

**BURDEN OF PROOF STATEMENT FOR COMPREHENSIVE PLAN TEXT AND MAP AMENDMENT
AND ZONE CHANGE**

**APPLICANT/
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LAND USE
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LOCATION: The subject property is approximately 15.58 acres and is assigned map/tax lot number 151005D000100. The property is currently within the City of Sisters Urban Growth Boundary (UGB) and within City limits.

REQUEST: Consistent with the Land Use District Map and Text Amendment criteria outlined in SDC 4.7.300(B), the Applicant requests approval of a comprehensive plan map amendment and zone change from UAR to Light Industrial for the subject property, as well as a comprehensive plan text amendment to Chapters 9 and 14 of the City of Sisters Comprehensive Plan.

I. APPLICABLE PROCEDURES AND CRITERIA:

Sisters Development Code

- Chapter 4.7 Land Use District Map and Text Amendments

City of Sisters Comprehensive Plan

Oregon Administrative Rules (OARs)

660-009, Economic Development

660-012, Transportation Planning Rule

660-015, Oregon Statewide Planning Goals

II. PROPOSED FINDINGS OF FACT:

A. Location:

The subject property is located north of W Barclay Drive, between W Pine Street and W Hwy 20. The subject property is assigned map/tax lot number 151005D000100. The property is within the City of Sisters Urban Growth Boundary (UGB) and within City limits.

B. Lot of Record:

Tax lot 100 was established as Parcel 3 of Partition Plat 2008-30, recorded on July 9, 2008 as instrument #2008-29101.

C. Zoning/Plan Designation:

The subject property is designated and zoned Urban Area Reserve (UAR).

D. Site Description & Surrounding Uses:

The subject property is currently vacant and undeveloped. The subject property is outside of any FEMA flood zones. The property to the west is developed as a Best Western hotel and to the east are light industrial properties. South of Barclay, the properties are still owned by the Forest Service.

E. Proposal:

Consistent with the Land Use District Map and Text Amendment criteria outlined in SDC 4.7.300(B), the Applicant requests approval of the following:

- Comprehensive Plan Text Amendments to Chapter 9 and 14 (Exhibit D)
- Comprehensive Plan Map Amendment from UAR to Light Industrial (Exhibit B)
- Zone Change from UAR to Light Industrial (Exhibit B)

F. Exhibits and Attachments:

Exhibit A. Existing Mapping

Exhibit B. Proposed Mapping

Exhibit C. Legal Description of Area to be Rezoned

Exhibit D. Comprehensive Plan Proposed Text Amendments

Attachment A. Transportation Impact Study

Attachment B. Water/Sewer Memo

Attachment C. Title Report

Attachment D. Deed

Attachment E. EDCO Sisters Economic Development Goals/Missed Opportunities

Attachment F. EDCO Sisters 2018-20 Strategic Plan

Attachment G. Sisters Vacant Lands Chart - Employment Land 2019

Attachment H. EDCO Central Oregon and Sisters Building Activity an Employment Land Trends Q1 2020

Attachment I. EDCO Sisters Employment Land Trends

Attachment J. EDCO Central Oregon Industrial Lands Summary

Attachment K. City of Sisters Employment BLI - Industrial Districts

Attachment L. City of Sisters Employment BLI - All Districts

Attachment M. Employment Lands - Industrial Tax Lots

**Chapter 4.7 –
Land Use District Map and Text Amendments**

Sections:

- 4.7.100 Purpose**
- 4.7.200 Legislative Amendments**
- 4.7.300 Quasi-Judicial Amendment**
- 4.7.400 Conditions of Approval**
- 4.7.500 Record of Amendments**
- 4.7.600 Transportation Planning Rule Compliance**

4.7.100 Purpose

The purpose of this Chapter is to provide standards and procedures for legislative and quasi-judicial amendments to this Code and the Land Use District map. These amendments will be referred to as “map and text amendments.” Amendments may be necessary from time to time to reflect changing community conditions, needs and desires, to correct mistakes, or to address changes in the law.

4.7.200 Legislative Amendments

Legislative amendments are policy decisions made by City Council. They are reviewed using the Type IV procedure in Chapter 4.1, Section 600 and shall conform to Section 4.7.600, as applicable.

RESPONSE: This application includes proposed text amendments to the City Comprehensive Plan, which is a legislative amendment. The legislative criteria of 4.1.600 include:

4.1.600 Type IV Procedure (Legislative)

E. Decision-Making Considerations. The recommendation by the Planning Commission and the decision by the City Council shall be based on consideration of the following factors:

- 1. Approval of the request is consistent with the Statewide Planning Goals.**
- 2. Approval of the request is consistent with the Comprehensive Plan;**
- 3. The property and affected area is presently provided with adequate public facilities, services and transportation networks to support the use, or such facilities, services and transportation networks are planned to be provided concurrently with the development of the property. The applicant must demonstrate that the property and affected area shall be served with adequate public facilities, services and transportation networks to support maximum anticipated levels and densities of use allowed by the District without adversely impacting current levels of service provided to existing users; or applicant’s proposal to provide concurrently with the development of the property such facilities, services and transportation networks needed to support maximum anticipated level and density of use allowed by the District without adversely impacting current levels of service provided to existing users.**
- 4. Compliance with 4.7.600, Transportation Planning Rule (TPR) Compliance.**

RESPONSE: Compliance with the Statewide Planning Goals and Comprehensive Plan are demonstrated below. The portion of the application that is legislative

are proposed text amendments to the Comprehensive Plan, which do not include specific proposals for the subject property. As such, the demonstration of compliance with the TPR and assessment of adequate public facilities is associated with the comprehensive plan map amendment and zone change, which are addressed herein.

4.7.300 Quasi-Judicial Amendment

A. Quasi-Judicial Amendments. Quasi-judicial amendments involve the application of adopted policy to a specific development application or Code revision. Quasi-judicial map amendments shall follow the Type III procedure as governed by Chapter 4.1.500, using standards of approval in Subsection “B” below. The approval authority shall be as follows:

- 1. The Planning Commission shall review and recommend Land Use District map changes which do not involve comprehensive plan map amendments;**
- 2. The Planning Commission shall make a recommendation to the City Council on an application for a comprehensive plan map amendment. The City Council shall decide such applications; and,**
- 3. The Planning Commission shall make a recommendation to the City Council on a land use district change application that also involves a comprehensive plan map amendment application. The City Council shall decide both applications.**

RESPONSE: This application proposes three actions: 1. comprehensive plan text amendment, 2. comprehensive plan map amendment, and 3. zone change. The Applicant understands that the comprehensive plan map amendment and zone change will be reviewed by both the Planning Commission and City Council as quasi-judicial amendments.

B. Criteria for Quasi-Judicial Amendments. A recommendation or a decision to approve, approve with conditions or to deny an application for a quasi-judicial amendment shall be based on all of the following criteria:

- 1. Approval of the request is consistent with the Statewide Planning Goals;**

RESPONSE: Consistency with Statewide Planning Goals is demonstrated below.

- 2. Approval of the request is consistent with the Comprehensive Plan;**

RESPONSE: Consistency with the Comprehensive Plan is demonstrated below. Further, the Comprehensive Plan was developed to respond to the Statewide Planning Goals, which are also discussed below.

- 3. The property and affected area is presently provided with adequate public facilities, services and transportation networks to support the use, or such facilities, services and transportation networks are planned to be provided concurrently with the development of the property. The applicant shall update the City of Sisters Master Plans for Water, Sewer, Parks and Transportation Systems subject to City Council approval, to reflect impacts of the rezoning on those facilities and long-range plans. The applicant must demonstrate that the property and affected area shall be served with adequate public facilities, services and transportation networks to support maximum anticipated levels and densities of use allowed by the District without adversely impacting current levels of service provided to existing users; or applicant’s proposal to provide concurrently with the development of the**

property such facilities, services and transportation networks needed to support maximum anticipated level and density of use allowed by the District without adversely impacting current levels of service provided to existing users; and,

RESPONSE:

Water: Attachment B includes a water analysis, which addresses the adequacy of water facilities, as related to the subject property. The City's water infrastructure is outlined in the 2017 Water Capital Facilities Plan Update (WCFPU). As noted in this Plan, the subject property is already anticipated for development and will be required to connect the existing 12-inch water main on the Ponderosa Lodge property to the existing 12-inch water main in North Pine Street, which will improve system fire flow capacity. The water services include two categories - fire flow and water rights.

Fire Flow: Attachment B demonstrates that an 8-inch water main (rather than the required 12-inch) will be adequate to serve the property and meet fire flows of 2,500 gpm (or 1,500 gpm if the facilities are sprinklered). Additional water system layout details will be finalized through future development projects.

Water Rights: Attachment B includes a water volume analysis based on land use to determine acreage of water mitigation rights necessary to be purchased by the City, and the corresponding fee to be paid at building permit issuance to offset the City cost. Water volumes are typically calculated on a per capita basis, but this approach is not applicable to non-residential uses and the WCFPU does identify any water usage rates associated with non-residential uses. As directed by City staff, the water volume analysis shall utilize a volume of 2,000 gallons per acre per day (gpad) for the subject property.

With this water usage rate the acres of water rights to be purchased and the associated fee is calculated as follows:

$$15.58 \text{ acres} \times (2,000 \text{ gallons} / \text{acre} / \text{day}) = 11,373,400 \text{ gallons} / \text{yr} = 34.90 \text{ acre-ft} / \text{yr}$$

Reduce by 180 days per year (use 0.5) and 40% consumption factor:
 $(34.90 \text{ acre-ft} / \text{yr}) \times 0.5 \times 0.40 = 6.98 \text{ acre-ft} / \text{yr}$

One acre purchased of water rights provides 1.8 acre-ft/acre/yr at a cost of \$6,800/acre.

$$\text{Acres needed to be purchased: } (6.98 \text{ acre-ft}) / (1.8 \text{ acre-ft/acre}) = 3.88 \text{ acres}$$

Fee Calculation: 3.88 acres x (\$6,800/acre) = \$26,384 total due at building permit issuance. The fee total is for the entire project and will be divided on a per lot/acreage basis.

Sewer: Attachment B also includes a sanitary sewer infrastructure analysis. The City's Sanitary Sewer infrastructure is outlined in the Wastewater System Capital Facilities Plan Update (WSCFPU), current version dated February 2016. In this document, design flows for the City's collection system are calculated on an Equivalent Dwelling Unit (EDU) basis. Per City staff, UAR zoned areas were excluded from the WSCFPU planning document and therefore zero flow was assumed to be generated from these properties. Accordingly, there

were also no SDC funds assumed to be collected from this property that would contribute to system-wide improvements. Based on design flows provided by the City, the analysis of the downstream sanitary sewer infrastructure components confirms that the existing system is adequate to accommodate the additional design flow from the subject property.

Transportation: Attachment A includes a transportation impact study (TIS), which includes several conclusions to demonstrate that the subject property is served with adequate transportation networks, and where operations are currently operating or projected to operated in excess of maximum standards, mitigation can be implemented to offset potential impacts. A summary of the conclusions includes:

- Due to insufficient traffic volumes, traffic signal warrants are not projected to be met at the unsignalized study intersections of W Barclay Drive at N Pine Street and N Pine Street at US Highway 20 under any of the analysis scenarios.
- Three of the study intersections are either currently operating or projected to operate with v/c ratios in excess of the maximum allowable ODOT performance standards:
 - US Highway 20 at W Barclay Drive: Per the City’s Transportation System Plan (TSP), placing additional emphasis on Barclay Drive as an alternate route, particularly for trucks, will help distribute demand. This emphasis would serve to balance volumes at the roundabout, improving operation and extending the capacity of the intersection.
 - N Pine Street at US Highway 20: During peak hours when delays are long, drivers will self-select how they enter US Highway 20 to avoid excessive delays. Local traffic may choose a number of other routes to avoid US Highway 20 and utilize the local street system. For this reason, no mitigation is recommended.
 - N Locust Street at US Highway 20: The applicant proposes mitigation in the form of a proportional share payment for improvements at the intersection of N Locust Street at US Highway 20. The identified proportional share payment of \$98,469 will be due as a lump sum prior to site development.

The mitigation described above offsets the potential impacts from the project and avoids further degradation of key infrastructure in Sisters. Accordingly, the Transportation Planning Rule is satisfied.

- The proposed zone change will not produce types or levels of travel or access that are inconsistent with the functional classification of the existing transportation facility. In addition, any intersection impacts in excess of jurisdictional standards can be reasonably mitigated, as detailed in Attachment B.

4. Evidence of change in the neighborhood or community or a mistake or inconsistency in the comprehensive plan or land use district map regarding the property which is the subject of the application; and the provisions of Section 4.7.600, as is determined to be applicable by the city of Sisters.

RESPONSE: The basis for all three proposed actions (Comp Plan text amendment, Comp Plan map amendment, zone change) is due to changing needs in the City of Sisters. The City of Sisters has

experienced significant population growth over the past twenty years. Employment levels have reached a new high with strategic economic development efforts. The job number increases are in industries other than tourism, indicating that the local economy is becoming more diverse.

As noted in Attachment I, the North Sisters Business Park zone allows for a mixed use of commercial and residential. All but two sites are less than one acre; several are narrow and impacted by the RPZ (runway protection zone). This zone had only one owner-occupied building from 2009 until 2014. However, in the last six years, development at the business park has increased significantly. Six projects are complete and occupied with site plans approved for three more. Additionally, four lots were bought by a rapidly expanding company for near future development. Occupancy rate is 100%. Future tenants are signing leases before construction is complete.

The Sisters Light Industrial zone has nine vacant underdeveloped lots, however all are currently being utilized (Attachment I). Only one is being actively marketed, is adjacent to residential and requires access through a developed site that is occupied (also for sale). Currently, all underdeveloped lots are used by area businesses for parking, storage of raw materials, etc. Occupancy rate for the entire zone is nearly 100% with one site vacant while under construction.

In 2014, the City of Sisters approved a request to convert approximately 20 acres from designated future employment land to residential. The loss of employment land has not yet been replaced and the proposed applications are the first step to entitle the subject property to partially replenish the needed employment land.

Based on information from Economic Development for Central Oregon (EDCO), Sisters has missed five economic development opportunities recently due to very low inventory levels (Attachment H). Most businesses aren't able or do not want to endure the building construction process. A diverse supply of lot sizes and buildings in an LI zone is needed to attract more traded sector projects (Sisters Country Economic Development Strategic Plan). Local companies desire to stay and expand in Sisters, but will require buildings in the LI zone for their operations.

In conclusion, Sisters has not had enough available light industrial inventory to take advantage of opportunities. In addition, land that was rezoned from employment to residential needs to be replaced to capitalize on future opportunities and to retain local expanding companies. The proposed actions directly address this need for more light industrial lands, to meet the needs of the changing economic environment.

4.7.400 Conditions of Approval

A quasi-judicial decision may be for denial, approval, or approval with conditions. A legislative decision may be approved or denied.

RESPONSE: These applications for a Comprehensive Plan Map Amendment and Zone Change are quasi-judicial. Based on the responses provided herein, and the supporting documentation, it has been demonstrated that this quasi-judicial application should be approved.

4.7.500 Record of Amendments

The Community Development Department shall maintain a record of amendments to the text of this Code and the Land Use Districts map in a format convenient for public use.

RESPONSE: This is an action required of City staff and the Applicant understands that the City will comply with these requirements.

4.7.600 Transportation Planning Rule Compliance

A. When a development application includes a proposed comprehensive plan amendment or land use district change, the proposal shall be reviewed by the City to determine whether it significantly affects a transportation facility, in accordance with Oregon Administrative Rule (OAR) 660-012-0060. Significant means the proposal would:

- 1. Change the functional classification of an existing or planned transportation facility. This would occur, for example, when a proposal is projected to cause future traffic to exceed the capacity of “collector” street classification, requiring a change in the classification to an “arterial” street, as identified by the Transportation System Plan; or**
- 2. Change the standards implementing a functional classification system; or**
- 3. Allow types or levels of land use that would result in levels of travel or access what are inconsistent with the functional classification of a transportation facility; or**
- 4. The effect of the proposal would reduce the performance standards of a public utility or facility below the minimum acceptable level identified in the Transportation System Plan.**

B. Amendments to the Comprehensive Plan and land use standards which significantly affect a transportation facility shall assure that allowed land uses are consistent with the function, capacity, and level of service of the facility identified in the Transportation System Plan. This shall be accomplished by one of the following:

- 1. Limiting allowed land uses to be consistent with the planned function of the transportation facility; or**
- 2. Amending the Transportation System Plan to ensure that existing, improved, or new transportation facilities are adequate to support the proposed land uses consistent with the requirement of the Transportation Planning Rule; or,**
- 3. Altering land use designations, densities, or design requirements to reduce demand for automobile travel and meet travel needs through other modes of transportation.**

RESPONSE: Conformance with the Transportation Planning Rule is addressed below, under OAR 660-12-0060.

