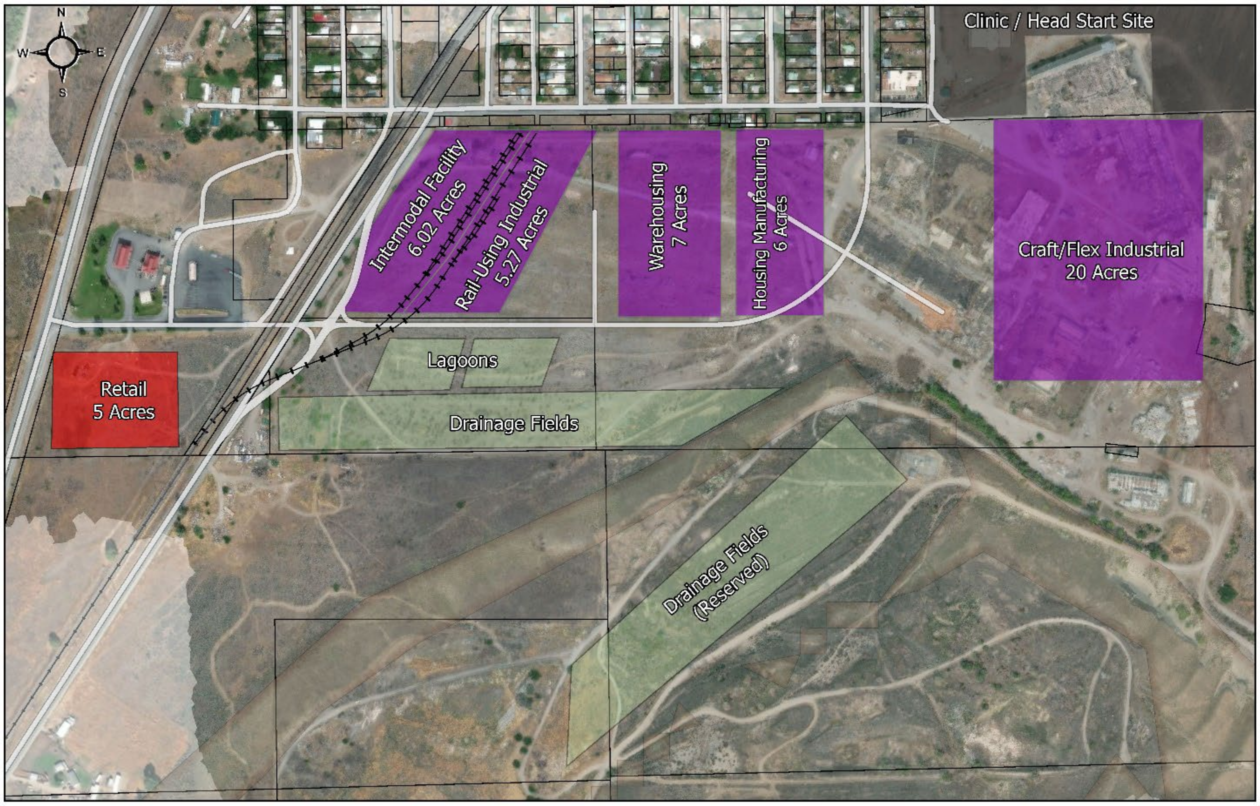


Bonneville Power Administration Transmission Service Request Process.

The Colville Confederated Tribes and Okanogan PUD #1 are mandated to adhere to BPA's business practices. Restoring the CCT Substation to its pre-existing capacity or providing power >1MW of power to the East Omak Industrial site via Okanogan PUD #1 would require adherence to the BPA TSR Study and Expansion Process (TSEP Version 8, 3/24/2023). [8]

BUILD OPTION ELECTRICAL REVIEW

[8] Bonneville Power Administration https://www.bpa.gov/energy-and-services/transmission/acquiring-transmission/tsep



The proposed Build Option for the East Omak Industrial Site is comprised of a Prefabricated Home Manufacturing Facility, an Intermodal Terminal, Warehousing, Light Industrial, Craft Industrial, Rail-Using Industrial, and Retail spaces. Note: the construction/build of any preferred usage options over 1MW of power will require adherence to the above-mentioned Okanogan PUD #1 New Large Load Agreement and the BPA TSR Study.

TABLE 1.1 EAST OMAK INDUSTRIAL SITE PREFERRED USES

PREFERRED USES	ACRES	LOW SF*	HIGH SF	SF ASSUMPTION	BUILDINGS ASSUMPTIONS FULL BUILD-OUT	TOTAL SF PER TYPE
PREFABRICATED HOUSING CLUSTER	4-7	70,000	122,000	122,000	1	122,000
INTERMODAL/TRANSLOADING TERMINAL	7-10	5,000	50,000	25,000	2	50,000
WAREHOUSING	5-20	5,000	200,000	100,000	2	200,000
FLEX LIGHT INDUSTRIAL (INFILL)	1.5+	12,000	25,000	25,000	25	25,000
CRAFT INDUSTRIAL (INFILL)	1+	8,000	35,000	35,000	1	35,000
RAIL-USING INDUSTRIAL	1.5-5	16,000	52,000	40,000	5	52,000
RETAIL	5	25,000	50,000	25,000	2	50,000

*SF: Square feet

TABLE 1.2 ESTIMATED CONNECTED LOAD DENSITY – WATTS/SF

PREFERRED USES	LIGHTING	MECHANICAL	RECEPTACLE	MISC. EQUIPMENT	TOTAL W/SF
PREFABRICATED HOUSING CLUSTER	1	2.4	5	2	10.4
INTERMODAL/TRANSLOADING TERMINAL	1	3	2	15	21
WAREHOUSING	1	2.4	2	5	10.4
FLEX LIGHT INDUSTRIAL (INFILL)	1	3	2	8	14
CRAFT INDUSTRIAL (INFILL)	1	3	2	8	14
RAIL-USING INDUSTRIAL	1	3	4	4	12
RETAIL	1	4	5	2	12

Data sourced from U.S. EIA[9]

TABLE 1.3 EAST OMAK INDUSTRIAL SITE PREFERRED USE ESTIMATED ELECTRICAL LOAD - MW

PREFERRED USES	ACRES	BUILDINGS ASSUMPTIONS FULL BUILD-OUT	TOTAL SF PER TYPE	ESTIMATED CONNECTED LOAD W/SF	TOTAL ESTIMATED CONNECTED LOAD MW*
PREFABRICATED HOUSING CLUSTER	4-7	1	122,000	10	1.27
INTERMODAL/TRANSLOADING TERMINAL	7-10	2	50,000	18	0.90
WAREHOUSING	5-20	2	200,000	10	2.00
FLEX LIGHT INDUSTRIAL (INFILL)	1.5+	25	25,000	14	0.35
CRAFT INDUSTRIAL (INFILL)	1+	1	35,000	14	0.49
RAIL-USING INDUSTRIAL	1.5-5	5	52,000	12	0.48
RETAIL	5	2	50,000	12	0.60

*MW: Megawatts

Tribal Options for Proposed Build Load Less Than 1MW

Option A: Preferred Build Uses must not exceed a total estimate load of 1MW. Okanogan PUD will assess East Omak Industrial Site as an entire system given its current infrastructure limitations. The estimated electrical improvement construction start time is 12-24 months. Improvements will include extending the power from Line C.

The proposed *Build Option* estimated total connected load of any (1) preferred use or a combination thereof would require a load <1MW given the currently available power to the East Omak Industrial Site.

[9] Electrical estimations calculated from historical data collected by the U.S. Energy Information Administration https://www.eia.gov/electricity/

If the Colville Confederated Tribes chose to build or allow the build of any preferred use(s) >1MW it would require one of the following options:

Tribal Options for Proposed Build Load Exceeding 1MW

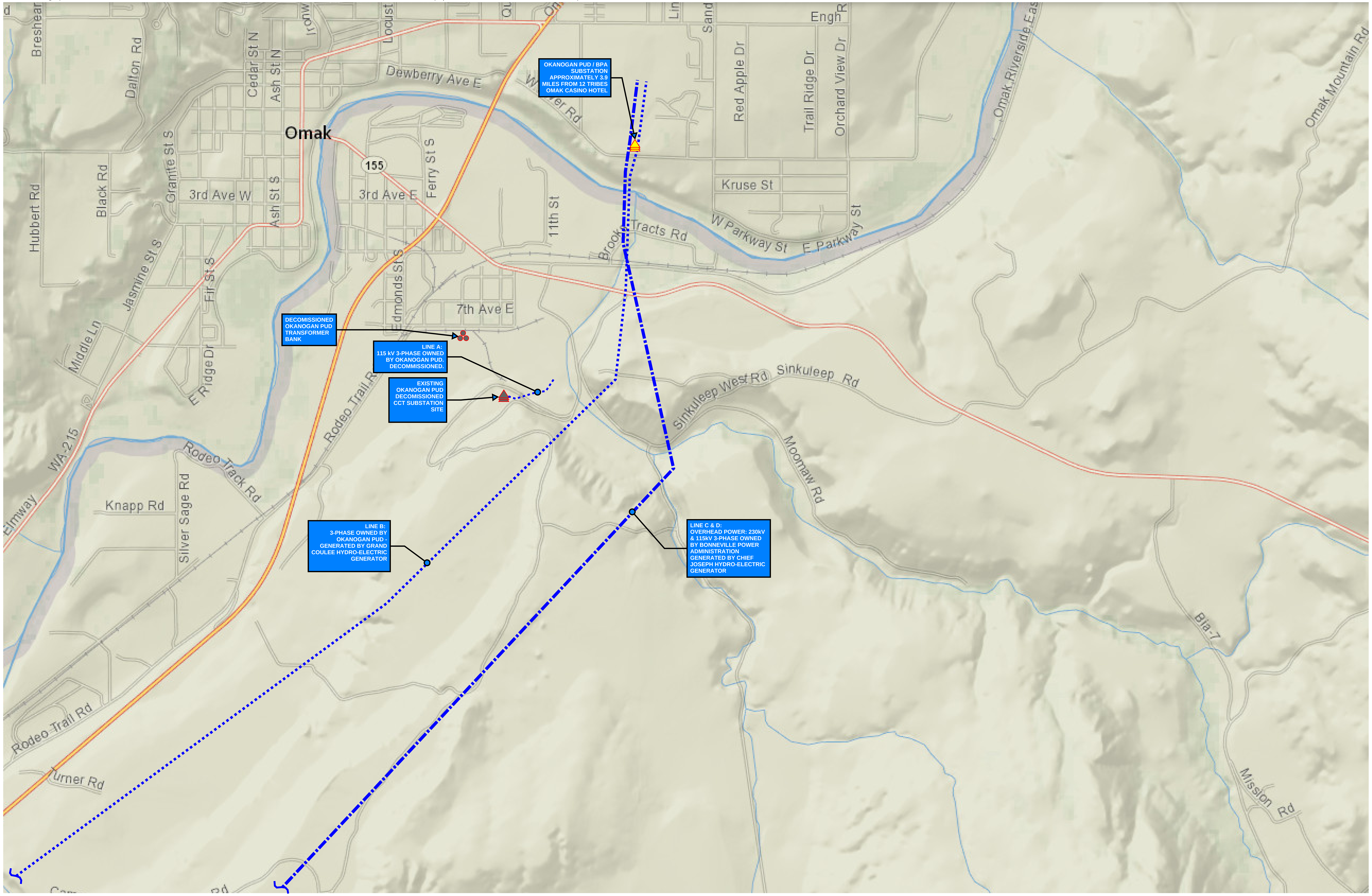
Option B: Tribal Sovereignty by rebuilding the CCT substation via a BPA Contractor Agreement[10] adhering to the BPA Transmission Study & Expansion Process – TSEP. Estimated construction start time of 24 months – 5 years.

Option C: Tribal pursuit of East Omak Industrial Site power exceeding 1 MW via Okanogan PUD #1 adhering to the BPA Transmission Study & Expansion Process – TSEP. Estimated construction start time of 24 months – 5 years.

Attachments: Appendix A: Map of East Omak Existing Power Grid

[10] BPA Contractor & Vendor Resources https://www.bpa.gov/energy-and-services/customers-and-contractors/bonneville-purchasing-instructions

National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp. | Bonneville Power Administration, Geospatial Services



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REVISIONS

OMAK INDUSTRIAL
Power Grid Assessment

OMAK, WA

PROJECT ID 23004

ENGINEER JRL

DRAFTER CAL

DRAWING NAME

OVERALL ELECTRICAL PLAN

APPENDIX A

SHEET NUMBER

E-001

Appendix F

Wastewater Collection System and Treatment Plant Feasibility Report

Wastewater Collection and Treatment Infrastructure Existing Conditions Report

Confederated Tribes of the Colville Reservation

East Omak, Colville Reservation, Washington

Prepared For:
Confederated Tribes of the Colville Reservation

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May 2023

SCJ ALLIANCE
CONSULTING SERVICES

Wastewater Collection and Treatment Infrastructure Existing Conditions Report

Project Information

Project:	East Omak Industrial Site Readiness Report
Prepared for:	Confederated Tribes of the Colville Reservation Agency Campus, 21 Colville Street Nespelem, WA 99155

Grant Program

Agency:	WA State Department of Commerce Office of Economic Development & Competitiveness 2001 6th Avenue Suite 2600. Seattle, WA 98121
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Project Reference:	SCJ #23-000139

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1 Project Description and Understanding

SCJ Alliance (SCJ) was engaged by the Confederated Tribes of the Colville Reservation (CCT) to develop a site readiness report for the Omak Industrial Site and Commerce Park, located in Omak Washington on the Colville Reservation. This report includes a review of the current wastewater utility conditions and an alternatives analysis, which explores different options for the construction of a new wastewater treatment plant (WWTP) to serve East Omak, the 12 Tribes Omak Casino Hotel, and the proposed future commercial developments shown in Figure 1.

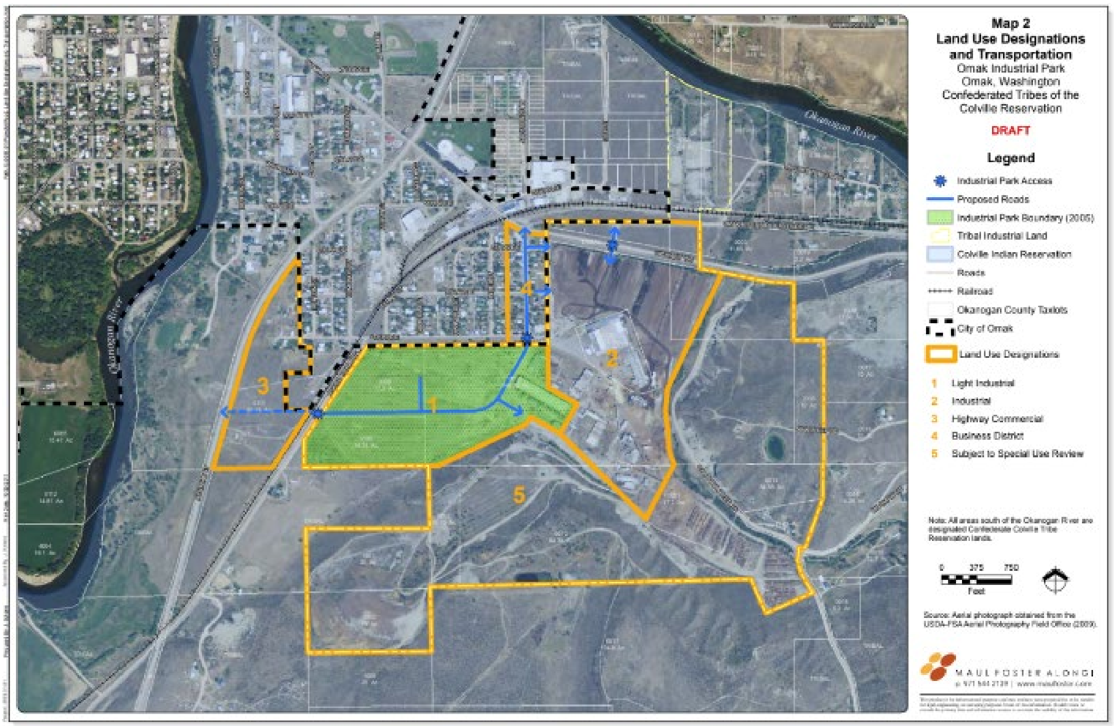

Figure 1. Land Use Designations

1.1 Project Background

The CCT originally completed a Master Plan for Omak Business and Industrial Park in 2005 and updated it in 2011. This plan included high-level recommendations for wastewater treatment, transportation improvements, and target industry analysis. Wastewater treatment findings from the 2011 report included 3 options:

Option 1: Collection and connection to the City of Omak sewer system.
Option 2: Collection and on-site treatment and disposal.
Option 3: Individual drain fields for each parcel within the industrial park.

The options above were referenced when deciding on a potential site and type of WWTP. It should be noted that the CCT wants to pursue options that support tribal sovereignty and self-sufficiency as much as possible.

1.2 Proposed Wastewater Treatment Facility Locations

Multiple site conditions were considered when selecting potential locations for the proposed WWTP. Those site conditions included proximity to the Okanogan River for discharging of treated effluent, soil type, topography, and vicinity to the existing sewer line running from the 12 Tribes Omak Casino Hotel (Casino) and East Omak. The potential sites are depicted in Figure 2 with most being located near the Okanogan River. However, several constraints were encountered that excluded Sites 2 to 7 from site selection. Those constraints will be discussed in section 2.4