Conformance with the State Administrative Rules (OARs)

OAR 660-015, Statewide Planning Goals

Goal 1 - Citizen Involvement, “To develop a citizen involvement program that insures the opportunity for citizens to be involved in all phases of the planning process.” Statewide planning Goal 1 requires that the City provide the opportunity for citizens to be involved in the planning process.

RESPONSE: Notice of the public hearing to consider the proposed comprehensive plan text amendment, comprehensive plan map amendment and zoning ordinance amendment is expected to be posted,

mailed to neighbors, and published in the local newspaper. Citizens will be provided the opportunity to comment on the proposed amendments at the public hearings before the Planning Commission and the City Council, or in writing in advance of the hearings.

Goal 2 - Land Use Planning, *“To establish a land use planning process and policy framework as a basis for all decision and actions related to use of land and to assure an adequate factual base for such decisions and actions.”* Goal 2 outlines the basic procedures of Oregon’s statewide planning program. Land use decisions are to be made in accordance with a comprehensive plan, and that suitable "implementation ordinances" to put the plan's policies into effect must be adopted. It requires that plans be based on "factual information"; that local plans and ordinances be coordinated with those of other jurisdictions and agencies; and that plans be reviewed periodically and amended as needed.

RESPONSE: As required by Goal 2, the City has adopted criteria and procedures through the Sisters Development Code to evaluate and make land use decisions. Goal 2 requires periodic review and amendments to ordinances as needed and in accordance with the Comprehensive Plan. The proposed amendments meet the requirements of Goal 2 by following the appropriate procedures for amendments and by considering the goals and policies outlined in the Comprehensive Plan. The proposal will be reviewed according to the established local land use regulations, including the City’s Development Code and the Comprehensive Plan.

Goal 3 - Agricultural Lands

Goal 3 requires counties to inventory agricultural lands and to "preserve and maintain" them through farm zoning outside of urban growth boundaries.

RESPONSE: Goal 3 is not required for compliance within the Urban Growth Boundary. Additionally, the proposed map amendments do not adversely impact the ability of the City to plan for agricultural transition opportunities within the City.

Goal 4 - Forest Lands

This goal defines forest lands and requires counties to inventory them and adopt policies and ordinances that will "conserve forest lands for forest uses."

RESPONSE: The proposed map amendments are consistent with Forest Lands (Goal 4) and Goal policies, as they do not adversely impact the ability of the City to plan for the appropriate transition of Forest lands within the City of Sisters.

Goal 5 - Open Spaces, Scenic and Historic Areas and Natural Resources

Goal 5 covers more than a dozen natural and cultural resources such as wildlife habitats and wetlands. It establishes a process for each resource to be inventoried and evaluated. If a resource or site is found to be significant, a local government has three policy choices: preserve the resource, allow proposed uses that conflict with it, or strike some sort of a balance between the resource and the uses that would conflict with it.

RESPONSE: The proposed amendments are consistent with Goal 5 and the Goal policies, as they do not adversely impact the ability of the City to protect the important natural resource and environmental elements within the City. The subject properties have not been identified or listed as a Goal 5 resource for the City of Sisters.

Goal 6 - Air, Water and Land Resources Quality

This goal requires local comprehensive plans and implementing measures to be consistent with state and federal regulations on matters such as groundwater pollution. All waste and process discharges from future development, when combined with such discharges from existing development shall not threaten to violate, or violate applicable state or federal environmental quality statutes, rules and standards.

RESPONSE: The proposed amendments are consistent with Goal 6 and the Goal policies, as they do not adversely impact the ability of the City to protect air, water, and land resources quality. Any future development of the subject properties will be required to submit quadrant plan and subdivision plan applications, which are reviewed for compliance with water, sewer, stormwater, and transportation requirements.

Goal 7 - Natural Hazards

Goal 7 focuses on local government planning to protect people and property from natural hazards.

RESPONSE: The proposed amendments do not impact the City's ability to plan for natural hazards and mitigate risks. The subject property is not within the 100-year floodplain and the applicant is not aware of any known geologic faults on the property. There is no particular designation that makes the subject property more hazardous than any other properties in the area. The proposal is consistent with this goal.

Goal 8 - Recreational Needs

This goal calls for each community to satisfy the recreational needs of the citizens and visitors and, where appropriate, to provide for the siting of necessary recreational facilities including destination resorts.

RESPONSE: The proposed amendments do not impact the City's ability to plan for the recreational needs of the citizens and visitors. Additionally, the subject property has not been listed in any inventory of recreational needs, is not needed to provide recreational needs of the citizens of the state, and is not identified as a Goal 8 resources, therefore, Goal 8 is not directly applicable to this proposal.

Goal 9 - Economic Development

Goal 9 calls for diversification and improvement of the economy. It requires communities to inventory commercial and industrial lands, project future needs for such lands, and plan and zone enough land to meet those needs.

RESPONSE: The proposed amendments directly support the City's efforts to accommodate diversification and improvement of the economy by providing needed industrial lands. According to a recent EDCO report (see Attachment H), the Sisters area has missed five light industrial economic opportunities due to limited inventory. Of these five, four required one-acre or smaller lot sizes and one required a 55,000 sf lot size.

By early 2020, the amount of developable LI-designated lands inside the Sisters UGB has significantly decreased. Attachments K, L, and M illustrate the status of the City's recent inventory of employment lands within the UGB. These documents clearly demonstrate a severe lack of needed industrial land within the UGB. As the attachments indicate, there is currently only one light industrial parcel of 0.58 acres remaining in the City that is not developed, constrained, or utilized with an active use.

Development within the North Sisters Business Park zone has increased significantly and the occupancy rate is 100%. Current vacancy rates regionally are also lower than historic rates. Based on recent summaries by Economic Development for Central Oregon (EDCO), "Sisters has not had enough available light industrial inventory to take advantage of opportunities." EDCO further reports that the majority of light industrial lot needs in the area are currently less than one acre, but some flexibility in sizing is desired to accommodate an opportunity for a larger project.

Further, in 2014, more than half of the Three Sisters Business Park was rezoned from light industrial to residential. Justification for this change was the lull in lot sales and construction activity during and following the recession. The proposed comprehensive plan amendment and zone change of the subject property (from UAR to LI) support Goal 9 by replenishing a portion of these lost light industrial lands.

Goal 10 - Housing

This goal specifies that each city must plan for and accommodate needed housing types, such as multifamily and manufactured housing. It requires each city to inventory its buildable residential lands, project future needs for such lands, and plan and zone enough buildable land to meet those needs. It also prohibits local plans from discriminating against needed housing types.

RESPONSE: The proposed amendments do not impact the City's ability to provide for the housing needs of its citizens. The proposed amendments will not reduce residential inventories and the subject property has not been contemplated for residential uses.

Goal 11 - Public Facilities and Services

Goal 11 calls for efficient planning of public services such as sewers, water, law enforcement, and fire protection. The goal's central concept is that public services should be planned in accordance with a community's needs and capacities rather than be forced to respond to development as it occurs. OAR 660-11 implements Goal 11, and notes, "Cities or counties shall develop and adopt a public facility plan for areas within an urban growth boundary containing a population greater than 2,500 persons..."

RESPONSE: The proposed amendments do not adversely impact the City's ability to plan and develop a timely, orderly and efficient arrangement of public facilities. As addressed herein, the City has adequate water, sewer and transportation capacities to serve the subject property. Any future impacts of development will be mitigated at the time of development.

Goal 12 - Transportation

The goal aims to provide "a safe, convenient and economic transportation system." Goal 12 is implemented through the Transportation Planning Rule (TPR), OAR 660-012-0060, in addition to local land use regulations.

RESPONSE: The proposed amendments do not adversely impact the City's ability to provide a safe convenient and economic transportation system. Details of the transportation design within the subject property and connecting to the subject property will be reviewed in detail at the time of subdivision application.

Further, the Applicant submitted a TPR analysis within the Transportation Impact Study, prepared by Lancaster Mobley. The TPR analysis concluded that the TPR is satisfied for the following reasons:

The proposed zone change will not result in the need for additional changes to the functional

classification of existing or planned transportation facilities. The proposed zone change will not change any standards implementing the functional classification system. The proposed zone change will not produce types or levels of travel or access that are inconsistent with the functional classification of the existing transportation facility. In addition, the proposed development is not projected to degrade the performance of existing or planned transportation below performance standards identified in the City's Transportation System Plan. The data contained in this TIA is sufficient to address the impacts to the transportation system that will result from the zone change from UAR to LI. Transportation Planning Rule 660-012-0060 is satisfied for the proposed land use.

Goal 13 - Energy Conservation

Goal 13 requires that "land and uses developed on the land shall be managed and controlled so as to maximize the conservation of all forms of energy, based upon sound economic principles."

RESPONSE: The proposed amendments do not adversely impact the City's ability to create an arrangement and density of land uses to encourage energy conservation. In fact, the proposed amendments support the development of land within the UGB, near the center of the City, rather than outside of the UGB. The proposed amendments are the first step to entitle the subject property for needed light industrial uses within the City. Development of land within the UGB for light industrial uses encourages reduced vehicle miles traveled by keeping the destination within the city, rather than other regional cities or areas outside the city, supporting the City's goals for conservation. As such, compliance with Goal 13 is maintained.

Goal 14 - Urbanization

This goal requires cities to estimate future growth and needs for land and then plan and zone enough land to meet those needs. It requires cities to provide for an orderly and efficient transition from rural to urban land uses, and to accommodate urban population and employment inside urban growth boundaries, while ensuring efficient use of land.

RESPONSE: The proposed amendments directly support the City's efforts to accommodate urban populations and employment inside the urban growth boundary by creating much needed employment land within the UGB. According to a recent EDCO report (see Attachment H), the Sisters area has missed five light industrial economic opportunities due to limited inventory. Of these five, four required one-acre or smaller lot sizes and one required a 55,000 sf lot size.

By early 2020, the amount of developable LI-designated lands inside the Sisters UGB has significantly decreased. Attachments K, L, and M illustrate the status of the City's recent inventory of employment lands within the UGB. These documents clearly demonstrate a severe lack of needed industrial land within the UGB. As the attachments indicate, there is currently only one light industrial parcel of 0.58 acres remaining in the City that is not developed, constrained, or utilized with an active use. Development within the North Sisters Business Park zone has increased significantly and the occupancy rate is 100%. Current vacancy rates regionally are also lower than historic rates. Based on recent summaries by Economic Development for Central Oregon (EDCO), "Sisters has not had enough available light industrial inventory to take advantage of opportunities." EDCO further reports that the majority of light industrial lot needs in the area are currently less than one acre, but some flexibility in sizing is desired to accommodate an opportunity for a larger project.

Further, in 2014, more than half of the Three Sisters Business Park was rezoned from light industrial to

residential. Justification for this change was the lull in lot sales and construction activity during and following the recession. The proposed comprehensive plan amendment and zone change of the subject property (from UAR to LI) support Goal 14 by replenishing a portion of these lost light industrial lands.

Goals 15-19

RESPONSE: These goals pertain only to areas in western Oregon and are not applicable to these amendments.

OAR 660-009, Economic Development

660-009-0000

Intent and Purpose

The intent of the Land Conservation and Development Commission is to provide an adequate land supply for economic development and employment growth in Oregon. The intent of this division is to link planning for an adequate land supply to infrastructure planning, community involvement and coordination among local governments and the state. The purpose of this division is to implement Goal 9, Economy of the State (OAR 660-015-0000(9)), and ORS 197.712(2)(a) to (d). This division responds to legislative direction to assure that comprehensive plans and land use regulations are updated to provide adequate opportunities for a variety of economic activities throughout the state (ORS 197.712(1)) and to assure that comprehensive plans are based on information about state and national economic trends (ORS 197.717(2)).

RESPONSE: The proposed Comprehensive Plan text amendment, Comprehensive Plan map amendment and Zone Change are directly supportive of the intent and purpose of OAR 660-009, to assist in providing an adequate land supply for economic development and employment growth in the City of Sisters. Numerous EDCO documents (Attachments E, H, I and J) articulate local and regional industrial land trends, as well as a significant dearth of light industrial-zoned land within the City, which has resulted in several lost opportunities as industrial lands of the right size and/or quantity have not recently been available for prospective industrial companies.

Attachments K, L, and M illustrate the status of the City's recent inventory of employment lands within the UGB. These documents clearly demonstrate a severe lack of needed industrial land within the UGB. As the attachments indicate, there is currently only one light industrial parcel of 0.58 acres remaining in the City that is not developed, constrained, or utilized with an active use. The applicant's Comprehensive Plan Map amendment and zone change supporting information sufficiently address local and regional land use trends, and the shortage of industrial lands within the City of Sisters. For these reasons - demonstrated need, paired with directly addressing the need by creating more industrial lands - the proposed action is in direct support and compliance with OAR 660-009.

660-009-0025

Designation of Lands for Industrial and Other Employment Uses

Cities and counties must adopt measures adequate to implement policies adopted pursuant to OAR 660-009-0020. Appropriate implementing measures include amendments to plan and zone map designations, land use regulations, public facility plans, and transportation system plans.

RESPONSE: The City's Comprehensive Plan includes several policies in Chapter 9, focused on economic development. In particular, policy 6 of Chapter 9 states:

6. The City shall ensure an adequate supply of land for the needs of commercial, mixed-use and light industrial purposes.

As noted herein and via the multiple attachments, the amount of light industrial properties in the City is near zero, while the demand has significantly grown. The proposed amendments are in direct support of the above OAR 660-009-0020 requirement, by utilizing Plan text and map amendments and a zone change to enable development of needed employment lands (light industrial) that are currently lacking within the City's UGB.

(1) Identification of Needed Sites. The plan must identify the approximate number, acreage and site characteristics of sites needed to accommodate industrial and other employment uses to implement plan policies. Plans do not need to provide a different type of site for each industrial or other employment use. Compatible uses with similar site characteristics may be combined into broad site categories. Several broad site categories will provide for industrial and other employment uses likely to occur in most planning areas. Cities and counties may also designate mixed-use zones to meet multiple needs in a given location.

RESPONSE: As noted in the submitted EDCO Sisters Employment Land Trends summary (Attachment I), an adequate supply of light industrial lands are significantly lacking, with current occupancy of existing light industrial lands at 100%. The report goes on further to note that "a diverse supply of lot sizes and buildings in an LI zone is needed to attract more traded sector projects (Sisters Country Economic Development Strategic Plan)." The parcel subject to this application is approximately 15.59 (gross) acres, providing ample opportunity for flexible lot sizing and creation of multiple lots, both attributes that support the EDCO report and above OAR requirement.

(2) Total Land Supply. Plans must designate serviceable land suitable to meet the site needs identified in section (1) of this rule. Except as provided for in section (5) of this rule, the total acreage of land designated must at least equal the total projected land needs for each industrial or other employment use category identified in the plan during the 20-year planning period.

RESPONSE: These amendments are proposed by a property owner, not the City. As such, the property owner is not required to develop the City's 20-year planning forecast needs for industrial lands. However, the proposal directly supports the intent of the above requirement to provide a site for needed industrial land. As noted earlier, the subject property is approximately 15.59 acres, providing ample opportunity for flexible lot sizing and creation of multiple lots, both attributes that support the EDCO report and above OAR requirement. In addition, the proposal begins to replenish employment lands that were previously removed from the City's inventory at a time when the demand was low. (In 2014, approximately 20 acres of future employment land was rezoned to residential and has not yet been replenished, Attachment I).

(3) Short-Term Supply of Land. Plans for cities and counties within a Metropolitan Planning Organization or cities and counties that adopt policies relating to the short-term supply of land must designate suitable land to respond to economic development opportunities as they arise. Cities and counties may maintain the short-term supply of land according to the strategies adopted pursuant to OAR 660-009-0020(2).

(a) Except as provided for in subsections (b) and (c), cities and counties subject to this section must provide at least 25 percent of the total land supply within the urban growth boundary designated for industrial and other employment uses as short-term supply.