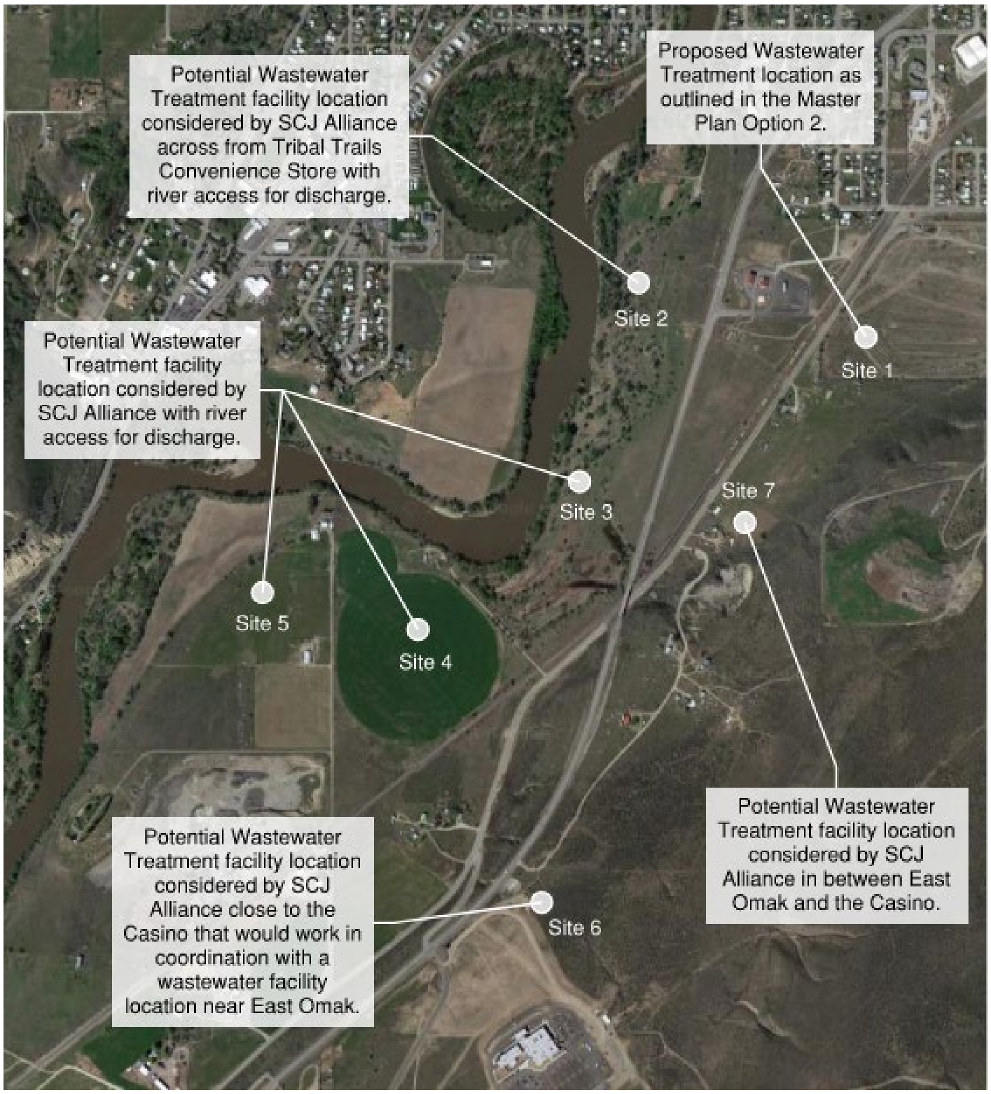

Figure 2. Potential Wastewater Treatment Facility Locations

2 Site Conditions

2.1 Soils

The soils in the areas of interest were determined to be of various types. Soil type is an important consideration for determining which type of WWTP should be used. Soil types can determine the location of collection system piping and/or the feasibility and location of wastewater stabilization ponds. Clays impact the possibility of a leach field concept, while bedrock influences pipe trenching plausibility. Preferred soils for treatment include gravel and cobble with good drainage. A description of the soil types found at the prospective sites as seen in Figure 3 will be described below with more specific information on soil types being provided with a geotechnical investigation.

The soil information in Figure 3 was obtained from the USDA Web Soil Survey (WSS). The WSS is the primary data and information source for soil and natural resources. Soil-type descriptions are provided by the USDA and described specifically for the potential sites below.

Figure 3. Soil Type

- Site 1 has Pogue fine sandy loam soils with 0 to 5 percent slopes and is well drained.
- Sites 2 and 3 are well-drained Okanogan loam with 0 to 5 percent slopes.
- Site 4 is Ellisforde silt loam with 0 to 5 percent slopes and is well drained.
- Site 5 is composed of Pogue stony fine sandy loam with 0 to 5 percent slopes and is somewhat excessively drained.

- Sites 6 and 7 are composed of Quincy loamy fine sand with 1 to 10 percent slopes and are excessively drained.

2.2 Proximity to Existing Sanitary Sewer Line

An existing sanitary sewer main exists between the 12 Tribes Omak Casino Hotel and East Omak along Okanogan-Omak East Road (Figure 4). The casino hotel is located about 1.30 miles south of the Industrial Site's center point. Based on the CCT's preference, a proposed wastewater treatment facility will be receiving flow from the Casino, so proximity to the existing sewer line will minimize the amount of pipe needed to make that connection, therefore, reducing cost.

Figure 4. Existing Sanitary Sewer Line

2.3 Topography

Topography played an integral role when considering proposed wastewater treatment facility locations. The ideal location is accessible via a gravity collection system to minimize cost. Site 1, the proposed wastewater treatment location as outlined in the Master Plan for Omak Business and Industrial Park Sanitary Sewer Option 2, is in an ideal location between East Omak and the Casino. The topography around Site 1 slopes down from the Casino in the south and down from East Omak in the north. Figure 5 illustrates the topography of Site 1.

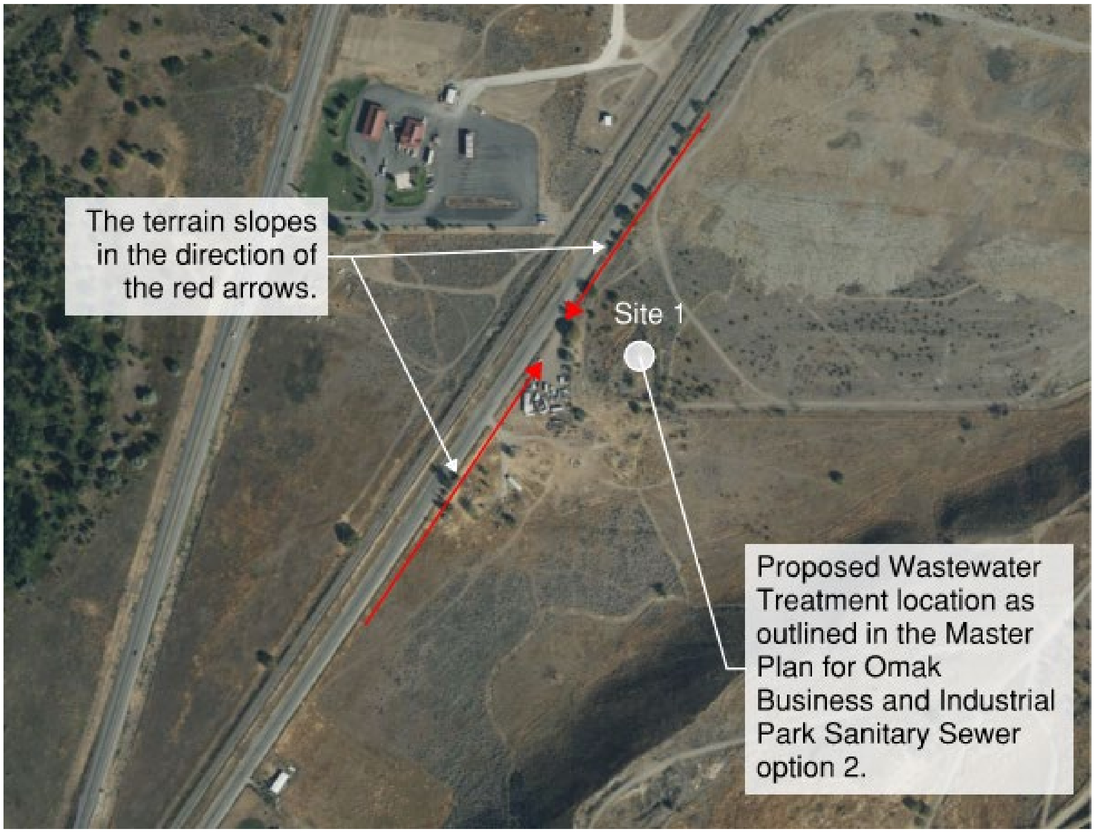

Figure 5. Slope at Proposed Site

2.4 Social and Cultural Constraints

Proposed WWTP sites 2-7 have a variety of limiting political and social issues that exclude them from further consideration to locate the WWTP. Those constraints are outlined below.

2.4.1 Private Property

The four sites illustrated in Figure 6 were designated as possible locations for the WWTP based on soil, topography, and proximity to existing infrastructure. All four were determined to be on private property. Based on conversations with CCT and casino hotel staff, nearby property owners would not be interested in cooperating with the development of a wastewater facility on their property.