(b) Affected cities and counties that are unable to achieve the target in subsection (a) above may set an alternative target based on their economic opportunities analysis.

(c) A planning area with 10 percent or more of the total land supply enrolled in Oregon's industrial site certification program pursuant to ORS 284.565 satisfies the requirements of this section.

RESPONSE: The City's Comprehensive Plan includes policies to ensure adequate supply of lands, however, does not specifically include policies and data related to the short-term supply of land. However, this proposal directly supports an immediate short-term need for light industrial land, as all but one small light industrial parcel (0.58 acres) in the city are developed, constrained, or under active use (Attachment M). The short term need for light industrial land is immediate and dire; in fact, EDCO has documented multiple recent "missed opportunities" (Attachment E) due to the lack of available light industrial land. This proposal would enable the development of approximately 15.59 acres of light industrial land to respond to the current short-term needs.

(4) If cities and counties are required to prepare a public facility plan or transportation system plan by OAR chapter 660, division 011 or division 012, the city or county must complete subsections (a) to (c) of this section at the time of periodic review. Requirements of this rule apply only to city and county decisions made at the time of periodic review...

RESPONSE: This section is not applicable as the City is not undertaking a public facilities plan or transportation planning activities at this time.

(5) Institutional Uses. Cities and counties are not required to designate institutional uses on privately owned land when implementing section (2) of this rule. Cities and counties may designate land in an industrial or other employment land category to compensate for any institutional land demand that is not designated under this section...

RESPONSE: This section is not applicable as the City is not evaluating institutional uses or institutional lands at this time.

(6) Compatibility. Cities and counties are strongly encouraged to manage encroachment and intrusion of uses incompatible with industrial and other employment uses. Strategies for managing encroachment and intrusion of incompatible uses include, but are not limited to, transition areas around uses having negative impacts on surrounding areas, design criteria, district designations, and limiting non-essential uses within districts.

RESPONSE: The subject property, proposed to be designated and zoned light industrial, is appropriately located for a light industrial use, for multiple reasons:

- Subject property is located on the periphery of the city, with no existing uses directly adjacent to the north where it is zoned Forest.
- The proposal is an extension of the existing light industrial zone that currently exists to the east (see image below).

- o No residential zones abut the subject property.

No encroachment or intrusion of incompatible uses will result from this proposal; rather, it is an expansion of an existing light industrial zone on the east side of adjoining N. Pine Street. Additionally, the property owner to the west (zoned Highway Commercial) recently purchased a portion of the western part of the subject property, which will serve as a buffer between the two zones. No uses or structures are immediately adjacent to the subject property to the west, or any other side. Immediately to the south, the subject property is bordered by Barclay Drive, a natural buffer between zones. South of Barclay Drive, the property is currently owned by the US Forest Service. Any future development of that parcel will have the opportunity to design its uses and zones for compatibility with the existing and proposed light industrial zone.



(7) Availability. Cities and counties may consider land availability when designating the short-term supply of land. Available land is vacant or developed land likely to be on the market for sale or lease at prices consistent with the local real estate market. Methods for determining lack of availability include, but are not limited to:

- (a) Bona fide offers for purchase or purchase options in excess of real market value have been rejected in the last 24 months;
- (b) A site is listed for sale at more than 150 percent of real market values;
- (c) An owner has not made timely response to inquiries from local or state economic development officials; or
- (d) Sites in an industrial or other employment land category lack diversity of ownership within a planning area when a single owner or entity controls more than 51 percent of those sites.

RESPONSE: Attachments K, L, and M include recent (April 2020) City data on available lands. These documents demonstrate that only one 0.58-acre light industrial parcel is currently undeveloped, unutilized, unconstrained and vacant. All others are developed (and not for sale), constrained, (by the runway protection zone or exceptionally narrow), or utilized with an active use such as material and equipment storage, adjacent site parking, etc (and not for sale). In summary, there is only one parcel that could be developed without displacing current uses.

...

OAR 660-012-0060, Transportation Planning Rule

660-012-0060 Plan and Land Use Regulation Amendments

1. If an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation (including a zoning map) would significantly affect an existing or planned transportation facility, then the local government must put in place measures as provided in section (2) of this rule, unless the amendment is allowed under section (3), (9) or (10) of this rule. A plan or land use regulation amendment significantly affects a transportation facility if it would:

(a) Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);

RESPONSE: The proposed zone change will not result in the need for additional changes to the functional classification of existing or planned transportation facilities. Accordingly, this section is not triggered.

(b) Change standards implementing a functional classification system; or

RESPONSE: The proposed zone change will not change any standards implementing the functional classification system. Accordingly, this section is not triggered.

(c) Result in any of the effects listed in paragraphs (A) through (C) of this subsection based on projected conditions measured at the end of the planning period identified in the adopted TSP. As part of evaluating projected conditions, the amount of traffic projected to be generated within the area of the amendment may be reduced if the amendment includes an enforceable, ongoing requirement that would demonstrably limit traffic generation, including, but not limited to, transportation demand management. This reduction may diminish or completely eliminate the significant effect of the amendment.

(A) Types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;

(B) Degrade the performance of an existing or planned transportation facility such that it would not meet the performance standards identified in the TSP or comprehensive plan; or

(C) Degrade the performance of an existing or planned transportation facility that is otherwise projected to not meet the performance standards identified in the TSP or comprehensive plan.

RESPONSE: The proposed zone change will not produce types or levels of travel or access that are inconsistent with the functional classification of the existing transportation facility. Upon rezoning properties within the subject site, three study intersections are currently or projected to operate with v/c ratios in excess of acceptable levels of operation per their respective jurisdictional standards. However, these intersections may be reasonably mitigated as detailed in the *Mitigation Analysis* section of this report. The identified mitigation offsets the potential impacts from the project and avoids further degradation of key infrastructure in Sisters. Accordingly, the Transportation Planning Rule is satisfied. The data contained in the TIA is sufficient to address the impacts to the transportation system that will result from the zone change

from UAR to LI. Transportation Planning Rule 660-012-0060 is satisfied for the proposed land use.

Conformance with the City of Sisters Comprehensive Plan

Goal 1, Policy 1.1. The City of Sisters shall seek out and encourage public participation in all aspects of the City planning process.

RESPONSE: The proposed amendments are subject to the procedures of the Sisters Development Code, which provides for notice, opportunities for written comment, and public hearings before the City's Planning Commission and the City Council to allow for public participation in this planning process.

...

Goal 9, Policy 3. The City shall continue to partner with the Community Action Team of Sisters, the Chamber of Commerce, Economic Development for Central Oregon, and other economic development agencies, to improve local and regional economic development efforts, attract businesses, and enhance and diversify the City's economic base. The City will participate with these agencies in periodic updating of the *Sisters Strategic Action Plan for Economic Development*.

RESPONSE: The City routinely coordinates with multiple agencies and committees regarding economic development. In the case of this application, the Applicant coordinated with EDCO and DLCD, which in turn, communicated with Regional Solutions. EDCO provided third party data about the economic development trends and industrial land needs in Central Oregon and in Sisters. In particular, the EDCO reports (included as attachments) highlight the dearth of industrial land in Sisters, which has resulted in lost economic development opportunities. The proposed comp plan map and text amendments and associated zone change seek to partially remedy the issue of limited industrial land by rezoning a little over 15 acres as light industrial.

Goal 9, Policy 4. The City should support efforts to attract businesses providing family-wage employment opportunities.

RESPONSE: A key aspect of attracting businesses to Sisters is the availability of employment land. By 2020, the amount of developable employment land inside the Sisters UGB has significantly decreased. All of the light industrial parcels in Sisters are being utilized (nearly 100% occupancy for the entire zone), with only 9 lots (6.75 acres) listed as vacant (still utilized, but not developed). EDCO notes in Attachment H that, due to limited industrial lands within the City, there have been five recent lost opportunities. The proposed comprehensive plan text/map amendments and zone change are the first steps to entitle the land as light industrial land, in support of Goal 9, Policy 4 to attract businesses providing family-wage employment opportunities.

...

Goal 9, Policy 6. The City shall ensure an adequate supply of land for the needs of commercial, mixed-use and light industrial purposes.

RESPONSE: This application directly supports Goal 9, Policy 6, by proposing to create light industrial lands to replenish the industrial lands that were rezoned to residential in past years.

In 2007, the City removed nearly 5 acres net buildable acres of land (approximately 11.7 gross acres)

located in the Sun Ranch Mixed Use Community from the industrial land supply of the City. Also in 2007, the City re-zoned a net buildable acre (12.6 gross acres) parcel from Light Industrial to Residential and Multi-Family Sub-district for residential purposes. In 2014, more than half of the Three Sisters Business Park (approximately 20 acres) was rezoned from light industrial to residential. Justification for this change was the lull in lot sales and construction activity during and the years following the recession. As a result of these previous rezoning and the surge in economic development needs, the City has a dearth of industrial lands and an inadequate supply to serve the needs of development.

By early 2020, the amount of developable employment land inside the Sisters UGB has significantly decreased. Attachments K, L, and M illustrate the status of the City's recent inventory of employment lands within the UGB. These documents clearly demonstrate a severe lack of needed industrial land within the UGB. As the attachments indicate, there is currently only one light industrial parcel of 0.58 acres remaining in the City that is not developed, constrained, or utilized with an active use. The proposed application would create 15+ acres of much needed industrial land within the city limits, in direct support of Goal 9, Policy 6.

Goal 14, Policy 1. The City shall promote development within the UGB to minimize the cost of providing public services and infrastructure and to protect resource land outside the UGB.

RESPONSE: This application directly supports Goal 14, Policy 1 by entitling the subject property for development within the UGB, where public services and infrastructure are available. As noted herein and in Attachments H, I, and J, Sisters has a dearth of light industrial land that cannot support the local demand. Rather than proposing development outside of the UGB, this application promotes the development of currently vacant land within the UGB. Water, sewer and transportation services are available in the streets adjacent to the subject property and the submitted infrastructure analyses (Attachments A, B) demonstrate available capacity to serve the subject property.

Goal 14, General Requirements for United Forest Service Properties:

In the event that this land is purchased with the intent of developing the land with either commercial, residential or light industrial uses, then it is the policy of the City of Sisters that any comprehensive plan and/or zoning amendment that affects the future development of the properties must meet specific criteria in order for the City to be able to support a potential plan amendment for the property. These criteria are as follows:

- 1. The amendment shall be based on a 20-year land need analysis for both employment and housing needs, including for affordable housing. The analysis shall include an updated buildable lands inventory for employment and housing needs as part of the 20-year land need analysis. The analysis shall be consistent with statewide planning Goal 9 (Economic Development) and Goal 10 (Housing).*

RESPONSE: Attachments H, I, and J are summaries provided by EDCO and include employment land trends and building activity for Central Oregon and Sisters. These documents demonstrate a dearth of light industrial lands in Sisters, which has resulted in several "lost opportunities" as businesses have had to look elsewhere for suitable developable employment land.

As noted earlier in this narrative, on several occasions (2007 and 2014), industrial lands were

rezoned residential to respond to land needs at that time, resulting in a significant decrease in industrial lands. The proposed comprehensive plan map amendment and zone change are the first step to entitle the subject property in order to replenish the loss of industrial lands within the city. Consistency with Statewide Planning Goal 9 is demonstrated herein, above.

The subject property has not been contemplated for residential uses, nor does the application affect the residential lands supply. The South of Barclay Parcel has been contemplated for residential uses, however, is not included in this application and must necessarily be considered separately.

2. The amendment shall demonstrate consistency and integration with the city's 2018 update of its Transportation System Plan, as well as the state's Transportation Planning Rule as found in OAR 660-012.

RESPONSE: Attachment A includes a Transportation Impact Study (TIS), which includes a Transportation Planning Rule (TPR) Analysis. As discussed earlier in this narrative, the TIS demonstrates that the TPR is satisfied for the subject applications.

3. The amendment shall demonstrate that it has maximized urban efficiency consistent with city and state planning requirements and quality in urban design.

RESPONSE: City land use requirements and state planning goals are addressed herein, demonstrating that the proposed amendments are consistent with city and planning requirements.

4. The amendment shall include a development plan for the South Barclay Parcel which integrates proposed land uses, transportation and building layout and design in a manner that meets the overall community needs. The development plan shall provide detailed commitments to design context, energy efficiency and public and private financing of public improvements.

5. The amendment shall demonstrate consistency and integration with the 2011 City of Sisters Parks Master Plan which recommends between 5 and 47 acres to be dedicated for a future community or regional park.

RESPONSE: These applications are for the property north of Barclay and do not include any portion of the property south of Barclay, as it is still owned by the Forest Service. As such, this application necessarily cannot include a development plan for the South Barclay Parcel or a park plan for the South Barclay Parcel. Items 4 and 5 do not apply to these applications.



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Memorandum

To: **City of Sisters**

From: **Melissa Webb, PE**

Date: **May 6, 2020**

Subject: **Updated Transportation Impact Study for Sisters Industrial Subdivision (CP 20-02, ZC 20-01)**

This memorandum addresses updates to the original Transportation Impact Study (TIS) for the Sisters Industrial Subdivision, dated February 25, 2020.

In response to comments by the City of Sisters and Oregon Department of Transportation (ODOT) staff, the original report was updated and resubmitted. The updated TIS for the Sisters Industrial Subdivision is dated May 6, 2020. The comment log provided by ODOT staff is included in the appendix of the updated report, and also contains responses to each comment.

If you have any further questions or comments, please don't hesitate to contact us.

Sincerely,

A handwritten signature in blue ink that reads 'Melissa Webb'.

Melissa Webb, PE

Transportation Analyst



Sisters Industrial Subdivision

Transportation Impact
Study

Sisters, Oregon

Date: February 25, 2020

Revised: May 6, 2020

Prepared for: Kevin Spencer

Prepared by: Melissa Webb, PE

Todd Mobley, PE



EXPIRATION DATE: 6/30/2020

Table of Contents

Executive Summary	4
Project Description	5
Introduction	5
Location Description	5
Vicinity Roadways	6
Study Intersections	6
Site Trips	9
Trip Generation	9
Trip Distribution	10
Traffic Volumes	13
Existing Conditions	13
Background Conditions	13
Buildout Conditions	14
Safety Analysis	18
Crash History Review	18
US Highway 20 at W Barclay Drive	20
W Barclay Drive at N Pine Street	20
N Pine Street at US Highway 20	21
Sight Distance Evaluation	21
Warrant Analysis	21
Left-Turn Lane Warrants	21
Preliminary Traffic Signal Warrants	22
Operational Analysis	22
Performance Standards	22
Delay & Capacity Analysis	23
Mitigation Analysis	24
US Highway 20 at W Barclay Drive	24
N Pine Street at US Highway 20	24
N Locust Street at US Highway 20	25
Proportional Share Mitigation Assessment	26
Transportation Planning Rule	26
660-012-0060 Plan and Land Use Regulation Amendments	26
Conclusions	27
Appendix	29

Table of Figures

Figure 1: Project Location (image from Google Earth)	5
Figure 2: Vicinity Map	8
Figure 3: Site Trip Distribution & Assignment	12
Figure 4: Existing Traffic Volumes	15
Figure 5: Year 2040 Background Conditions	16
Figure 6: Year 2040 Buildout Conditions	17

Table of Tables

Table 1: Roadway Characteristics	6
Table 2: Study Intersection Descriptions	7
Table 3: Trip Generation Summary	10
Table 4: Crash Type Summary	19
Table 5: Crash Severity and Rate Summary	19
Table 6: Capacity Analysis Summary	23
Table 7: Proportional Share Methodology Summary	26



Executive Summary

1. The proposed project involves a change in zoning from Urban Area Reserve (UAR) to Light Industrial (LI) on a currently undeveloped site located off W Barclay Drive in Sisters, Oregon.
2. A variety of permitted land uses were assumed for all 17 industrial lots on the current site plan. In order to estimate a reasonable worst-case scenario for trip generation, it was assumed that four of the lots would have high trip-generating retail/service land uses, and the remaining 13 lots would have more traditional industrial land uses. The City of Sisters has reviewed the trip generation assumptions and agrees that it constitutes a reasonable worst-case analysis.
3. No significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns. Accordingly, no safety mitigation is recommended per the crash data analysis.
4. The most recent site plan shows that proposed site access locations are in compliance with the access spacing standards shown in Development Code 3.1.300(l)(1). Actual site access locations will be determined at the time of a future land division applications, following the zone change.
5. Due to insufficient traffic volumes, traffic signal warrants are not projected to be met at the unsignalized study intersections of W Barclay Drive at N Pine Street and N Pine Street at US Highway 20 under any of the analysis scenarios.
6. Three study intersections are either currently operating or projected to operate with v/c ratios in excess of the maximum allowable ODOT performance standards:
 - US Highway 20 at W Barclay Drive: Per the City's Transportation System Plan (TSP), placing additional emphasis on Barclay Drive as an alternate route, particularly for trucks, will help distribute demand. This emphasis would serve to balance volumes at the roundabout, improving operation and extending the capacity of the intersection.
 - N Pine Street at US Highway 20: During peak hours when delays are long, drivers will self-select how they enter US Highway 20 to avoid excessive delays. Local traffic may choose a number of other routes to avoid US Highway 20 and utilize the local street system. For this reason, no mitigation is recommended.
 - N Locust Street at US Highway 20: The applicant proposes mitigation in the form of a proportional share payment for improvements at the intersection of N Locust Street at US Highway 20. The identified proportional share payment of \$98,469 will be due as a lump sum prior to site development.
7. The mitigation described above offsets the potential impacts from the project and avoids further degradation of key infrastructure in Sisters. Accordingly, the Transportation Planning Rule is satisfied.



Project Description

Introduction

The proposed project involves a change in zoning from Urban Area Reserve (UAR) to Light Industrial (LI) on a currently undeveloped site located off W Barclay Drive in Sisters, Oregon.

This report examines the impacts of the proposed change in land use on the transportation system in the vicinity of the project site. The purpose of this report is to analyze potential traffic impacts and recommend any required transportation mitigation measures to ensure safe and efficient performance of the transportation facilities that will be impacted by the proposed change in land use.

All supporting data and calculations are provided in the appendix to this report.

Location Description

The project site is currently undeveloped and is located east of the intersection of W Barclay Drive at US Highway 20 in Sisters, Oregon. The immediate proposal is for a change in zoning from Urban Area Reserve (UAR) to Light Industrial (LI). Eventually, a land division will be proposed to subdivide the existing 17.11-acre lot into approximately 17 smaller lots, which could be occupied by various industrial land uses. The project site is shown in Figure 1.



Figure 1: Project Location (image from Google Earth)

Vicinity Roadways

The proposed project is expected to impact four roadways near the site. Table 1 provides a description of each of the vicinity roadways.

Table 1: Roadway Characteristics

Roadway	Jurisdiction	Functional Classification	Speed (MPH)	Curbs & Sidewalks	On-Street Parking	Bicycle Lanes
US Highway 20	ODOT	State Highway/Arterial	20-35 posted	Yes	Downtown Core	Partial
W Barclay Drive	City of Sisters	Arterial	30 posted	Partial	No	Partial
N Pine Street	City of Sisters	Collector	25 posted	Partial	Yes	No
N Locust Street	City of Sisters	Arterial	20-40 posted	Partial	Partial	Partial

Table Notes: Functional Classification provided by the City of Sisters Transportation Plan (January 2010), Figure 7-1

Study Intersections

Based on the location of the subject property, preliminary calculations of trip generation, and coordination with the City of Sisters, the following intersections were identified for analysis:

- US Highway 20 at W Barclay Drive;
- W Barclay Drive at N Pine Street;
- E Barclay Drive at N Locust Street;
- N Pine Street at US Highway 20; and
- N Locust Street at US Highway 20

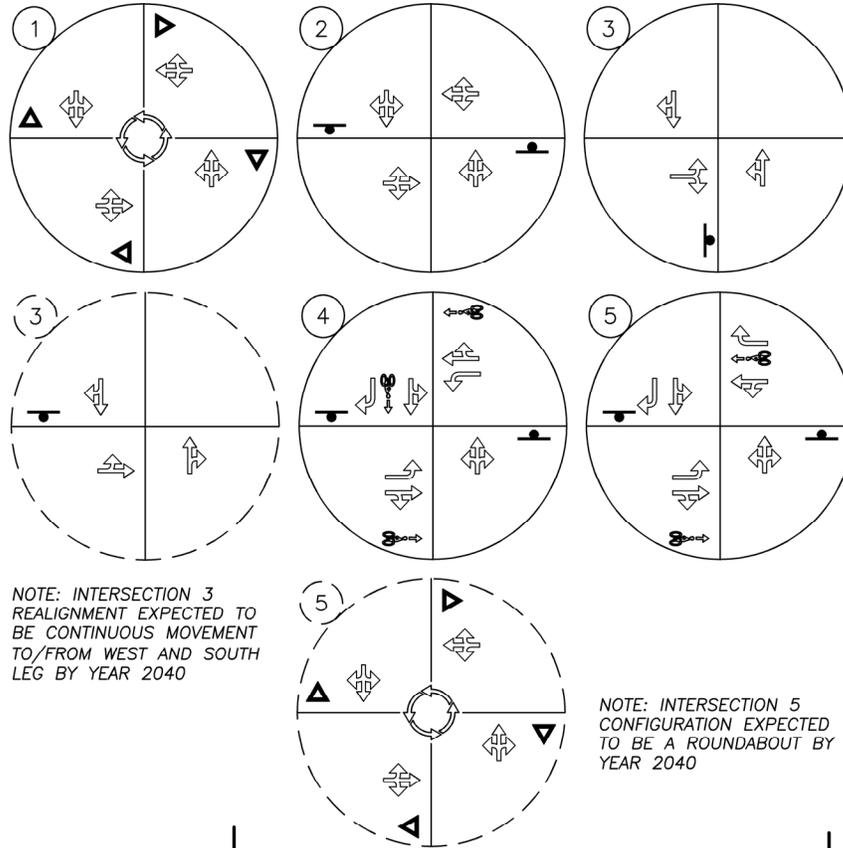
A summarized description of the study intersections is provided in Table 2. A vicinity map showing the project site, vicinity streets, and study intersection configurations is shown in Figure 2.

Table 2: Study Intersection Descriptions

Number	Intersection	Geometry	Traffic Control	Phasing/Stopped Approaches
1	US Highway 20 at W Barclay Drive	Roundabout	Yield-Controlled	NB/SB/EB/WB Yield-Controlled
2	W Barclay Drive at N Pine Street	Four-Legged	Stop-Controlled	NB/SB Stop-Controlled
3	E Barclay Drive at N Locust Street	Three-Legged	Stop-Controlled	EB Stop-Controlled
4	N Pine Street at US Highway 20	Four-Legged	Stop-Controlled	NB/SB Stop-Controlled
5	N Locust Street at US Highway 20	Four-Legged	Stop-Controlled	NB/SB Stop-Controlled

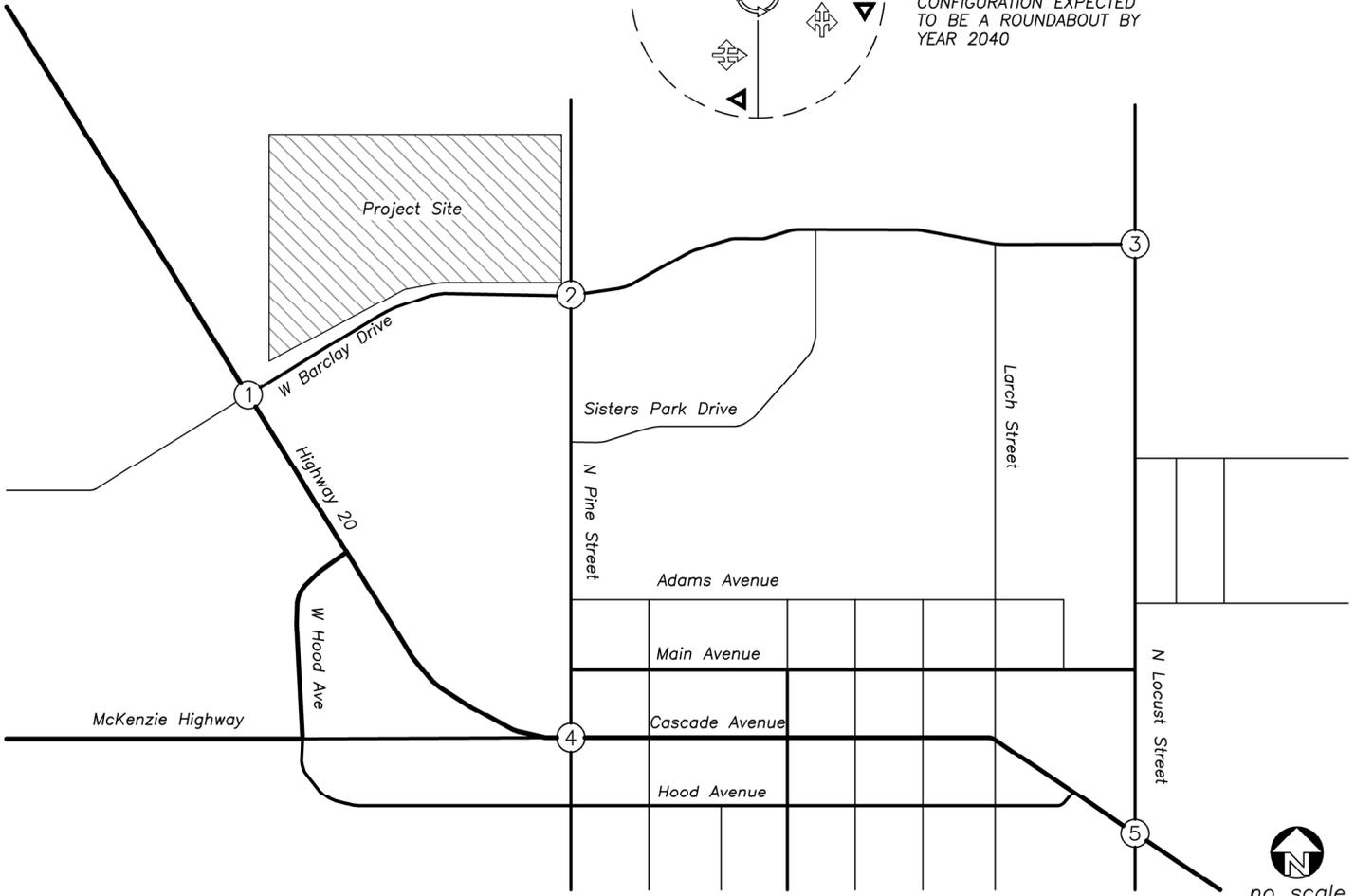
LEGEND

-  STUDY INTERSECTION
-  STUDY INTERSECTION
-  STOP SIGN
-  YIELD SIGN
-  ROUNDABOUT
-  BIKE LANE
-  PROJECT SITE
-  ARTERIAL ROADWAY
-  COLLECTOR ROADWAY
-  LOCAL ROADWAY



NOTE: INTERSECTION 3 REALIGNMENT EXPECTED TO BE CONTINUOUS MOVEMENT TO/FROM WEST AND SOUTH LEG BY YEAR 2040

NOTE: INTERSECTION 5 CONFIGURATION EXPECTED TO BE A ROUNDABOUT BY YEAR 2040



Site Trips

Trip Generation

The proposed project involves a change in zoning from Urban Area Reserve (UAR) to Light Industrial (LI) on a currently undeveloped site. Following this proposed change in zoning, a land division will be proposed to subdivide the existing 17.11-acre lot into approximately 17 smaller lots, according to the most recent site plan, which was used to guide development assumptions for the site. For each lot, a floor area ratio (FAR) was assumed in order to allow for adequate on-site parking, landscaping, etc. In general, a FAR of 25% was assumed for service or retail uses due to increased parking requirements, while industrial uses generally require less parking, so the assumed FAR was increased to 35%. A FAR of 10% was assumed for a specialty trade contractor use, as contractors typically have outdoor storage of large equipment and materials.

In order to estimate future trip generation of the site under the proposed LI zoning, a variety of permitted land uses were assumed for all 17 lots on the most recent site plan. Permitted land uses in the LI zone were determined from the City of Sister's Development Code 2.6.200. Table 2.6.1 lists permitted land uses for the LI district. In order to determine a reasonable worst-case scenario for uses in the LI district, permitted uses were chosen which were higher trip generators, but also included a mix of commercial and industrial uses. In addition, it was assumed that 4 of the lots would have a retail/service land use, and the remaining 13 lots would have an industrial land use. In addition, no reduction was made for internal trip capture within the 17-lot subdivision. The City of Sisters has agreed that this method represents a reasonable worst-case trip generation scenario.

To estimate the number of trips that will be generated, trip rates from the *Trip Generation Manual*¹ were used. Data for the following land use codes were used: 110 (*General Light Industrial*), 140 (*Manufacturing*), 150 (*Warehousing*), 180 (*Specialty Trade Contractor*), 640 (*Animal Hospital/Veterinary Clinic*), 842 (*Recreational Vehicle Sales*), 843 (*Automobile Parts Sales*), and 925 (*Drinking Place*). These land use codes were used to estimate the proposed zoning's trip generation based on the square footage of the buildings.

The trip generation calculations show that the proposed zoning is expected to generate 201 trips during the evening peak hour and 1,624 trips on a typical weekday. The trip generation calculations are summarized in Table 3 and detailed calculation worksheets are provided in the appendix.

¹ Institute of Transportation Engineers, *Trip Generation Manual*, 10th Edition, 2017.

Table 3: Trip Generation Summary

	ITE Code	Size	Evening Peak Hour			Weekday Total
			Enter	Exit	Total	
General Industrial	110	88,122	7	49	56	436
Manufacturing	140	34,102	7	16	23	134
Warehousing	150	21,344	1	3	4	38
Speciality Trade Contractor	180	3,049	2	4	6	32
Animal Hospital/Veterinary Clinic	640	11,217	16	24	40	241
Recreational Vehicle Sales	842	9,148	2	5	7	46
Automobile Parts Sales	843	8,494	20	22	42	470
Drinking Place	925	2,009	15	8	23	227
Total			70	131	201	1,624

Note: The Sisters Transportation System Plan (TSP) did not allocate any trips to this site as part of the TSP. Therefore, for the purpose of the zone change, trip generation for development under the existing zoning was assumed to be zero.

Trip Distribution

The directional distribution of site trips to and from the proposed site was estimated based on locations of likely trip origins and destinations, as well as locations of major transportation facilities in the site vicinity. The following trip distribution was estimated and used for analysis. This distribution was revised in this version of this report to reflect comments received from the City of Sisters and ODOT.

- Approximately 35 percent of site trips will travel to/from the southeast along US Highway 20;
- Approximately 15 percent of site trips will travel to/from the south along S Pine Street;
- Approximately 15 percent of site trips will travel to/from local destinations along N Locust Street;
- Approximately 10 percent of site trips will travel to/from the northwest along US Highway 20;
- Approximately 10 percent of site trips will travel to/from the west along McKinney Butte Road;

- Approximately 10 percent of site trips will travel to/from the north along Camp Polk Road; and
- Approximately 5 percent of site trips will travel to/from the west along Highway 242 (McKenzie Highway);

The following assumptions were used for trip distribution:

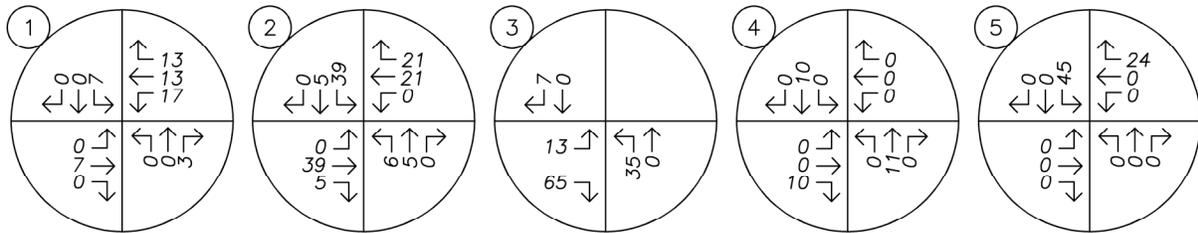
- For trips traveling to the project site north along N Pine Street: At the intersection of W Barclay Drive at N Pine Street, it was assumed that half of the trips would continue straight and use the site access at N Pine Street, and half of the trips would turn left and use the site access at W Barclay Drive.
- For trips traveling from the project site south along S Pine Street: It was assumed that half of the trips would exit the site, travel south along N Pine Street, cross US Highway 20, and continue southbound along S Pine Street. The other half of the trips were assumed to exit the site, travel west along W Barclay Drive to the roundabout at US Highway 20, travel southbound along US Highway 20, and make a right-turn onto S Pine Street and continue southbound.
- For trips traveling to the project site from the east along W Barclay Drive: At the intersection of W Barclay Drive at N Pine Street, it was assumed that half of the trips would continue straight and use the site access at W Barclay Drive, and half of the trips would turn right and use the site access at N Pine Street.
- For trips traveling from the project site to the east along W Barclay Drive: It was assumed that half of the trips would exit via the site access at W Barclay Drive and continue straight at the intersection of W Barclay Drive at N Pine Street. It was also assumed that half the trips would exit via the site access at N Pine Street and turn left onto W Barclay Drive at the intersection of W Barclay Drive at N Pine Street.