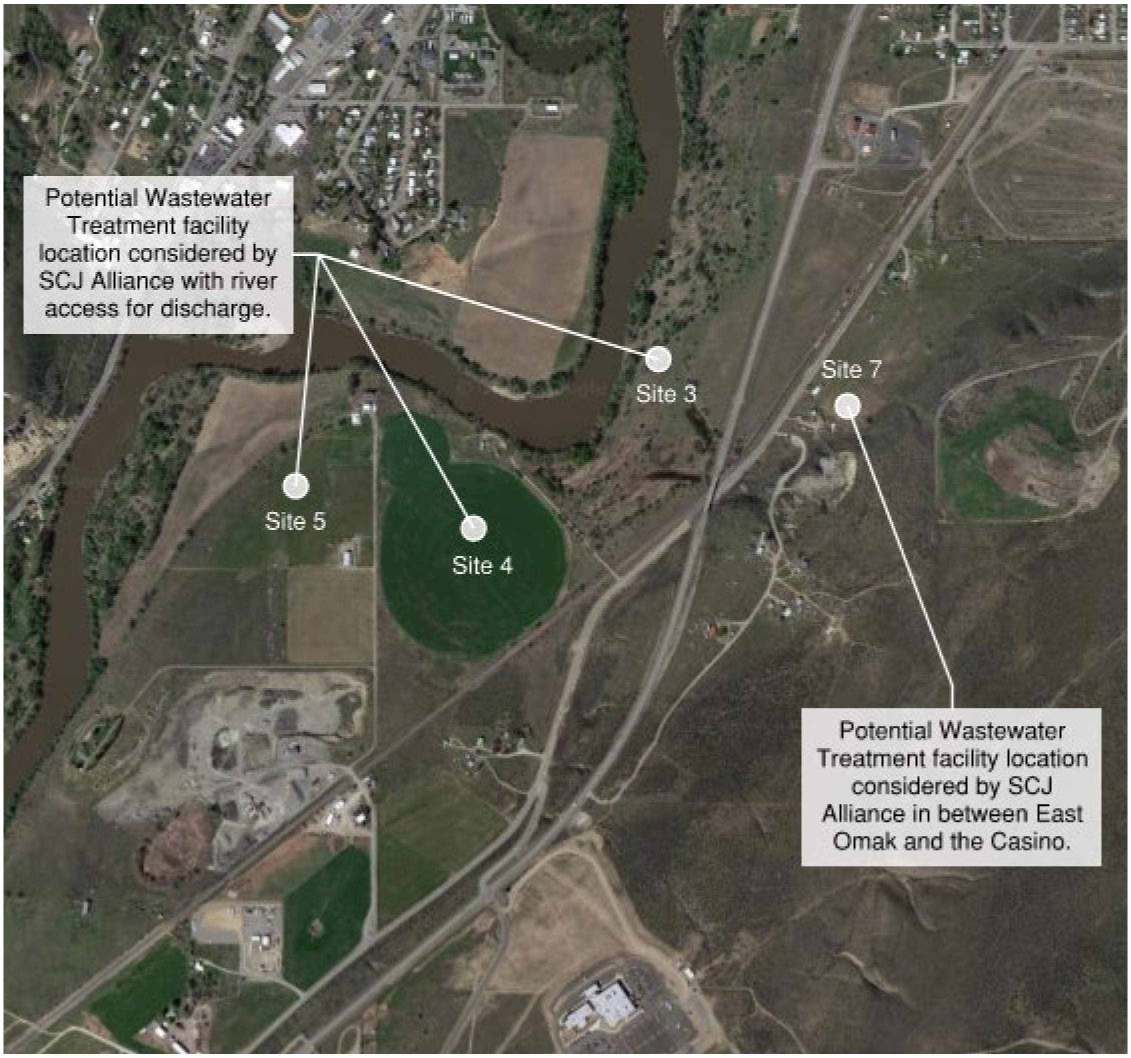

Figure 6. Private Properties

2.4.2 Archaeological

The parcel west of Tribal Trails Convenience Store (Figure 7) was also identified as a potential WWTP location but is known to be a site of human remains based on cultural surveying during the construction of the store. The presence of remains indicates this parcel is not feasible for ground disturbance activities. SCJ is following up with the CCT to understand the limitations associated with the discovery of human remains and request the cultural resources discovery report.

Figure 7. Inadvertent Discovery of Human Skeletal Remains Location

2.4.3 12 Tribes Omak Casino Hotel

Representatives from the 12 Tribes Omak Casino Hotel indicated that Colville Tribal Federation Corporation board members will more than likely not support a treatment facility on-site due to preferring economic development land uses (Figure 8). This also seems to be supported by an Alternatives Analysis conducted by PACE during the Casino lift station study, where treatment alternatives two and three consider a large onsite sewer system that was not pursued, likely due to cost and proximity to the Casino. The outcomes of the Alternatives Analysis are discussed in section 3.3 of this report.

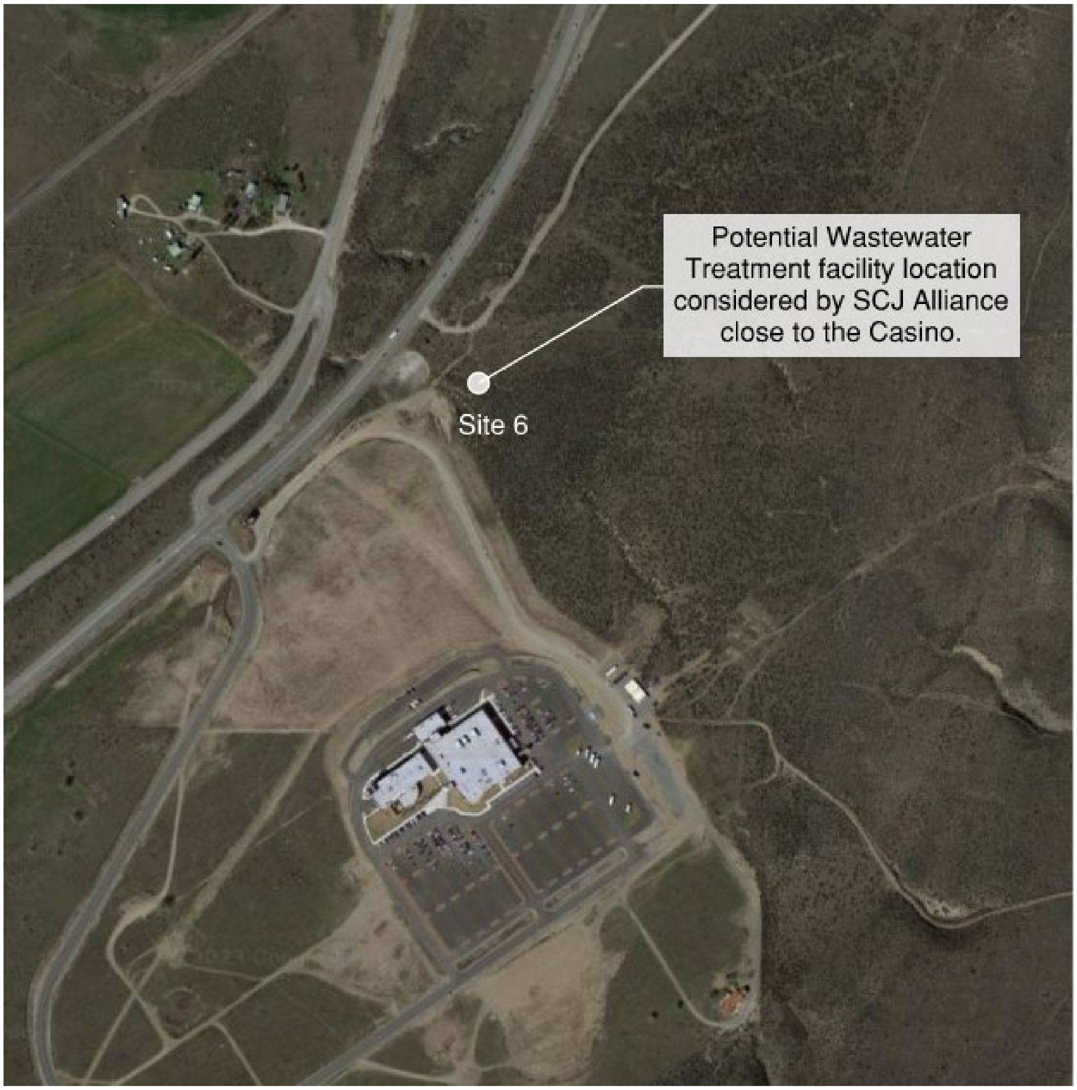

Figure 8. Potential Wastewater Treatment Facility Location near Casino

2.4.4 General Considerations

Discharging into the Okanogan River poses many problems with the timeframe and logistics of acquiring a National Pollution Discharge Elimination System (NPDES) permit through the Environmental Protection Agency (EPA). In particular, NPDES permits are difficult to obtain and require significant EPA oversight to maintain. Instead, a leach field, retention pond, or injection well is recommended for wastewater effluent discharge. These discharges might be located on-site or pumped to another location in the land use area.

Another consideration is the operational requirements for various types of treatment such as lagoon treatment versus mechanical treatment, the footprint and size, capital cost, operation and maintenance costs, operator licensing requirements, and discharge quality limitations. Operators will need to be properly trained and licensed in accordance with Washington State Department of Ecology (Ecology) regulations for the level of treatment selected (likely class 1 or 2 licensing requirements for mechanical treatment plants). A possible operation alternative is to execute a Memorandum of Agreement (MOA) between the City of Omak and CCT. An MOA allows for the City of Omak to take over the maintenance and operation of the collection and treatment systems; however, this may impact tribal self-sufficiency and sovereignty goals, as well as require agreement by both entities.

3 Existing East Omak Collection System Condition Assessment

3.1 Existing Sewer System Details

CCT representatives provided information about an existing sanitary sewer line running from the 12 Tribes Omak Casino Hotel to a connection point with the existing sewer line in East Omak. There are known issues with the flow of sewage and odor from the Casino to the connection with the existing sanitary sewer at the intersection of 8^{th} Avenue and the alley between Ferry Street and Garfield Street. This is also the wastewater tie-in location for the East Omak site used when the mill was previously operating. The line connection from 8^{th} Avenue to the Casino does not include manholes but has periodic cleanouts.

3.2 East Omak Sewer Flow Projections

Due to a lack of available flow data from the existing East Omak collection system, flow projections were estimated by assuming typical wastewater production per residential dwellings and commercial buildings located within the city limits on the east side of the Okanogan River and connected to the existing collection system.

Wastewater flows were estimated by pulling in building footprints for East Omak into the geographic information system software ArcGIS Pro. Those footprints were then compared to streetside and satellite imagery to determine the type of building as residential or commercial. Commercial buildings were further analyzed for their type of use as defined in Tables 1 and 2. The Criteria for Sewage Works Design by Ecology was referenced to estimate residential dwelling flow. Ecology estimates that flow as 100 gallons per day (gpd) per person. To determine the estimated flow of residential dwellings in East Omak that estimated flow was multiplied by the estimated per person per dwelling total. That per person per dwelling total was estimated by dividing the estimated population of 742 by the estimated 434 residential dwellings. To provide for a margin of error and buffer the total per person per household of 1.7 was rounded to 2 persons per household.