Figure 3 shows the site distribution and assignment for the proposed zone change.

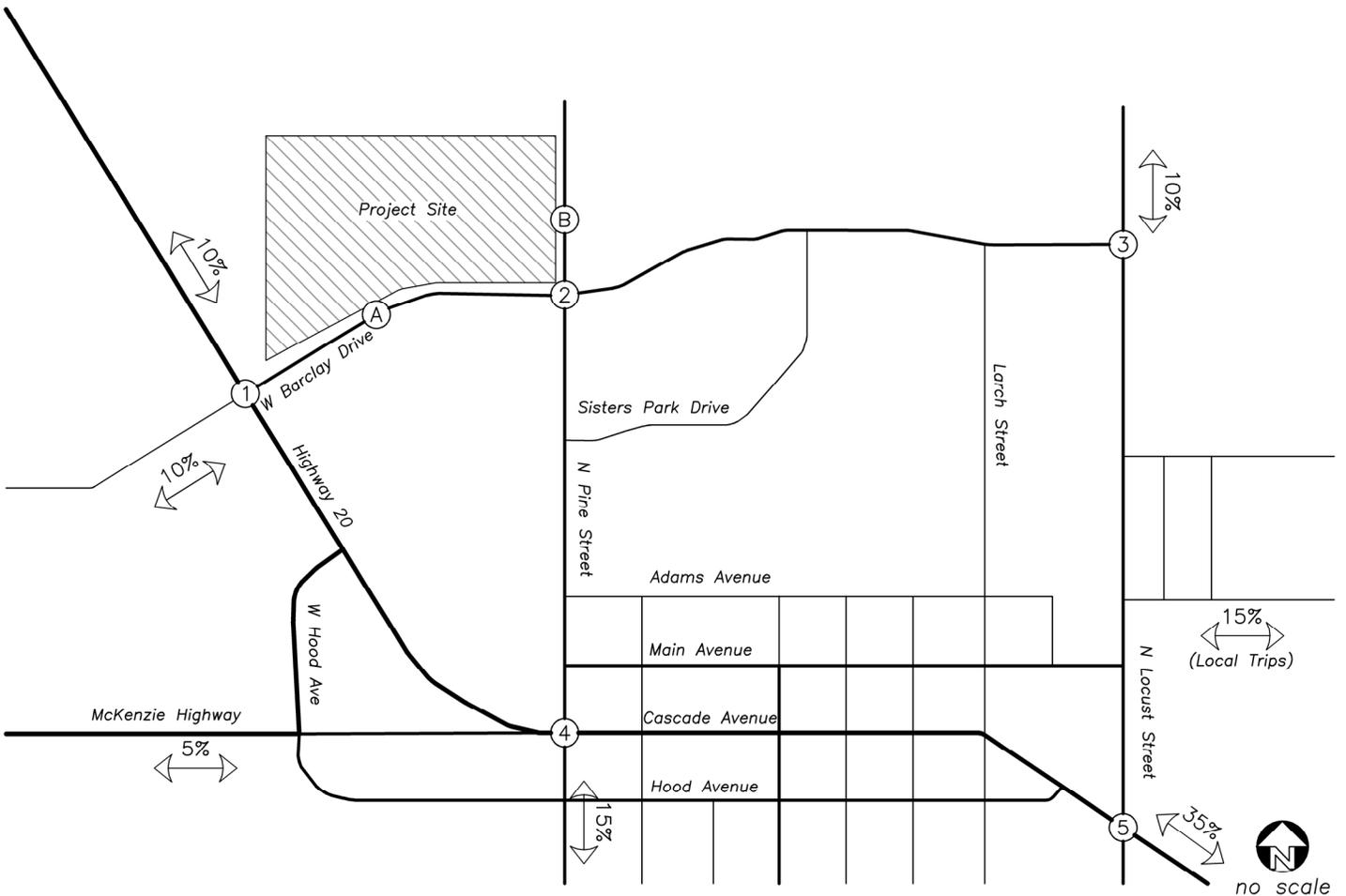
LEGEND

XX% PERCENT OF PRIMARY TRIPS

TRIP GENERATION			
	IN	OUT	TOTAL
PM	70	131	201



NOTE: Site Accesses shown as (A) and (B)



Traffic Volumes

Existing Conditions

Traffic counts were conducted at the study intersections on October 15, 2019, from 4:00 PM to 6:00 PM, and again on October 16, 2019, from 7:00 AM to 9:00 PM. At the time of the counts, schools were in session and Highway 242 (McKenzie Highway) was still open over the pass. Turning movement volumes corresponding to the system peak hour were used for analysis.

Since US Highway 20 is under the jurisdiction of the Oregon Department of Transportation (ODOT), procedures described in ODOT's *Analysis Procedures Manual* were used to seasonally adjust existing traffic volumes to reflect the 30th-highest hour in a typical year. Using a map of seasonal trends, this portion of US Highway 20 was determined to show a summer trend, and a seasonal adjustment factor (SAF) of 1.18349 was applied to through volumes along US Highway 20.

The existing seasonally-adjusted traffic volumes at the study intersections are shown in Figure 4.

Background Conditions

To provide analysis of the impact of the proposed land use, an estimate of future traffic volumes is required. A growth rate must be applied to recorded traffic volumes in order to calculate future volumes.

Growth rates for through traffic on US Highway 20 were derived using ODOT's 2038 Future Volume Table. Corresponding data was used for each of the three intersections along US Highway 20:

- Data corresponding to Milepost 100.5 (ODOT Highway 16) was used for the intersection of US Highway 20 at W Barclay Drive;
- Data corresponding to Milepost 92.52 (ODOT Highway 15) was used for the intersection of N Pine Street at US Highway 20; and
- Data corresponding to Milepost 92.85 (ODOT Highway 15) was used for the intersection of N Locust Street at US Highway 20.

The following growth rates were applied to US Highway 20 through volumes over a 21-year period to determine year 2040 background volumes:

- US Highway 20 at W Barclay Drive – 1.02386
- N Pine Street at US Highway 20 – 1.16458
- N Locust Street at US Highway 20 – 1.30706

For non-ODOT facilities, a compounded growth rate of two percent per year was applied to the existing traffic volumes over a 21-year period to determine year 2040 background volumes.

In addition to the expected background traffic growth in the site vicinity, the nearby McKenzie Meadows subdivision will impact future volumes at the study intersections. This development is proposed for the site west of McKinney Ranch Road and east of Sisters High School, on the north side of W McKinney Butte Road, and will include 150 single-family homes and 55 units of low-rise multi-family housing. Since this development will likely

be contributing trips to the transportation system by 2040, the site trips it is projected to generate were included in the 2040 background traffic volumes. A figure showing the in-process site trips generated by this development that are expected to impact the study intersections is provided in the appendix.

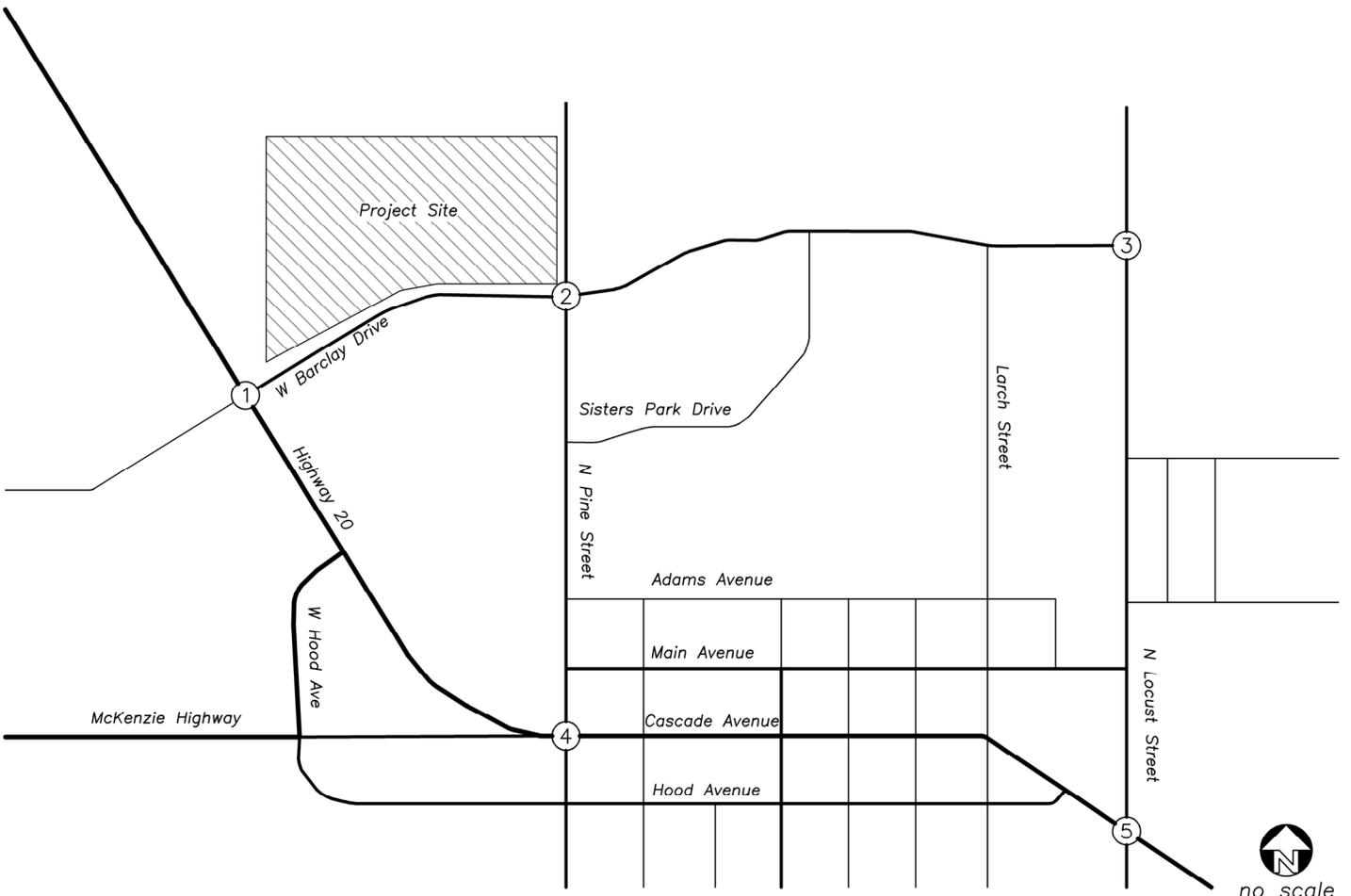
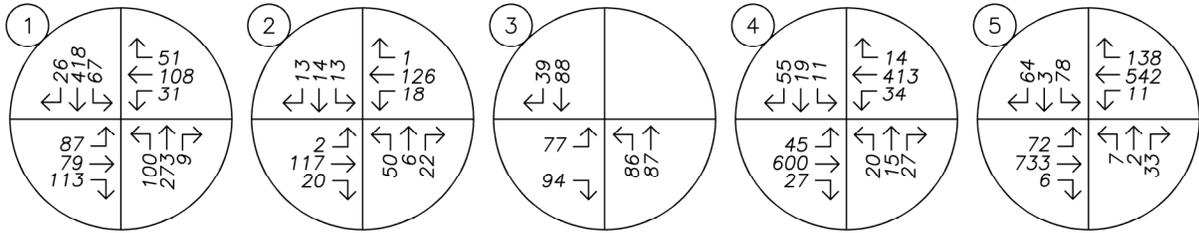
The Threewind Master Plan is also expected to impact future volumes at the study intersections. This development is proposed for the site southeast of W McKinney Butte Road and west of W Hood Avenue, and will include 50 units of multi-family housing and 28,000 square feet of commercial space. Since this development will likely be contributing trips to the transportation system by 2040, the site trips it is projected to generate were included in the 2040 background traffic volumes. A figure showing the in-process site trips generated by this development that are expected to impact the study intersections is provided in the appendix.

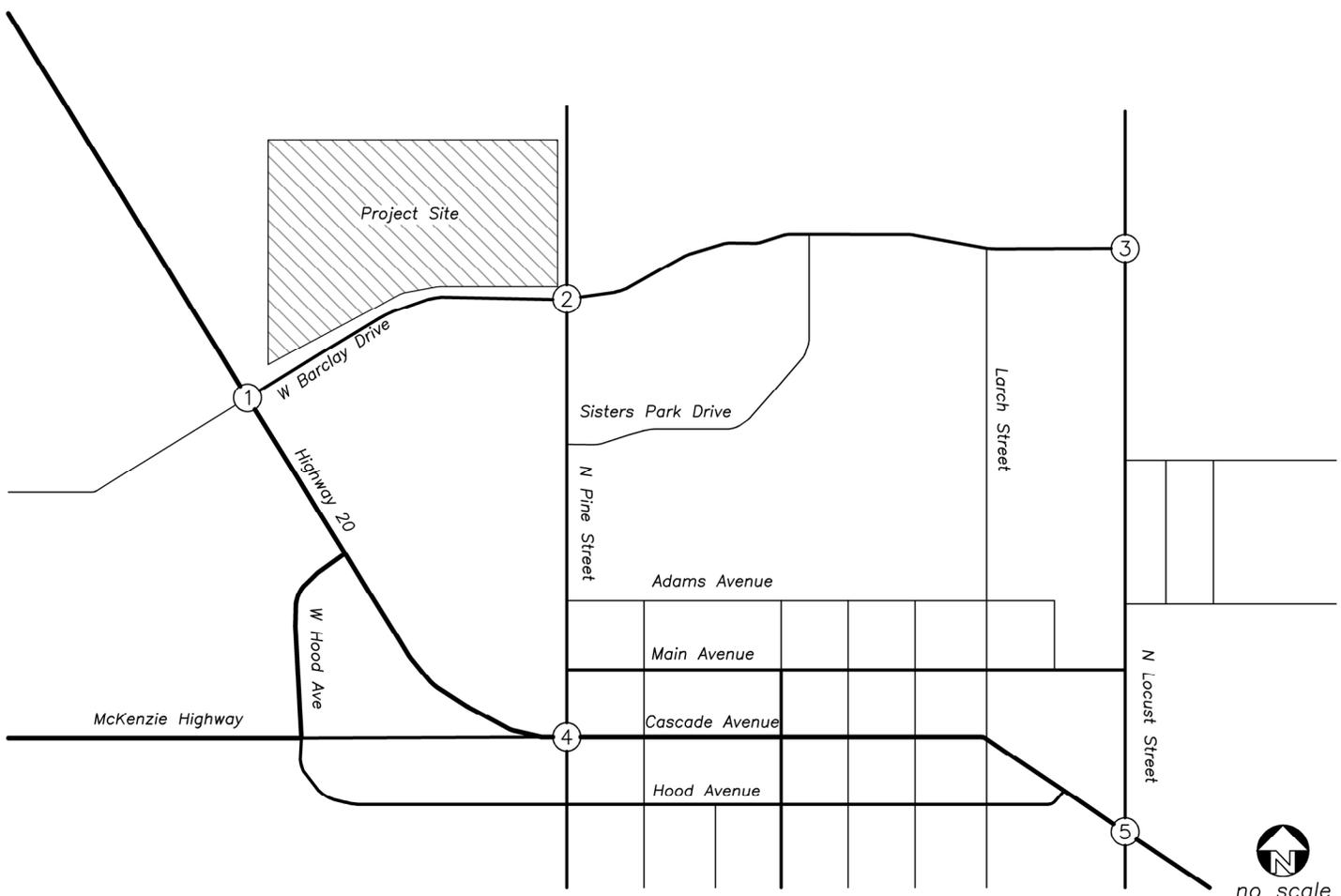
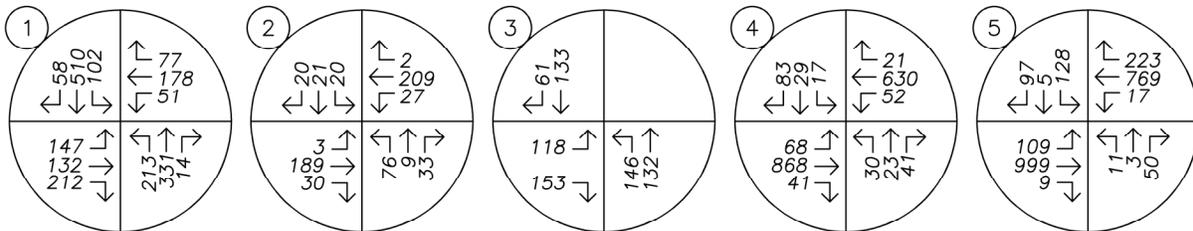
Finally, the Dollar General is also expected to impact future volumes at the study intersections. This development is proposed for the site southeast of McKinney Butte Road, east of N Wheeler Loop, and northwest of the existing Bi-Mart store, and includes construction of a 9,100 square foot building. Since this development will likely be contributing trips to the transportation system by 2040, the site trips it is projected to generate were included in the 2040 background traffic volumes. A figure showing the in-process site trips generated by this development that are expected to impact the study intersections is provided in the appendix.