Table 1. Typical wastewater flow rates from commercial sources

Table 3-4. Typical wastewater flow rates from commercial sources[a,b]

Facility	Unit	Flow, gallons/unit/day Range	Flow, gallons/unit/day Typical	Flow, liters/unit/day Range	Flow, liters/unit/day Typical
Airport	Passenger	2–4	3	8–15	11
Apartment house	Person	40–80	50	150–300	190
Automobile service station[c]	Vehicle served	8–15	12	30–57	45
	Employee	9–15	13	34–57	49
Bar	Customer	1–5	3	4–19	11
	Employee	10–16	13	38–61	49
Boarding house	Person	25–60	40	95–230	150
Department store	Toilet room	400–600	500	1,500–2,300	1,900
	Employee	8–15	10	30–57	38
Hotel	Guest	40–60	50	150–230	190
	Employee	8–13	10	30–49	38
Industrial building (sanitary waste only)	Employee	7–16	13	26–61	49
Laundry (self-service)	Machine	450–650	550	1,700–2,500	2,100
	Wash	45–55	50	170–210	190
Office	Employee	7–16	13	26–61	49
Public lavatory	User	3–6	5	11–23	19
Restaurant (with toilet)	Meal	2–4	3	8–15	11
Conventional	Customer	8–10	9	30–38	34
Short order	Customer	3–8	6	11–30	23
Bar/cocktail lounge	Customer	2–4	3	8–15	11
Shopping center	Employee	7–13	10	26–49	38
	Parking space	1–3	2	4–11	8
Theater	Seat	2–4	3	8–15	11

[a] Some systems serving more than 20 people might be regulated under USEPA's Class V Underground Injection Control (UIC) Program. See http://www.epa.gov/safewater/uic.html for more information.
[b] These data incorporate the effect of fixtures complying with the U.S. Energy Policy Act (EPACT) of 1994.
[c] Disposal of automotive wastes via subsurface wastewater infiltration systems is banned by Class V UIC regulations to protect ground water. See http://www.epa.gov/safewater/uic.html for more information.

Source: Crites and Tchobanoglous, 1998.

Table 3-5. Typical wastewater flow rates from institutional sources[a]

Facility	Unit	Flow, gallons/unit/day Range	Flow, gallons/unit/day Typical	Flow, liters/unit/day Range	Flow, liters/unit/day Typical
Assembly hall	Seat	2–4	3	8–15	11
Hospital, medical	Bed	125–240	165	470–910	630
	Employee	5–15	10	19–57	38
Hospital, mental	Bed	75–140	100	280–530	380
	Employee	5–15	10	19–57	38
Prison	Inmate	80–150	120	300–570	450
	Employee	5–15	10	19–57	38
Rest home	Resident	50–120	90	190–450	340
	Employee	5–15	10	19–57	38
School, day-only:					
With cafeteria, gym, showers	Student	15–30	25	57–110	95
With cafeteria only	Student	10–20	15	38–76	57
Without cafeteria, gym, or showers	Student	5–17	11	19–64	42
School, boarding	Student	50–100	75	190–380	280

[a] Systems serving more than 20 people might be regulated under USEPA's Class V UIC Program. See http://www.epa.gov/safewater/uic.html for more information.

Source: Crites and Tchobanoglous, 1998.

Table 3-6. Typical wastewater flow rates from recreational facilities[a]

Facility	Unit	Flow, gallons/unit/day Range	Typical	Flow, liters/unit/day Range	Typical
Apartment, resort	Person	50–70	60	190–260	230
Bowling alley	Alley	150–250	200	570–950	760
Cabin, resort	Person	8–50	40	30–190	150
Cafeteria	Customer	1–3	2	4–11	8
	Employee	8–12	10	30–45	38
Camps:					
Pioneer type	Person	15–30	25	57–110	95
Children's, with central toilet/bath	Person	35–50	45	130–190	170
Day, with meals	Person	10–20	15	38–76	57
Day, without meals	Person	10–15	13	38–57	49
Luxury, private bath	Person	75–100	90	280–380	340
Trailer camp	Trailer	75–150	125	280–570	470
Campground-developed	Person	20–40	30	76–150	110
Cocktail lounge	Seat	12–25	20	45–95	76
Coffee Shop	Customer	4–8	6	15–30	23
	Employee	8–12	10	30–45	38
Country club	Guests onsite	60–130	100	230–490	380
	Employee	10–15	13	38–57	49
Dining hall	Meal served	4–10	7	15–38	26
Dormitory/bunkhouse	Person	20–50	40	76–190	150
Fairground	Visitor	1–2	2	4–8	8
Hotel, resort	Person	40–60	50	150–230	190
Picnic park, flush toilets	Visitor	5–10	8	19–38	30
Store, resort	Customer	1–4	3	4–15	11
	Employee	8–12	10	30–45	38
Swimming pool	Customer	5–12	10	19–45	38
	Employee	8–12	10	30–45	38
Theater	Seat	2–4	3	8–15	11
Visitor center	Visitor	4–8	5	15–30	19

[a] Some systems serving more than 20 people might be regulated under USEPA's Class V UIC Program.

Source: Crites and Tchobanoglous, 1998.

Table 2. Design Basis for New Sewage Works

Discharge Facility	Design Units	Flow* (gpd)	BOD (lb/day)	SS (lb/day)	Flow Duration (hr)
Dwellings	per person	100	0.2	0.2	24
Schools with showers and cafeteria	per person	16	.04	.04	8
Schools without showers and with cafeteria	per person	10	.025	.025	8
Boarding schools	per person	75	0.2	0.2	16
Motels at 65 gal/person (rooms only)	per room	130	0.26	0.26	24
Trailer courts at 3 persons/trailer	per trailer	300	0.6	0.6	24
Restaurants	per seat	50	0.2	0.2	16

Discharge Facility	Design Units	Flow* (gpd)	BOD (lb/day)	SS (lb/day)	Flow Duration (hr)
Interstate or through-highway restaurants	per seat	180	0.7	0.7	16
Interstate rest areas	per person	5	0.01	0.01	24
Service stations	per vehicle serviced	10	0.01	0.01	16
Factories	per person per 8-hr shift	15-35	0.03-0.07	0.03-0.07	Operating period
Shopping centers	per 1,000 sq ft of ultimate floor space	200-300	0.01	0.01	12
Hospitals	per bed	300	0.6	0.6	24
Nursing homes	per bed	200	0.3	0.3	24
Homes for the aged	per bed	100	0.2	0.2	24
Doctor's office in medical center	per 1,000 sq ft	500	0.1	0.1	12
Laundromats, 9 to 12 machines	per machine	500	0.3	0.3	16
Community colleges	per student and faculty	15	0.03	0.03	12
Swimming pools	per swimmer	10	0.001	0.001	12
Theaters, drive-in type	per car	5	0.01	0.01	4
Theaters, auditorium type	per seat	5	0.01	0.01	12
Picnic areas	per person	5	0.01	0.01	12
Resort camps, day and night, with limited plumbing	per campsite	50	0.05	0.05	24
Luxury camps with flush toilets	per campsite	100	0.1	0.1	24

*Includes normal infiltration

This data provides a general insight into potential demands on a new wastewater treatment facility by building and use type. The estimated flow for the existing East Omak collection system is based on the commercial values provided in Table 2 combined with those of the residential dwellings usage of 100 gpd per person producing a total daily usage of 0.106 million gallons per day (mgd). It should be noted that East Side Park, which contains the Omak Stampede Rodeo Grounds is owned by the city of Omak. The park's wastewater is pumped across the Okanogan River and treated at the WWTP in Omak. The East Omak total combined with the peak usage from the 12 Tribes Omak Casino Hotel of 69,120 gpd as outlined in the 12 Tribes Resort Casino Colville Sewer Lift Station Engineering Design Report prepared by PACE seen in Table 3 totals 0.175 (mgd).

Table 3. Casino Peak Flows

Table 3: Peak Flows				
Discharge Facility	Design Unit	Flow per unit (gpd)	Flow per unit (gpm)	Resultant Flow (gpm)
Hotel (100% capacity)	per room	130	0.09	7.22
Casino & Restaurants	per 1,000 SF	600	0.31	32.30
1,000 Seat Event Center	per seat	5	0.0035	3.47
Laundry/Housekeeping	–	7200	5	5
			Peak Flow (gpm)	48.00

Peak Flow (Table 3):

- The hotel is 100% occupied (all 80 rooms are full)
- Flow rate from casinos and restaurants reaches 300 gpd per 1,000 square feet (upper limit for facilities modeled as shopping centers).
- The 1,000-seat theater is open.
- The flow rate from Laundry and Housekeeping is 5 gpm (7,200 gpd)

3.2.1 Infiltration and Inflow

Another consideration in selecting a WWTP is the effect of infiltration and inflow (I&I) on the system. Infiltration is the process of groundwater seeping into sewer pipes through points of weakness such as holes, cracks, and faulty joints. Inflow is the process of stormwater entering the sewer system from the yard, roof, and storm drains. It is important to estimate this I&I contribution as it can vastly increase the hydraulic capacity requirements of a WWTP. I&I will explore more in the Proposed Improvements, Alternatives, and Growth Projections Report when considering the capacity of the proposed WWTP.

3.2.2 Flow Data for Proposed Future Commercial Developments

These totals from East Omak and the 12 Tribes Omak Casino Hotel will be added to the estimated usage from the proposed commercial developments in the designated land use areas discussed in the Master Plan for Omak Business and Industrial Park. The amount of wastewater produced in those areas will vary depending on the industries selected. The flow rates will depend on the type of industry the CCT decides to pursue.