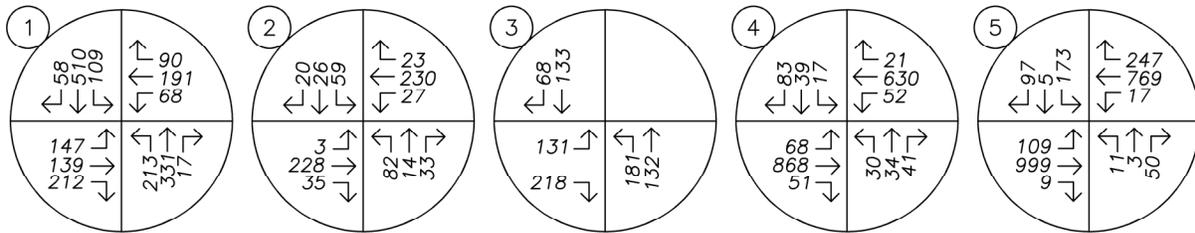
Figure 5 shows the projected year 2040 background traffic volumes during the morning and evening peak hours.

Buildout Conditions

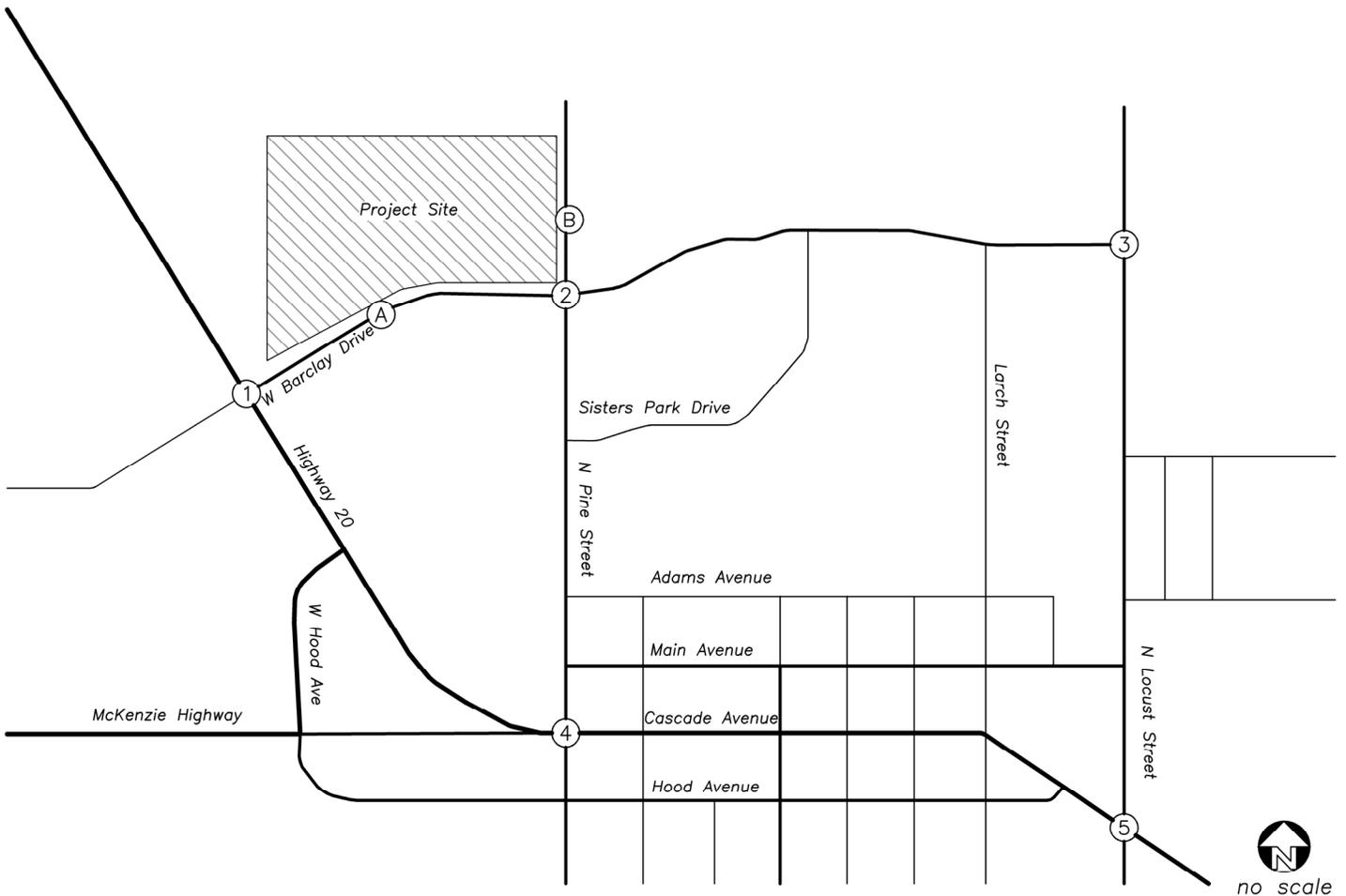
Figure 6 shows year 2040 buildout traffic volumes generated by the proposed land use.







NOTE: Site Accesses shown as Ⓐ and Ⓑ



Safety Analysis

Crash History Review

Using data obtained from ODOT's Crash Data System, a review of approximately five years of the most recent available crash history (January 2013 through December 2017) was performed at the study intersections. The crash data was evaluated based on the number of crashes, the type of collisions, and the severity of the collisions. Crash severity is based on injuries sustained by people involved in the crash, and includes five categories:

- PDO – property damage only;
- Injury C – possible injury or complaint of pain;
- Injury B – non-incapacitating injury;
- Injury A – incapacitating injury (i.e. bleeding or broken bones); and
- Fatality

Crash rates provide the ability to compare safety risks at different intersection by accounting for both the number of crashes that have occurred during the study period and the number of vehicles that typically travel through the intersection. Crash rates were calculated using the common assumption that traffic counted during the evening peak hour represents approximately 10 percent of the annual average daily traffic (AADT) at the intersection. Crash rates in excess of 1.0 crashes per million entering vehicles (CMEV) may be indicative of design deficiencies and therefore require a need for further investigation and possible mitigation.

Table 4 provides a summary of crash types while Table 5 summarizes crash severities and rates for each of the study intersections. Detailed crash data is provided in the appendix to this report.

Table 4: Crash Type Summary

	Intersection	Rear End	Turn	Angle	Crash Type			Ped	Bike	Total Crashes
					Fixed Object	Side swipe	Other			
1	US Highway 20 at W Barclay Drive	0	0	5	1	0	0	0	0	6
2	W Barclay Drive at N Pine Street	0	0	3	0	0	0	0	0	3
3	E Barclay Drive at N Locust Street	0	1	0	0	0	0	0	0	1
4	N Pine Street at US Highway 20	3	1	0	0	0	0	1	0	5
5	N Locust Street at US Highway 20	3	2	1	0	0	0	0	0	6

Table 5: Crash Severity and Rate Summary

	Intersection	Crash Severity					Total Crashes	AADT	Crash Rate
		PDO	Injury C	Injury B	Injury A	Fatality			
1	US Highway 20 at W Barclay Drive	3	0	1	2	0	6	12,560	0.26
2	W Barclay Drive at N Pine Street	0	0	3	0	0	3	4,020	0.41
3	E Barclay Drive at N Locust Street	0	1	0	0	0	1	4,710	0.12
4	N Pine Street at US Highway 20	2	3	0	0	0	5	11,230	0.24
5	N Locust Street at US Highway 20	1	5	0	0	0	6	14,910	0.22

BOLDED text indicates a crash rate in excess of 1.00 CMEV.

Based on a review of the crash data, there were several crashes which involved either a pedestrian or were classified as “Incapacitating Injury – Bleeding, Broken Bones” (*Injury A*) or “Non-Incapacitating Injury” (*Injury B*). An

in-depth analysis of these crashes is detailed in the following sections to determine any potential crash patterns indicative of safety issues.

US Highway 20 at W Barclay Drive

The intersection of US Highway 20 at W Barclay Drive had two crashes resulting in injuries consistent with *Injury A* classification. The first crash occurred when the driver of a westbound vehicle struck a southbound-traveling motorcycle. Both the motorcyclist and passenger sustained injuries consistent with *Injury A* classification. The second crash occurred when the driver of a northbound vehicle failed to yield right-of-way to an westbound-traveling vehicle and struck the westbound vehicle. All three occupants of the westbound vehicle sustained injuries consistent with *Injury A* classification.

The intersection also had one crash resulting in injuries consistent with *Injury B* classification. The crash occurred when the driver of a westbound vehicle failed to yield right-of-way to a southbound-traveling vehicle and struck the southbound vehicle. The driver of the southbound vehicle and three passengers sustained injuries consistent with *Injury B* classification.

It should be noted that all of the crashes in the analysis period occurred in 2013, which was before construction of the existing roundabout at the intersection of US Highway 20 at W Barclay Drive.

W Barclay Drive at N Pine Street

The intersection of W Barclay Drive at N Pine Street had three crashes resulting in injuries consistent with *Injury B* classification. The first crash occurred when the driver of a southbound-traveling vehicle ran a stop sign and collided with an eastbound-traveling vehicle. The crash reported noted that "inattention" was a factor in the collision. The southbound-traveling vehicle overturned after the collision, and the driver sustained injuries consistent with *Injury B* classification, while the driver and passenger of the eastbound-traveling vehicle sustained injuries consistent with *Injury C* classification.

The second crash occurred when the driver of a northbound-traveling vehicle ran a stop sign and collided with a westbound-traveling vehicle. The northbound-traveling vehicle overturned after the collision, and the driver and passenger both sustained injuries consistent with *Injury B* classification. The driver of the westbound-traveling vehicle did not report any injuries.

The third crash occurred when the driver of a southbound-traveling vehicle ran a stop sign and collided with a westbound-traveling vehicle. The driver of the southbound-traveling vehicle sustained injuries consistent with *Injury B* classification, while the passenger sustained injuries consistent with *Injury C* classification. Both the driver of the westbound-traveling vehicle and the passenger sustained injuries consistent with *Injury B* classification.

Based on a review of the crash data at the intersection of W Barclay Drive at N Pine Street, it was noted that all three collisions occurred in 2017 and were the result of either a northbound or southbound-traveling vehicle failing to stop at the stop signs located along N Pine Street. Upon review of the study intersection, it was noted that the northbound approach of N Pine Street has a "Stop Ahead" warning sign as well as a flashing stop sign. The southbound approach of N Pine Street also has a flashing stop sign. Both of the flashing stop signs were in place by May of 2018 and appear to have been installed following the three crashes in 2017. The preliminary crash data from January 2018 to December 2018 shows that there were no reported crashes at the intersection during this analysis period.

N Pine Street at US Highway 20

The intersection of N Pine Street at US Highway 20 had one crash which involved a pedestrian and was classified as “Possible Injury or Complaint of Pain” (*Injury C*). The crash occurred when the driver of a westbound vehicle failed to yield right-of-way to a southbound pedestrian crossing in a marked crosswalk. The pedestrian sustained injuries consistent with *Injury C* classification.

Based on an analysis of the available crash data, all intersections were calculated as having a crash rate below 1.00 CMEV. No significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns. Accordingly, no safety mitigation is recommended per the crash data analysis.

Sight Distance Evaluation

Actual site access locations will be determined at the time of a future land division applications, following the zone change. The most recent site plan has one site access along W Barclay Drive, approximately 330 feet from the current site access driveway to the Best Western Ponderosa Lodge, and a second site access along N Pine Street, approximately 297 feet from the intersection of N Pine Street at W Barclay Drive.

The City of Sisters Development Code 3.1.300(I)(1) identifies access spacing standards for various roadway classifications. W Barclay Drive is classified by the City of Sisters as an Arterial, and the minimum driveway-to-driveway spacing along an arterial roadway is 330 feet. In addition, the minimum roadway-to-driveway spacing along an arterial roadway is also 330 feet. N Pine Street is classified by the City of Sisters as a minor collector, and the minimum roadway-to-driveway spacing along a collector is 100 feet.

The most recent site plan shows that proposed site access locations are in compliance with the access spacing standards shown in Development Code 3.1.300(I)(1).

Warrant Analysis

Left-turn lane warrants and preliminary traffic signal warrants were examined for the study intersections where such treatments would be applicable.

Left-Turn Lane Warrants

Left-turn lane warrants were examined for the study intersections where such treatments would be applicable.

A left-turn refuge lane is primarily a safety consideration for the major street, removing left-turning vehicles from the through traffic stream. The left-turn lane warrants were examined using methodologies provided in the ODOT’s *Analysis Procedures Manual (APM)*. Left-turn lane warrants were evaluated based on the number of advancing and opposing vehicles, number of turning vehicles, travel speed, and the number of through lanes.

Left-turn lane warrants were not examined for the intersection of E Barclay Drive at N Locust Street. This intersection is identified in the *2018 Sisters Transportation System Plan (TSP) Refinement*², and a future project includes the realignment of the intersection to make a continuous movement to/from the west and south legs.

² Kittelson & Associates, *Sisters Transportation System Plan Refinement*, June 2018.

Left-turn lane warrants were also not examined for the intersection of N Locust Street at US Highway 20. This intersection is identified in the City's TSP Refinement, and a future project includes the construction of a roundabout.

Left-turn lane warrants are projected to be met under the year 2040 buildout scenario for the intersection of W Barclay Drive at N Pine Street, specifically for the westbound approach.

Preliminary Traffic Signal Warrants

Preliminary traffic signal warrants were examined for the following unsignalized study intersections to determine whether the installation of a new traffic signal will be warranted at the intersection upon completion of the proposed zone change:

- W Barclay Drive at N Pine Street;
- N Pine Street at US Highway 20.

Due to insufficient traffic volumes, traffic signal warrants are not projected to be met at the unsignalized study intersections under any of the analysis scenarios. Traffic signal warrants were not examined for the intersection of N Locust Street at US Highway 20 due to the intersection being listed in City's TSP Refinement as a candidate for a future roundabout. It was assumed in this study that the roundabout would be in place by the year 2040. In addition, traffic signal warrants were not examined for the intersection of E Barclay Drive at N Locust Street due to the intersection being listed in the City's TSP Refinement as a candidate for a future intersection realignment. It was assumed in this study that the realignment would be in place by the year 2040.

Operational Analysis

A capacity and delay analysis were conducted for each of the study intersections per the unsignalized intersection analysis methodologies in the *Highway Capacity Manual* (HCM)³. Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. The level of service (LOS) of an intersection can range from LOS A, which indicates very little or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay. The volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

Performance Standards

The study intersections of US Highway 20 at W Barclay Drive, N Pine Street at US Highway 20, and N Locust Street at US Highway 20 are under the jurisdiction of ODOT. The applicable minimum operation standard for this facility is established under the *Oregon Highway Plan*⁴ and is based on the v/c ratio of the intersection. According to the Oregon Highway Plan, US Highway 20 is a freight route on a statewide highway, and has a maximum allowable v/c ratio of 0.85. The above mentioned intersections along US Highway 20 were analyzed according to this standard.

³ Transportation Research Board, *Highway Capacity Manual 6th Edition*, 2016.

⁴ Oregon Department of Transportation, *1999 Oregon Highway Plan: Including amendments November 1999 through May 2015*, 1999.

The study intersections of W Barclay Drive at N Pine Street and E Barclay Drive at N Locust Street, both two-way stop-controlled intersections, are under the jurisdiction of the City of Sisters. The City's TSP Refinement states that two-way stop-controlled intersections should have a v/c ratio no greater than 0.90.

Delay & Capacity Analysis

The LOS, delay, and v/c results of the capacity analysis are shown in Table 6 for the evening peak hour. Detailed calculations as well as tables showing the relationship between delay and LOS are included in the appendix to this report.

Table 6: Capacity Analysis Summary

	PM Peak Hour		
	LOS	Delay (s)	v / c
US Highway 20 at W Barclay Drive			
2019 Existing Conditions	A	9	0.53
2040 Background Conditions	C	22	0.86
2040 Buildout Conditions	D	25	0.89
W Barclay Drive at N Pine Street			
2019 Existing Conditions	B	12	0.11
2040 Background Conditions	C	18	0.24
2040 Buildout Conditions	C	22	0.30
E Barclay Drive at N Locust Street			
2019 Existing Conditions	B	13	0.15
2040 Background Conditions (with realignment)	C	18	0.32
2040 Buildout Conditions (with realignment)	C	22	0.38
N Pine Street at US Highway 20			
2019 Existing Conditions	F	57	0.23
2040 Background Conditions	F	>200	2.08
2040 Buildout Conditions	F	>200	3.61
N Locust Street at US Highway 20			
2019 Existing Conditions	F	>200	1.10
2040 Background Conditions (with roundabout)	E	45	1.06
2040 Buildout Conditions (with roundabout)	F	55	1.11

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection. **BOLDED** results indicate operation above acceptable jurisdictional standards

Based on the results of the operational analysis, there are three intersections that are either currently or projected to operate with v/c ratios in excess of minimum ODOT performance standards:

- US Highway 20 at W Barclay Drive
- N Pine Street at US Highway 20

- N Locust Street at US Highway 20

Further inspection and potential mitigations at the intersections listed above are discussed within the following *Mitigation Analysis* section.

All other study intersections are currently operating acceptably per City of Sisters standards and are projected to continue operating acceptably through the 2040 planning horizon, regardless of the potential increase in site trip generation upon rezoning the site. No operational mitigation is necessary or recommended at these intersections.

Mitigation Analysis

As determined within the *Operational Analysis* section, there are three study intersections that are projected to exceed acceptable levels of operation per ODOT performance standards. The following narrative discusses potential mitigative measures which may improve operation of study intersections to acceptable levels. The City of Sisters TSP Refinement, Deschutes County TSP, and ODOT's Statewide Transportation Improvement Plan (STIP) were reviewed to determine any planned projects at these intersections.

US Highway 20 at W Barclay Drive

The intersection of US Highway 20 at W Barclay Drive is projected to exceed ODOT's maximum v/c ratio of 0.85 under year 2040 buildout conditions due to high southbound through volumes of traffic. However, the intersection remains within capacity and with delays that are not excessive (level of service D). US Highway 20 through Sisters is a key freight corridor for the Central Oregon region. An Alternate Route for the movement of trucks through Sisters is planned to route through trucks off of US Highway 20 along Barclay Drive and N Locust Street during peak periods of congestion.

Currently, vehicles choosing to use W Barclay Drive for eastbound travel experience long delays when turning left onto US Highway 20 from N Locust Street. Future upgrades to the Alternate Route include widening Barclay Drive to a 3-lane arterial section between Pine Street and N Locust Street, as well as realignment of N Locust Street at the Barclay Drive intersection to remove stop control on the predominant movement. In addition, a roundabout is planned for the intersection of US Highway 20 at N Locust Street, which would reduce long delays for vehicles turning left onto US Highway 20 from N Locust Street, thus making the Alternate Route a reasonable choice for vehicles traveling both eastbound and westbound to bypass downtown Sisters.

The City of Sisters TSP Refinement notes that intelligent transportation system (ITS) technology, which detects congestion on the highway and directs traffic onto the Alternate Route, is suggested as part of the Alternate Route. In conjunction with ITS technology, variable-message signs (VMS) could be placed along US Highway 20 to direct traffic onto the Alternate Route, thus relieving congestion along US Highway 20 through downtown Sisters.

N Pine Street at US Highway 20

The intersection of N Pine Street at US Highway 20 is projected to exceed ODOT's maximum v/c ratio of 0.85 under year 2040 background conditions. This is due primarily to a relatively high northbound left-turn volume

from N Pine Street onto US Highway 20. The intersection operates acceptably for existing conditions, but delays increase in future years, regardless of the zoning change of the project site. No mitigations to improve capacity are recommended at this intersection for the following reason:

- During peak hours when delays are long, drivers will self-select how they enter US Highway 20 to avoid excessive delays. Local traffic may choose a number of other routes to avoid US Highway 20 and utilize the local street system.

In addition, the Motor Vehicle Master Plan Projects table (Table 7-5) in the City's TSP Refinement lists a possible mitigation of restricting northbound and southbound approaches at the intersection to right-turns only. The intersection should be monitored to determine whether these movement restrictions become necessary in the future.

N Locust Street at US Highway 20

The intersection of N Locust Street at US Highway 20 is also projected to operate above acceptable ODOT standards; however, this issue is projected to occur regardless of whether the proposed zoning change is approved. The City of Sisters is aware the intersection fails to meet operational standards, and recently conducted a roundabout feasibility study at the intersection.

According to the City's TSP Refinement, near-term mitigation at the intersection includes the installation of a mini-roundabout with the intent of addressing near-term capacity and safety deficiencies. It is my understanding that following preliminary investigation into the feasibility of a mini-roundabout, the City and ODOT have decided not to further pursue this interim option. In addition, a long-term mitigation improvement includes the installation of a full-size roundabout at the intersection. Initial traffic forecasts and analysis performed for the City's TSP Refinement indicate that a single-lane roundabout would operate acceptably through 2030 but not for the entire planning horizon.

Based on the operational analysis results either with or without the proposed zone change, it is recommended that design options to add capacity be explored, such as the addition of a westbound right-turn slip lane. However, capacity enhancements such as additional lanes can affect safety at the intersection, particularly for vulnerable roadway users. The City of Sisters and ODOT will need to balance safety and capacity when deciding the configuration of this intersection improvement. For the purpose of this 2040 planning horizon analysis, it was assumed that a standard, single-lane roundabout would be constructed.

Proposed Mitigation: The applicant proposes mitigation in the form of a proportional share payment for improvement of the intersection of N Locust Street at US Highway 20. Improvement of this intersection is the largest planned intersection improvement in Sisters and that project cost and implementation would far exceed the rough proportionality of the impacts of this site development. Therefore, a proportional share fee is proposed and explained further in the *Proportional Share Mitigation Assessment* section.

Proportional Share Mitigation Assessment

Proportional share fees were evaluated at the intersection of N Locust Street at US Highway 20. Table 7 provides the methodology used to calculate proportional share fees based on the proposed zone change’s trip generation impacts.

Table 7: Proportional Share Methodology Summary

N Locust Street at US Highway 20	
Mitigation Project Summary	Construct Roundabout
City TSP Project ID	2A
Peak Hour	Weekday PM
Scenario When Mitigation is Triggered	Existing (2019)
2040 Background Traffic Volume (X)	2420
Project Trips (PT)	69
Proportional Share (% $, PT/(PT+X)$)	2.77%
Project Cost Estimate (\$)	\$3.552M
Proportional Share Cost	\$98,469

Table Notes: Table 7 of the 2019 City of Sisters *Transportation System Development Charge Update, Final Report*, shows that SDCs are planned to pay for 4% of the total project cost, with ODOT funding the remaining 96%. Since development of the industrial subdivision on the subject site will pay SDCs, the project cost was taken to be the ODOT share, which is \$3,552,000.

Recognizing that it is based on a reasonable worst-case development scenario, the proportional share payment amount will not be reduced or refunded if the site develops at a lower intensity. As a result, and also recognizing that the site will develop over a period of years, the applicant proposes that the proportional share payment of \$98,469 will be due as a lump sum prior to site development.

Transportation Planning Rule

The Transportation Planning Rule (TPR) is in place to ensure that the transportation system is capable of supporting possible increases in traffic intensity that could result from changes to adopted plans and land-use regulations. The applicable elements of the TPR are each quoted directly in italics below, with responses following.

660-012-0060 Plan and Land Use Regulation Amendments

1. *If an amendment to a functional plan, an acknowledged comprehensive plan, or a land use regulation (including a zoning map) would significantly affect an existing or planned transportation facility, then the local government must put in place measures as provided in section (2) of this rule, unless the amendment is allowed under section (3), (9) or (10) of this rule. A plan or land use regulation amendment significantly affects a transportation facility if it would:*

- (a) *Change the functional classification of an existing or planned transportation facility (exclusive of correction of map errors in an adopted plan);*
- (b) *Change standards implementing a functional classification system; or*
- (c) *Result in any of the effects listed in paragraphs (A) through (C) of this subsection based on projected conditions measured at the end of the planning period identified in the adopted TSP. As part of evaluating projected conditions, the amount of traffic projected to be generated within the area of the amendment may be reduced if the amendment includes an enforceable, ongoing requirement that would demonstrably limit traffic generation, including, but not limited to, transportation demand management. This reduction may diminish or completely eliminate the significant effect of the amendment.*
 - (A) *Types or levels of travel or access that are inconsistent with the functional classification of an existing or planned transportation facility;*
 - (B) *Degrade the performance of an existing or planned transportation facility such that it would not meet the performance standards identified in the TSP or comprehensive plan; or*
 - (C) *Degrade the performance of an existing or planned transportation facility that is otherwise projected to not meet the performance standards identified in the TSP or comprehensive plan.*

Based on the analysis findings in this report, subsections (a) and (b) are not triggered since the proposed zone change will not impact or alter the functional classification of any existing or planned facility, and the proposal does not include a change to any functional classification standards.

Upon rezoning properties within the subject site, three study intersections are currently or projected to operate with v/c ratios in excess of acceptable levels of operation per their respective jurisdictional standards. However, these intersections may be reasonably mitigated as detailed in the *Mitigation Analysis* section of this report.

The identified mitigation offsets the potential impacts from the project and avoids further degradation of key infrastructure in Sisters. Accordingly, the Transportation Planning Rule is satisfied.

Conclusions

The proposed project involves a change in zoning from Urban Area Reserve (UAR) to Light Industrial (LI) on a currently undeveloped site located off W Barclay Drive in Sisters, Oregon.

A variety of permitted land uses were assumed for all 17 lots on the current site plan. In order to have a “worst-case scenario” estimate of trip generation, it was assumed that four of the lots would have a retail/service land use, and the remaining 13 lots would have an industrial land use. The trip generation calculations show that the proposed variety of land uses is projected to generate 201 trips during the evening peak hour.

All intersections were calculated as having a crash rate below 1.00 CMEV. No significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns. Accordingly, no safety mitigation is recommended per the crash data analysis.

The most recent site plan shows that proposed site access locations are in compliance with the access spacing standards shown in Development Code 3.1.300(I)(1). Actual site access locations will be determined at the time of a future land division applications, following the zone change.

Due to insufficient traffic volumes, traffic signal warrants are not projected to be met at the unsignalized study intersections of W Barclay Drive at N Pine Street and N Pine Street at US Highway 20 under any of the analysis scenarios.

Three study intersections are either currently operating or projected to operate with v/c ratios in excess of the maximum allowable ODOT performance standards:

- US Highway 20 at W Barclay Drive: Per the City's Transportation System Plan (TSP), placing additional emphasis on Barclay Drive as an alternate route, particularly for trucks, will help distribute demand. This emphasis would serve to balance volumes at the roundabout, improving operation and extending the capacity of the intersection.
- N Pine Street at US Highway 20: During peak hours when delays are long, drivers will self-select how they enter US Highway 20 to avoid excessive delays. Local traffic may choose a number of other routes to avoid US Highway 20 and utilize the local street system. For this reason, no mitigation is recommended.
- N Locust Street at US Highway 20: The applicant proposes mitigation in the form of a proportional share payment for improvements at the intersection of N Locust Street at US Highway 20. The identified proportional share payment of \$98,469 will be due as a lump sum prior to site development.

The mitigation described above offsets the potential impacts from the project and avoids further degradation of key infrastructure in Sisters. Accordingly, the Transportation Planning Rule is satisfied.

Appendix





TRIP GENERATION CALCULATIONS

Land Use: General Light Industrial
Land Use Code: 110
Setting/Location: General Urban/Suburban
Variable: 1,000 Square Feet of Gross Floor Area
Variable Quantity: 88.1

AM PEAK HOUR

Trip Rate: 0.70

	Enter	Exit	Total
Directional Distribution	88%	12%	
Trip Ends	55	7	62

PM PEAK HOUR

Trip Rate: 0.63

	Enter	Exit	Total
Directional Distribution	13%	87%	
Trip Ends	7	49	56

WEEKDAY

Trip Rate: 4.96

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	218	218	436

SATURDAY

Trip Rate: 1.99

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	88	88	176



TRIP GENERATION CALCULATIONS

Land Use: Manufacturing
Land Use Code: 140
Setting/Location: General Urban/Suburban
Variable: 1,000 Square Feet
Variable Quantity: 34.1

AM PEAK HOUR

Trip Rate: 0.62

	Enter	Exit	Total
Directional Distribution	77%	23%	
Trip Ends	16	5	21

PM PEAK HOUR

Trip Rate: 0.67

	Enter	Exit	Total
Directional Distribution	31%	69%	
Trip Ends	7	16	23

WEEKDAY

Trip Rate: 3.93

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	67	67	134

SATURDAY

Trip Rate: 6.42

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	109	109	218



TRIP GENERATION CALCULATIONS

Land Use: Warehousing
Land Use Code: 150
Variable: 1,000 Square Feet
Variable Quantity: 21.3

AM PEAK HOUR

Trip Rate: 0.17

	Enter	Exit	Total
Directional Distribution	77%	23%	
Trip Ends	3	1	4

PM PEAK HOUR

Trip Rate: 0.19

	Enter	Exit	Total
Directional Distribution	27%	73%	
Trip Ends	1	3	4

WEEKDAY

Trip Rate: 1.74

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	19	19	38

SATURDAY

Trip Rate: 0.15

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	2	2	4



TRIP GENERATION CALCULATIONS

Land Use: Specialty Trade Contractor
Land Use Code: 180
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 3.1

AM PEAK HOUR

Trip Rate: 1.66

	Enter	Exit	Total
Directional Distribution	73%	27%	
Trip Ends	4	1	5

PM PEAK HOUR

Trip Rate: 1.97

	Enter	Exit	Total
Directional Distribution	32%	68%	
Trip Ends	2	4	6

WEEKDAY

Trip Rate: 10.22

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	16	16	32



TRIP GENERATION CALCULATIONS

Land Use: Animal Hospital/Veterinary Clinic
Land Use Code: 640
Variable: 1000 Sq Ft Gross Floor Area
Variable Value: 11.2

AM PEAK HOUR

Trip Rate: 3.64

	Enter	Exit	Total
Directional Distribution	67%	33%	
Trip Ends	27	14	41

PM PEAK HOUR

Trip Rate: 3.53

	Enter	Exit	Total
Directional Distribution	40%	60%	
Trip Ends	16	24	40

WEEKDAY

Trip Rate: 21.5

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	121	120	241



TRIP GENERATION CALCULATIONS

Land Use: Recreational Vehicle Sales
Land Use Code: 842
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 9.1

AM PEAK HOUR

Trip Rate: 0.46

	Enter	Exit	Total
Directional Distribution	85%	15%	
Trip Ends	3	1	4

PM PEAK HOUR

Trip Rate: 0.77

	Enter	Exit	Total
Directional Distribution	31%	69%	
Trip Ends	2	5	7

WEEKDAY

Trip Rate: 5.00

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	23	23	46



TRIP GENERATION CALCULATIONS

Land Use: Automobile Parts Sales
Land Use Code: 843
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 8.5