3.3 Casino Lift Station

Representatives from the 12 Tribes Omak Casino Hotel informed SCJ Alliance that a lift station and macerator (Figure 9) have been designed by PACE to address persistent flow and odor issues associated with the existing sewer main, running from the Casino to East Omak. The macerator and lift station projects are still in the early stages of construction, but the construction of a new wastewater treatment facility may impact the pump and the force-main design by PACE. The location and elevation of the proposed WWTP may require recalibration and/or redesign of the lift station pumps. Because the location of the proposed WWTP has not been finalized, we recommend that PACE select a pump that operates in the middle of its curve, to provide a buffer on either end for the required total dynamic head (TDH). Additionally, it’s recommended that the pumps be powered by variable frequency drives (VFDs), not only for surge protection but also for the ability to easily adjust pump speed after the proposed WWTP is commissioned.

Figure 9. Location of Macerator and Lift Station

3.4 Summary of Existing Conditions

In conclusion, the existing sewer system presents challenges and constraints to tribal sovereignty that support the need for a new wastewater treatment facility to service East Omak, the 12 Tribes Omak Casino Hotel, and planned development areas. The ideal location for the WWTP, based on these existing conditions is Site 1, which was originally outlined in the 2011 Master Plan for Omak Business and Industrial Park Wastewater Treatment, as Option 2 (see Figure 10 below). Many factors exclude the other sites considered for potential wastewater treatment facility development. Those factors include issues with private property, archaeological sites, stringent EPA permitting requirements for river discharging, and proximity to the Casino.

Another consideration is the design and construction of the macerator and lift station by the 12 Tribes Omak Casino Hotel to address flow and odor issues impacting the existing sewer main from the Casino to East Omak. Any new WWTP is likely to necessitate design revisions for the lift station by PACE. The lack of available flow data from East Omak provided challenges when trying to calculate flow rates. All available data was gathered to inform our flow estimates for the area. The absence of available certified and experienced wastewater treatment facility operators is another important consideration for the type of treatment selected. All these factors and constraints will be considered when determining what type of wastewater treatment system will best suit the estimated future needs of the CCT.

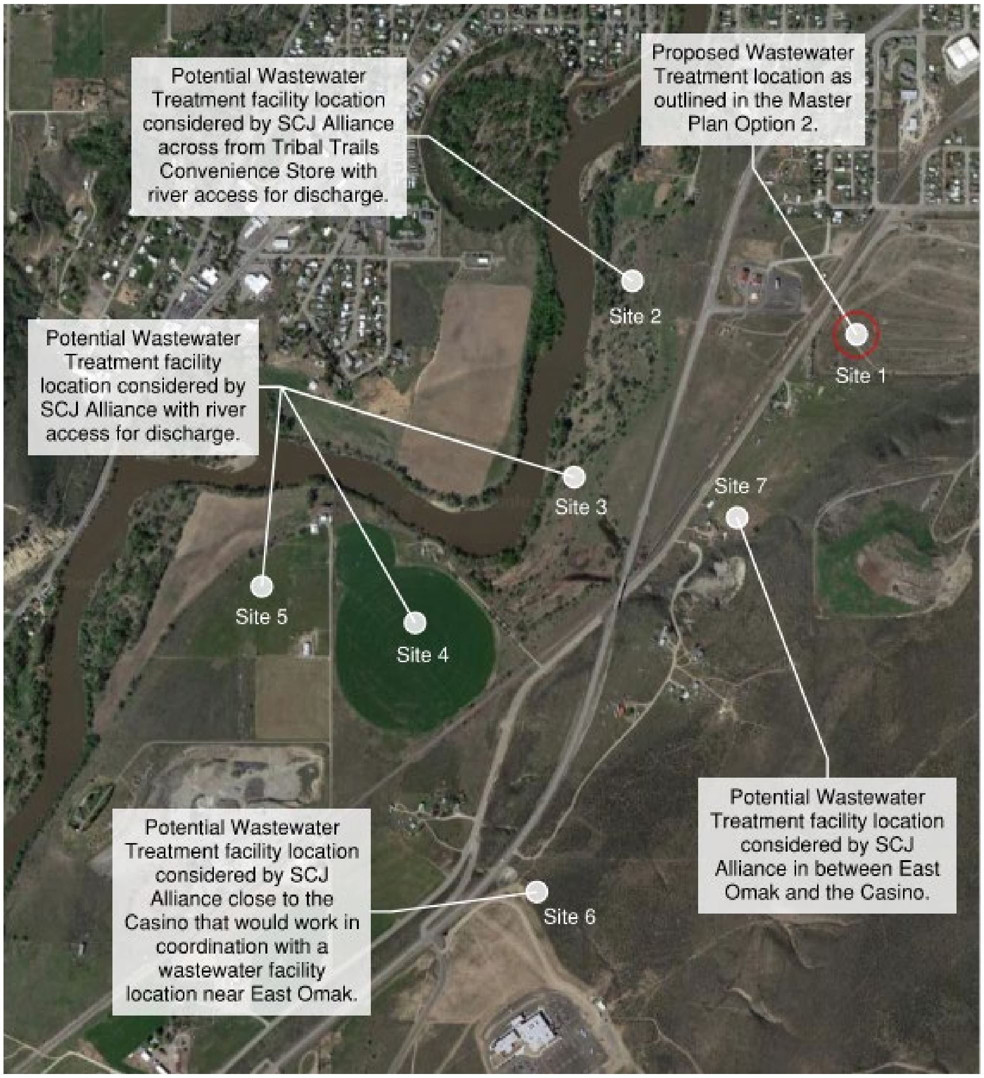

Figure 10. Ideal Wastewater Treatment Facility Location

4 Wastewater Projected Demand

The CCT is looking for wastewater treatment alternatives to serve existing residential and commercial development as well as future industry. This section includes an analysis of potential wastewater treatment alternatives that would serve East Omak, the Casino, and the proposed future commercial developments shown in Figure 11.

4.1 Hydraulic Loading

Future wastewater flow forecasts were estimated for East Omak, the Casino, and the proposed industrial area while also considering infiltration and inflow (I&I) rates for those areas. The methodology for these estimates can be found in section 3.2.

4.2 Proposed Industrial Development

The CCT has outlined potential development preferences for the areas of development seen in Figure 11.

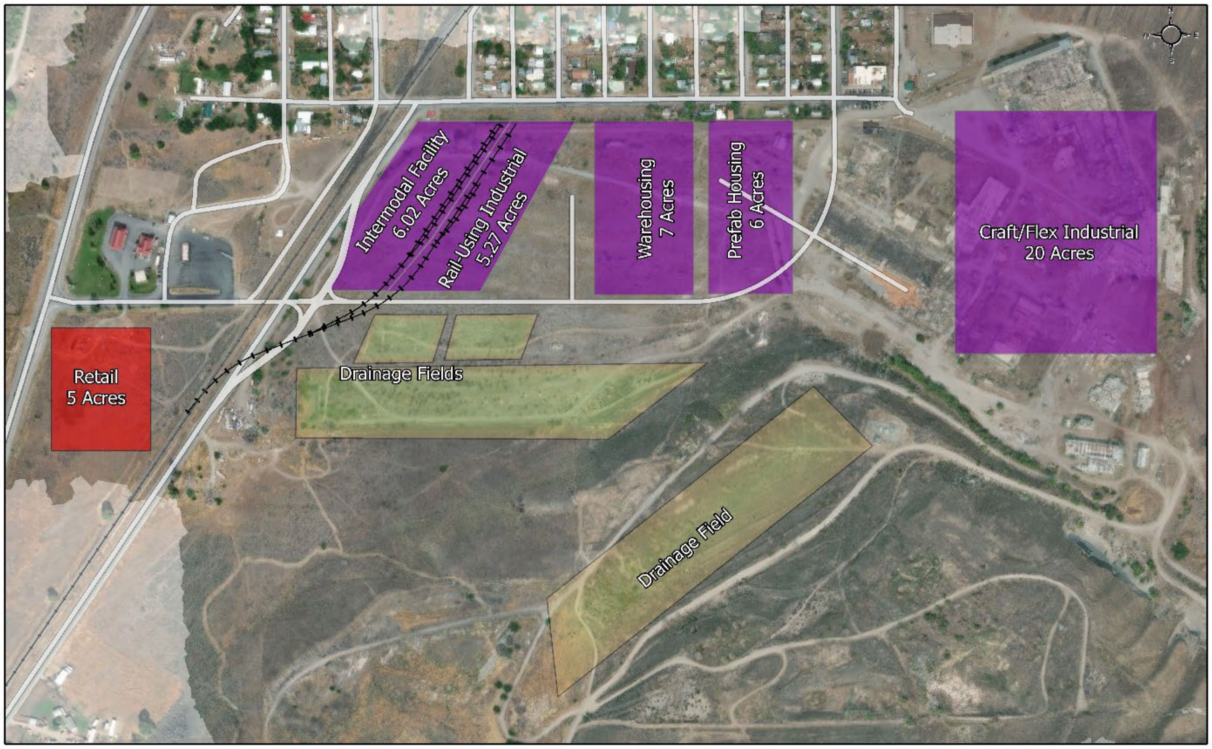

Figure 11. CCT East Omak Industrial Site Potential Industries and Layout

Wastewater flows for the proposed future industries were estimated using the Water Resources Handbook (Tables 23.9 and 23.10) by Larry Mays published in 1996. Water demands in gallons per day per employee were multiplied by the proposed number of employees per industry as seen in Table 1. It was assumed that wastewater production would be approximately equal to the water demands, with negligible unrecoverable losses such as irrigation, human consumption, and leakage. Wastewater flow for the proposed industrial park was therefore estimated to be 22,619 gallons per day (gpd) based on the information provided by the CCT.

Table 4. Water Usage Calculations.

Use	Estimated (sf)	Estimated Employees (ea)	Consumption per Employee (Gal/Emp*d)	Daily Consumption (gpd)	Annual Consumption (gallons)	Annual Consumption (ac-ft)	Qpeak (gph)	FS * Qpeak hour (gph)	Qpeak (gpm)	Assumed Building Type	Fire Flow (gpm)	Fire Flow Duration (hr)	Total Fire Flow Requirement (gal)
Intermodal Facilities	25,000	26	85	2,210	806,650	2.48	184	645	11	IIA	2,500	2	300,000
Craft Industrial	35,000	49	164	8,036	2,933,140	9.00	1,005	3,516	59	IIB	4,000	4	960,000
Prefabricated Housing	122,000	26	49	1,274	465,010	1.43	159	557	9	IIA	5,000	4	1,200,000
Rail-Using Industry	40,000	35	85	2,975	1,085,875	3.33	372	1,302	22	IIA	3,000	3	540,000
Warehousing	100,000	33	85	2,805	1,023,825	3.14	351	1,227	20	IIA	4,500	4	1,080,000
Retail	25,000	27	93	2,511	916,515	2.81	314	1,099	18	IIB	3,250	3	585,000
Flex Light Industrial	25,000	78	36	2,808	1,024,920	3.15	351	1,229	20	IIB	3,250	3	585,000
			Max	**8,036**	**2,933,140**	**9**					**5,000**	**4**	**1,200,000**
			Total	**22,619**	**8,255,935**	**25**	**2,735**	**9,574**	**160**				

4.3 Infiltration and Inflow

Infiltration and inflow must be considered when sizing a wastewater treatment plant (WWTP). Infiltration is the process of groundwater seeping into sewer pipes through points of weakness such as holes, cracks, and faulty joints. Inflow is the process of stormwater entering the sewer system from the yard, roof, and storm drains. It is important to estimate this I&I contribution as it can vastly increase the hydraulic capacity requirements of a WWTP.

4.4 East Omak Demand

I&I for East Omak was estimated by determining the inch diameter-miles of pipe (idm) and assuming a maximum allowable infiltration rate of 1,500 gpd/idm, as outlined in the Quick Guide for Estimating Infiltration and Inflow published by the United States Environmental Protection Agency (EPA) in 2014. The idm was calculated by taking the sum of each diameter of pipe multiplied by the miles of that diameter pipe. Refer to Section 3.2.

GIS data containing the diameter and lengths of sewer pipes for East Omak was provided by the City of Omak. However, the sewer data was missing a significant portion of the residential lateral connections in East Omak. Missing sewer laterals were therefore assumed to be 4” in diameter and 100ft long each.

4.4.1 12 Tribes Omak Casino Hotel

The 12 Tribes Omak Casino Hotel is currently undergoing a conversion of the existing gravity sanitary sewer line to a pressurized force main to address current persistent flow and odor issues. PACE Engineers has designed a macerator and lift station to address these problems. Pressurized pipes are not susceptible to infiltration due to having a higher hydraulic gradient than the surrounding groundwater, additionally, any small amounts of inflow into the lift station are considered negligible, therefore no I&I contributions from the casino were included in the estimate.

4.4.2 Proposed East Omak Industrial Development

The I&I contributions of the East Omak Industrial Park are unknown currently as the area is still in the conceptual design phase.

4.5 Total Flow Data Estimates

The estimated 23,000 gpd for the proposed industrial development area was combined with the estimated 106,000 gpd from East Omak, the estimated 70,000 gpd from the 12 Tribes Omak Casino Hotel, and the estimated I&I from East Omak of 83,000 gpd to produce a total estimated wastewater flow forecast of 0.282 million gallons per day (MGD).

5 Wastewater Treatment Alternatives

The process of treating wastewater creates two by-products: liquid waste, known as effluent, which must be discharged to a receiving source, and organic solids called biosolids, which must be hauled offsite and properly disposed of or repurposed.

5.1 Mechanical Plant

Mechanical plants typically use a process involving activated sludge, in which a reactor containing highly concentrated microorganisms is used to remove pollutants. A mechanical plant is best suited for areas where land area is limited and/or when the required discharge limits cannot be reliably met by other forms of treatment. Mechanical plants are typically more expensive in both capital cost and operation and maintenance (O&M) costs when compared to other types of treatment. Mechanical plants also require a higher level of operator training and certification than other forms of treatment.

5.2 Lagoon System

Lagoon treatment consists of a series of exterior aerated lagoon cells, which host a concentrated number of microorganisms used to treat wastewater. Lagoons generally perform well in warm to moderate climates, but treatment performance is reduced as water temperatures begin to drop during winter months and microorganisms become less active. Due to the relatively mild climate in Omak, a lagoon system would likely provide an adequate level of treatment for this application, which is understood to consist of residential-strength wastewater. Lagoons offer a cost-effective option that has low maintenance and oversight requirements for treating wastewater and storing biosolids for a long period. Eventually, biosolids accumulation will require the lagoons to be dredged and the solids to be hauled offsite and properly disposed of. This can be a significant cost and should be properly budgeted over a 5 to 10-year timeframe. Some potential disadvantages of lagoon treatment systems are the initial state/federal permitting process, large land use requirements, cold weather treatment performance, and financial planning for future biosolids removal.

c

Figure 12. Example of a Lagoon System

5.2.1 Lagoon System with Potential Pretreatment

Lagoon treatment consists of a series of exterior aerated lagoon cells, which host a concentrated number of microorganisms used to treat wastewater. Lagoons generally perform well in warm to moderate climates, but treatment performance is reduced as water temperatures begin to drop during winter months and microorganisms become less active. Due to the relatively mild climate in Omak, a lagoon system would likely provide an adequate level of treatment for this application, which is understood to consist of residential-strength wastewater.

Lagoons offer a cost-effective option that has low maintenance and oversight requirements for treating wastewater and storing biosolids for a long period. Eventually, biosolids accumulation will require the lagoons to be dredged and the solids to be hauled offsite and properly disposed of. This can be a significant cost and should be properly budgeted over a 5 to 10-year timeframe. Some potential disadvantages of lagoon treatment systems are the initial state/federal permitting process, large land use requirements, cold weather treatment performance, and financial planning for future biosolids removal.

5.2.2 Parallel Treatment

A parallel treatment option would include one treatment system, such as a lagoon system, to meet the current wastewater treatment needs of East Omak and the Casino. A second treatment facility, such as a lagoon system and/or mechanical plant, could then be constructed adjacent to the initial plant to serve the proposed industrial area when industry types are finalized, and wastewater loading can be more accurately estimated. This alternative would also provide a flexible option to meet the current and future needs of East Omak, the Casino, and the proposed Industrial Park.

5.2.3 Pump to Omak

A final option that's important to note is for existing and future wastewater from East Omak (all 3 contributors) to continue being pumped to the City of Omak WWTP for treatment. The 2011 Master Plan for Omak Business and Industrial Park states that there was adequate capacity in the sewage treatment plant to accommodate additional domestic discharge generated by the Industrial Park Development.

However, it was also indicated by City staff that there was no capacity to accommodate any process waste that may be generated by an industry that relies on heavy water use, such as food processing. Currently, no food processing industries are considered in the potential development preferences for the areas of development.

5.3 WWTP Discharge Alternatives

5.3.1 Surface Water Discharge

Surface water discharge requires the least amount of land area and the least amount of O&M costs when compared to other alternatives. The Okanogan River is a waterway of the United States of America and therefore, discharging WWTP effluent to the river would require a National Pollutant Discharge Elimination System (NPDES) permit. The permit would require continuous water quality monitoring of the effluent to ensure that discharge limitations are being met.

Surface water discharge limits are generally much stricter than other types of discharges, due to their direct interface with freshwater flora and fauna and with the public through recreational and domestic uses of the water source. It has been expressed by the CCT that this is the least favorable option due to the challenging permitting process and increased treatment requirements. SCJ has therefore not reviewed surface water discharge as a viable option based on this direction given by the CCT.

5.3.2 Land Treatment

The land treatment utilizes treated wastewater effluent to irrigate agricultural land. Treated effluent is applied at agronomic rates such that the crop uptake of nutrients is considered part of the treatment process. According to the Onsite Wastewater Treatment Systems Manual published by the EPA, agricultural applications require significant disinfection and pretreatment before application. Some examples of agricultural applications could be irrigating different types of crops like those listed below with irrigation estimates in gallons per day (gpd) per acre (ac). In Washington State, non-food crops such as alfalfa can be irrigated with treated effluent. However, food crops must be irrigated with Class A reclaimed water.

- Apples – 5,300 gpd/ac = 57 ac @ 0.3 MGD
- Dry Beans – 2,900 gpd/ac = 103 ac @ 0.3 MGD
- Lentils – 2,300 gpd/ac = 130 ac @ 0.3 MGD
- Peas – 3,100 gpd/ac = 97 ac @ 0.3 MGD
- Alfalfa – 3,500 gpd/ac = 86 ac @ 0.3 MGD

5.3.3 Class A Reclaimed Water

The Criteria for Sewage Works Design published by the Department of Ecology for the State of Washington in 2008 defines reclaimed water as water derived in any part from wastewater that is adequately treated for a specific purpose other than human consumption. Discharge limits for class A reclaimed water are more stringent than those for agricultural irrigation (land treatment) of non-edible crops. Reclaimed water can be used for irrigation of landscaping, irrigation of food crops, and industrial processes such as cooling.

5.3.4 Groundwater Discharge

WWTP effluent can also be discharged to groundwater. This can be accomplished by mechanically pumping effluent into the ground via an injection well or it can be gravity fed via an infiltration basin or drain field. The size of a groundwater discharge facility is highly dependent on the porosity of the soils that it is constructed on and surrounded by. This method of discharge is best suited for well-drained porous soils. A geotechnical investigation should be conducted to confirm soil types and infiltration rates before sizing the system.

5.3.5 Pump to Omak

A final option that's important to note is for existing and future wastewater from East Omak (all 3 contributors) to continue being pumped to the City of Omak WWTP for treatment. The 2011 Master Plan for Omak Business and Industrial Park states that there was adequate capacity in the sewage treatment plant to accommodate additional domestic discharge generated by the Industrial Park Development. However, it was also indicated by City staff that there was no capacity to accommodate any process waste that may be generated by an industry that relies on heavy water use, such as food processing. Currently, no food processing industries are considered in the potential development preferences for the areas of development.

5.4 Biosolids Disposal Alternatives

Biosolids are concentrated during the wastewater treatment process as solids are allowed to settle out of the solution and, once the liquid is decanted, the result is sludge. Sludge is then physically and chemically treated to further condense and dry to produce a semisolid, nutrient-rich substance, which can be disposed of or repurposed. Biosolids can have many applications and disposal options such as beneficial reuse as a fertilizer, incineration, or landfill disposal.

Biosolids are categorized into two categories: Class A or Class B. Class A biosolids are effectively pathogenically inert, meaning that all pathogens, including viruses, have been removed. Class B biosolids are 99.9% pathogen free but require additional processing to remove all pathogens. Most biosolids are stored in some capacity before being removed and disposed of or repurposed. The drying of biosolids, required to produce Class A or Class B, can have very high capital costs and O&M costs. Lagoon systems will typically not include a drying process and instead will be sized appropriately to allow long-term accumulation of sludge (approx. 5-10 years). Once the operational sludge storage is at its maximum limit it must either be pumped and hauled off as liquid sludge or dried on-site and hauled off. The cost of this long-term sludge removal can be very expensive and must therefore be properly budgeted as an O&M item.

5.4.1 Organic Loading

Organic loading is dependent on two parameters, Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). The concentration of these constituents will determine the level of treatment required as well as the rate at which biosolids accumulate. We were unable to get sufficient operational data from the Omak WWTP to estimate the organic loading more accurately at the proposed WWTP. We have therefore assumed typical BOD and TSS concentrations for residential-strength wastewater of 250 mg/L (each).

5.5 Treatment Alternatives Key Component Sizing

It is important to consider the footprint requirements for the various treatment and discharge alternatives being considered as they vary greatly. For instance, a mechanical plant would have a smaller footprint compared to a lagoon treatment system. When considering the footprint of the different discharge options, land treatment would have the greatest acreage requirement while surface water discharging the lowest. A lagoon treatment option with a drainage field combines the cost-saving benefit of a lagoon treatment system and the medium land use requirement of a drainage field. Sections 5.5.1 and 5.5.2 elaborate on the methodology used to calculate the sizing requirements needed for a lagoon treatment and drainage field discharge system to meet the demands of the area.

5.5.1 Groundwater Discharge Drain Field

The soil type plays a crucial role in drain field sizing due to the different hydraulic loading rate factors shown in WAC 246-272b *Table 1* (Table 5 below). It also influences the positioning of collection system piping and the feasibility and location of lagoons.

Table 5. Soil Type Hydraulic Loading Factors

Soil Type	Soil Textural Classification	Maximum Hydraulic Loading Rate, for residential strength effluent, gpd/sf
1	Gravelly and very gravelly coarse sands, all extremely gravelly soils.	1.0
2	Coarse sands.	1.0
3	Medium sands, loamy coarse sands, loamy medium sands.	0.8
4	Fine sands, loamy fine sands, sandy loams, loams.	0.6
5	Very fine sands, very fine loamy sand, very fine sandy loams; or silt loams and sandy clay loams with a moderate or strong structure (excluding platy structure).	0.4
6	Other silt loams, sandy clay loams, clay loams, silty clay loams.	Not suitable
7	Sandy clay, clay, silty clay, strongly cemented or firm soils, soil with a moderate or strong platy structure, any soil with a massive structure, any soil with appreciable amounts of expanding clays. Soils greater than 90% rock.	Not suitable

According to the soil information obtained from the USDA Web Soil Survey, the chosen drain field site exhibits well-drained characteristics with fine sandy loam soils and slopes ranging from 0 to 5 percent.

Figure 13. USDA Soil Web Soil Survey

After determining the projected effluent flow rate, we can consider the noted soil type to determine the sizing of the drain field. By using an application rate of 0.6 gals/sf/day for soil type 4 (fine sands), we can calculate the appropriate size for the proposed and reserve drain field. The drain field sizing calculation is provided below in Figure 14. It's important to note that the 468,875 square footage (10.8 acres) size mentioned is solely for the primary drain field depicted in Figure 15, and an equally sized dedicated reserve area must also be considered.

$$Primary\ Drainfield\ Size = \frac{Gallons\ Per\ Day}{Application\ Rate\ From\ Soil\ Type} = \frac{281{,}325\,\frac{gal}{day}}{\frac{0.6\,\frac{gal.}{sq.ft.}}{day}} = 468{,}875\ sq.ft.$$

Figure 14. Drain Field Sizing Calculation

A "reserve area" is also needed in the vicinity. A “reserve area” is an area of land approved for the installation of a Large Onsite Septic System (LOSS) and is dedicated to the replacement of the LOSS in the event of a system failure. Due to limited space in the Industrial Park area for placement of the reserve area, it may be located on the plateau to the southeast of the WTTP as seen in Figure 15 in an area of similar soil type and slope. In the event of a system failure at the main drainage field location, the reserve field will need to be accessed via a lift station.

5.5.2 Lagoons

When sizing lagoons, factors for consideration are wastewater strength, discharge limits, and storage need for sludge and/or treated liquid effluent, when agricultural irrigation discharge is seasonally limited. A system of this size would require an aerated treatment lagoon with a volume of 3-4 million gallons and an approximate footprint of 1-2 acres. If discharged to a land treatment site, there would also need to be 2-3 storage lagoons with a combined volume of approximately 60-70 million gallons and an approximate footprint of 22 acres (in addition to the agricultural acreage discussed in the land treatment section 5.3.2). If discharging solely to groundwater via a drain field, the size of the storage lagoons can be significantly reduced but the drain field would still be required and would have a minimum footprint of approximately 11 ac (as discussed in 5.5.1) (Figure 15). In either discharge scenario, the CCT is looking at a very large land area, approximately 20-40 acres.

Figure 15. Rendition of Treatment Lagoon & Drainage Fields

5.6 Alternatives Cost Considerations

At this point, there are still many unknowns, and therefore accurate cost estimates are not possible; however, we have provided some preliminary cost ranges (see below), which demonstrate the general cost magnitude required to design and construct these various alternatives. This cost review does not consider the acquisition of land, if applicable, which should be considered separately. This cost review also does not include the construction of sewer main extensions throughout the proposed industrial park development, because the site layout and specific building locations are unknown at this time.

A rough estimate of $2M - $5M should be budgeted separately for such future collection system improvements. Lastly, treatment alternatives that include a surface water discharge have not been considered in this cost review due to the direction provided by the CCT. It's important to note that a surface water discharge would likely have significant cost savings for both capital improvements as well as ongoing O&M when compared to the other discharge options.

Estimated Design & Construction Costs for WWTP Alternatives:

- *Mechanical Plant w/ Agricultural Irrigation Discharge ~ $30M - $40M*
- *Mechanical Plant w/ Groundwater Discharge ~ $25M - $35M*
- *Lagoon System w/ Agricultural Irrigation Discharge ~ $15M - $20M*
- *Lagoon System w/ Groundwater Discharge ~ $10M - $15M*
- *Continue discharging to the City of Omak WWTP ~ $2M*

6 Recommendations

Based on the expressed interests of the CCT, including cost, practicality, operational requirements, and permitting requirements, we recommend that the CCT proceed with the design of a lagoon treatment facility, hydraulically sized to serve East Omak, the 12 Tribes Omak Casino Hotel, and the proposed industrial park development. If plans for the industrial park development change in the future and a greater level of treatment is required to treat higher-strength industrial wastewater, the CCT can at that time design and construct a pretreatment facility for the industrial discharges rather than modifying the process of the entire WWTP.

We further recommend that the CCT proceed with a groundwater discharge as well as a potential future irrigation discharge, to supplement the groundwater discharge once agriculture and/or irrigated landscaping has been established. During spring runoff months, the water table is high, and the ground is saturated, therefore groundwater discharge capacity is reduced. Similarly, crops can only be irrigated during the spring and summer months. The WWTP will therefore benefit from the added flexibility of having multiple discharge options. The WWTP will require storage lagoons in addition to aerated treatment lagoons, to store treated effluent until it can be discharged to groundwater and/or be used to irrigate. These storage lagoons would also be used to store biosolids (sludge) long-term until the lagoons have reached capacity and must be removed.

Before proceeding with the design of the selected WWTP alternative, we recommend that the CCT collects additional information to aid in the design process and ensure that the system is properly sized. This information would include geotechnical investigations of the area; operational data from the City of Omak WWTP; review of land availability and potential land acquisition in the area of the proposed WWTP; further review of the proposed industries to refine treatment sizing; site survey data, including as-builts of existing water and sewer infrastructure; and review of anticipated EPA discharge limits for the proposed facility.

7 References

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