AM PEAK HOUR

Trip Rate: 2.59

	Enter	Exit	Total
Directional Distribution	55%	45%	
Trip Ends	12	10	22

PM PEAK HOUR

Trip Rate: 4.91

	Enter	Exit	Total
Directional Distribution	48%	52%	
Trip Ends	20	22	42

WEEKDAY

Trip Rate: 55.34

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	235	235	470

SAT PEAK HOUR OF GENERATOR

Trip Rate: 11.53

	Enter	Exit	Total
Directional Distribution	51%	49%	
Trip Ends	50	48	98



TRIP GENERATION CALCULATIONS

Land Use: Drinking Place
Land Use Code: 925
Setting/Location: General Urban/Suburban
Variable: 1,000 Sq. Ft. GFA
Variable Value: 2

PM PEAK HOUR

Trip Rate: 11.36

	Enter	Exit	Total
Directional Distribution	66%	34%	
Trip Ends	15	8	23

WEEKDAY

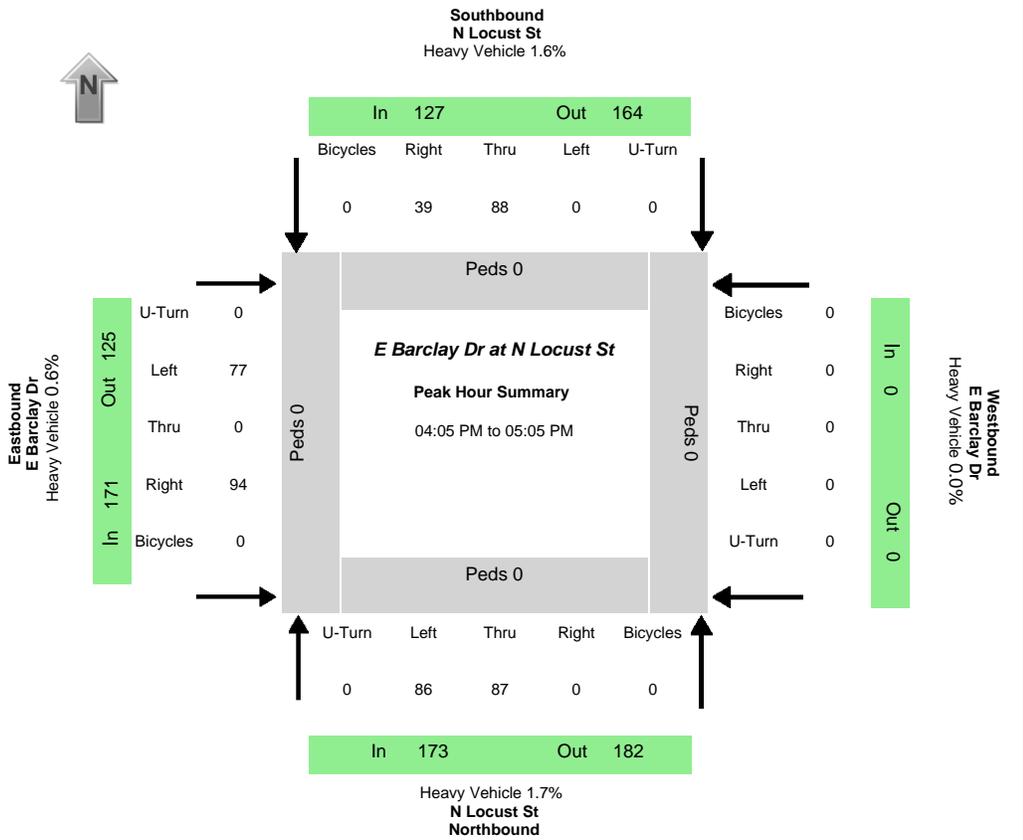
Trip Rate: 113.60

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	114	113	227

Note: Weekday rate assumed to be ten times the PM peak hour.

Data Provided by K-D-N.com 503-594-4224

N/S street	N Locust St
E/W street	E Barclay Dr
City, State	Sisters OR
Site Notes	
Location	44.297603 - -121.543743
Start Date	Tuesday, October 15, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:05:00 PM
Peak 15 Min Start	04:35:00 PM
PHF (15-Min Int)	0.93



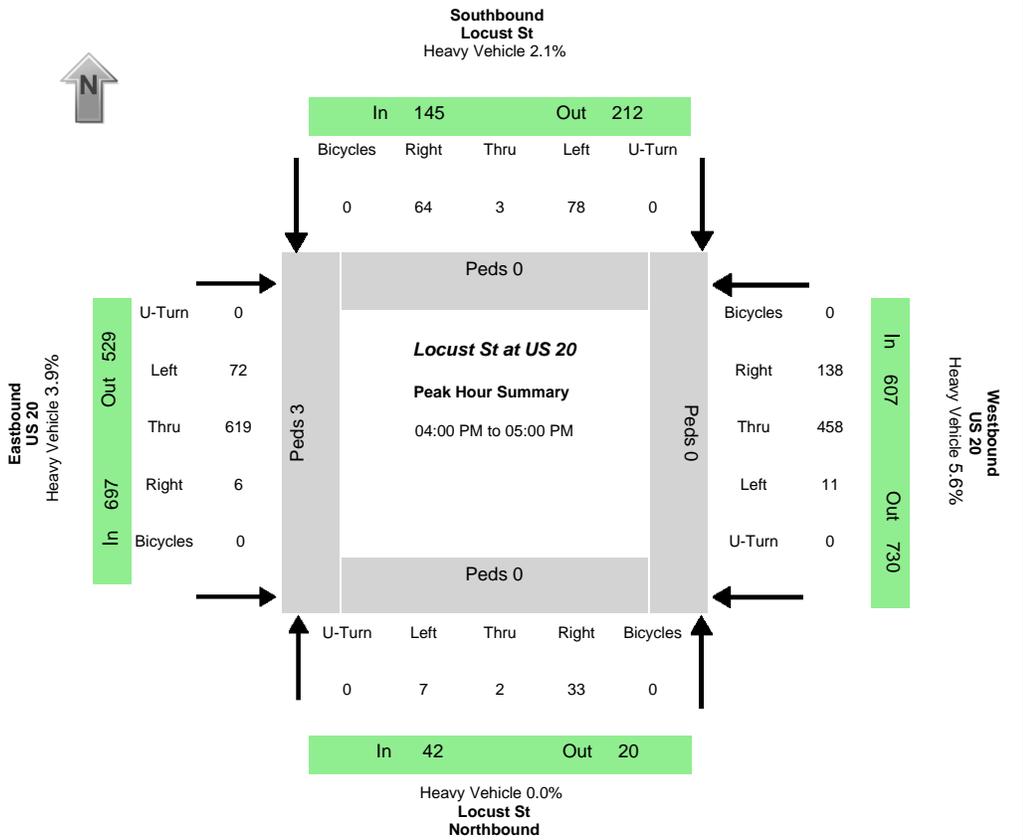
Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
86	87	0	0	0	88	39	0	77	0	94	0	0	0	0	0	173	127	171	0	182	164	125	0
Percent Heavy Vehicles																							
3.5%	0.0%	0.0%	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	1.6%	0.6%	0.0%	1.6%	0.0%	2.4%	0.0%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				Sum	in Crosswalk				Sum
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		NB	SB	EB	WB	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

All Vehicle Volumes																		
Time	Northbound N Locust St				Southbound N Locust St				Eastbound E Barclay Dr				Westbound E Barclay Dr				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn														
04:00:00 PM	8	13	0	0	0	4	3	0	3	0	5	0	0	0	0	0		
04:05:00 PM	12	6	0	0	0	8	3	0	5	0	8	0	0	0	0	0		
04:10:00 PM	7	9	0	0	0	7	1	0	7	0	9	0	0	0	0	0	118	
04:15:00 PM	8	7	0	0	0	9	3	0	5	0	7	0	0	0	0	0	121	
04:20:00 PM	8	5	0	0	0	9	5	0	8	0	4	0	0	0	0	0	118	
04:25:00 PM	9	6	0	0	0	3	4	0	3	0	8	0	0	0	0	0	111	
04:30:00 PM	7	9	0	0	0	6	3	0	3	0	6	0	0	0	0	0	106	
04:35:00 PM	4	8	0	0	0	7	3	0	11	0	12	0	0	0	0	0	112	
04:40:00 PM	7	5	0	0	0	8	7	0	7	0	9	0	0	0	0	0	122	
04:45:00 PM	5	9	0	0	0	7	3	0	7	0	8	0	0	0	0	0	127	
04:50:00 PM	10	8	0	0	0	8	1	0	8	0	9	0	0	0	0	0	126	
04:55:00 PM	0	8	0	0	0	6	5	0	7	0	6	0	0	0	0	0	115	466
05:00:00 PM	9	7	0	0	0	10	1	0	6	0	8	0	0	0	0	0	117	471
05:05:00 PM	9	9	0	0	0	3	1	0	5	0	6	0	0	0	0	0	106	462
05:10:00 PM	9	4	0	0	0	5	2	0	7	0	8	0	0	0	0	0	109	457
05:15:00 PM	5	10	0	0	0	8	5	0	4	0	10	0	0	0	0	0	110	460
05:20:00 PM	5	6	0	0	0	6	6	0	6	0	8	0	0	0	0	0	114	458
05:25:00 PM	6	17	0	0	0	3	2	0	3	0	0	0	0	0	0	0	110	456
05:30:00 PM	7	7	0	0	0	7	2	0	11	0	7	0	0	0	0	0	109	463
05:35:00 PM	5	11	0	0	0	7	4	0	6	0	5	0	0	0	0	0	110	456
05:40:00 PM	5	8	0	0	0	4	5	0	3	0	5	0	0	0	0	0	109	443
05:45:00 PM	7	11	0	0	0	7	3	0	2	0	2	0	0	0	0	0	100	436
05:50:00 PM	9	5	0	0	0	8	0	0	5	0	7	0	0	0	0	0	96	426
05:55:00 PM	7	3	0	0	0	6	1	0	9	0	2	0	0	0	0	0	94	422

Data Provided by K-D-N.com 503-594-4224

N/S street	Locust St
E/W street	US 20
City, State	Sisters OR
Site Notes	
Location	44.290153 - -121.543805
Start Date	Tuesday, October 15, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:20:00 PM
PHF (15-Min Int)	0.94



Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
7	2	33	0	78	3	64	0	72	619	6	0	11	458	138	0	42	145	697	607	20	212	529	730
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	2.6%	0.0%	1.6%	0.0%	1.4%	4.2%	0.0%	0.0%	0.0%	5.2%	7.2%	0.0%	0.0%	2.1%	3.9%	5.6%	0.0%	5.2%	4.7%	3.8%

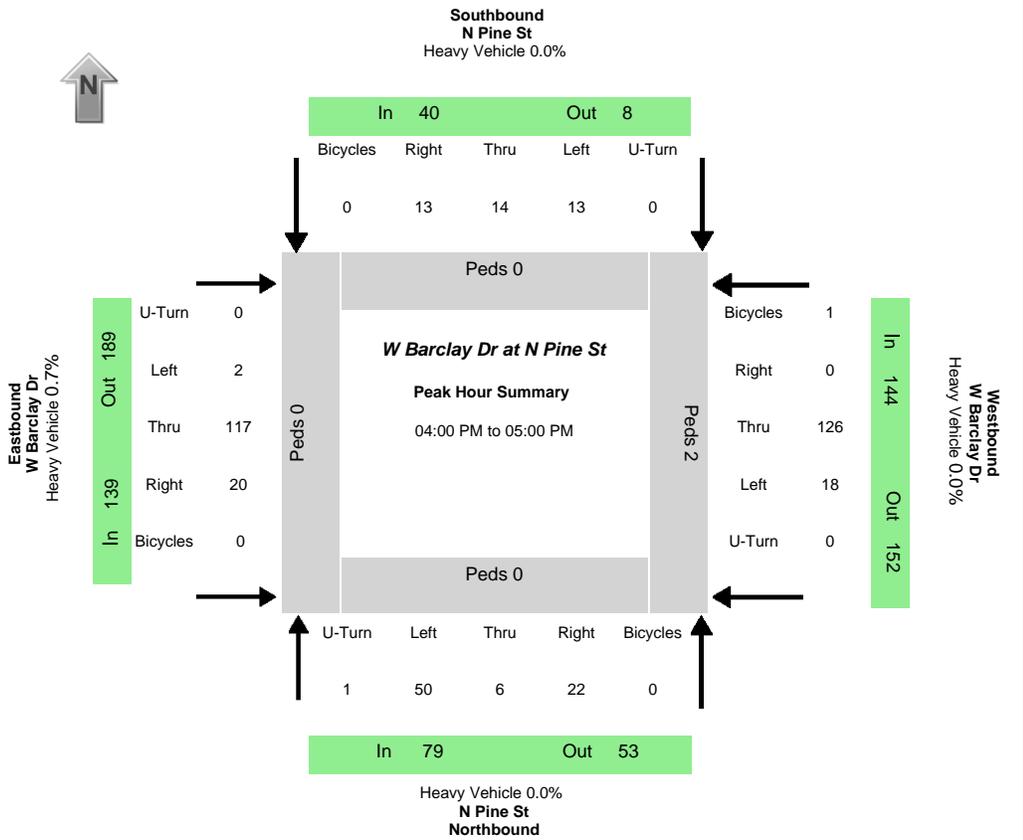
PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3

Time	Northbound Locust St				Southbound Locust St				Eastbound US 20				Westbound US 20				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	1	0	0	0	7	0	3	0	10	35	1	0	2	46	20	0		
04:05:00 PM	0	1	2	0	5	0	8	0	4	53	1	0	1	39	17	0		
04:10:00 PM	1	1	8	0	6	0	4	0	4	59	1	0	1	31	10	0	382	
04:15:00 PM	0	0	3	0	6	0	6	0	5	42	1	0	0	40	11	0	371	
04:20:00 PM	0	0	3	0	7	0	2	0	7	50	0	0	3	40	16	0	368	
04:25:00 PM	2	0	5	0	7	0	4	0	5	62	0	0	0	42	12	0	381	
04:30:00 PM	1	0	2	0	5	0	5	0	6	62	0	0	0	41	6	0	395	
04:35:00 PM	0	0	1	0	8	0	3	0	4	53	0	0	1	34	5	0	376	
04:40:00 PM	0	0	3	0	9	0	2	0	7	47	0	0	2	37	12	0	356	
04:45:00 PM	1	0	2	0	4	0	10	0	7	57	0	0	0	38	11	0	358	
04:50:00 PM	1	0	0	0	4	2	10	0	6	63	1	0	0	41	11	0	388	
04:55:00 PM	0	0	4	0	10	1	7	0	7	36	1	0	1	29	7	0	372	1491
05:00:00 PM	1	0	1	0	7	1	0	0	9	45	1	0	2	31	13	0	353	1477
05:05:00 PM	0	0	3	0	6	0	5	0	7	75	0	0	0	30	9	0	349	1481
05:10:00 PM	0	0	4	0	7	1	2	0	1	61	0	0	4	17	9	0	352	1461
05:15:00 PM	0	1	3	0	15	0	3	0	3	46	1	0	7	28	11	0	359	1465
05:20:00 PM	0	0	2	0	11	0	4	0	5	39	1	0	4	28	14	0	332	1445
05:25:00 PM	1	0	2	0	3	0	3	0	5	78	1	0	0	25	15	0	359	1439
05:30:00 PM	0	0	1	0	2	0	5	0	7	64	1	0	3	32	12	0	368	1438
05:35:00 PM	0	1	2	0	7	0	4	0	4	28	0	0	1	30	13	0	350	1419
05:40:00 PM	0	0	0	0	4	1	5	0	5	38	0	0	3	26	17	0	316	1399
05:45:00 PM	0	0	4	0	5	0	4	0	6	56	0	0	3	31	7	0	305	1385
05:50:00 PM	0	1	4	0	7	1	5	0	4	55	0	0	4	30	11	0	337	1368
05:55:00 PM	0	1	1	0	9	0	5	0	5	30	1	0	1	30	11	0	332	1359



KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	N Pine St
E/W street	W Barclay Dr
City, State	Sisters OR
Site Notes	
Location	44.29704 - -121.55394
Start Date	Tuesday, October 15, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:00:00 PM
Peak 15 Min Start	04:30:00 PM
PHF (15-Min Int)	0.84



Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
50	6	22	1	13	14	13	0	2	117	20	0	18	126	0	0	79	40	139	144	53	8	189	152
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.7%

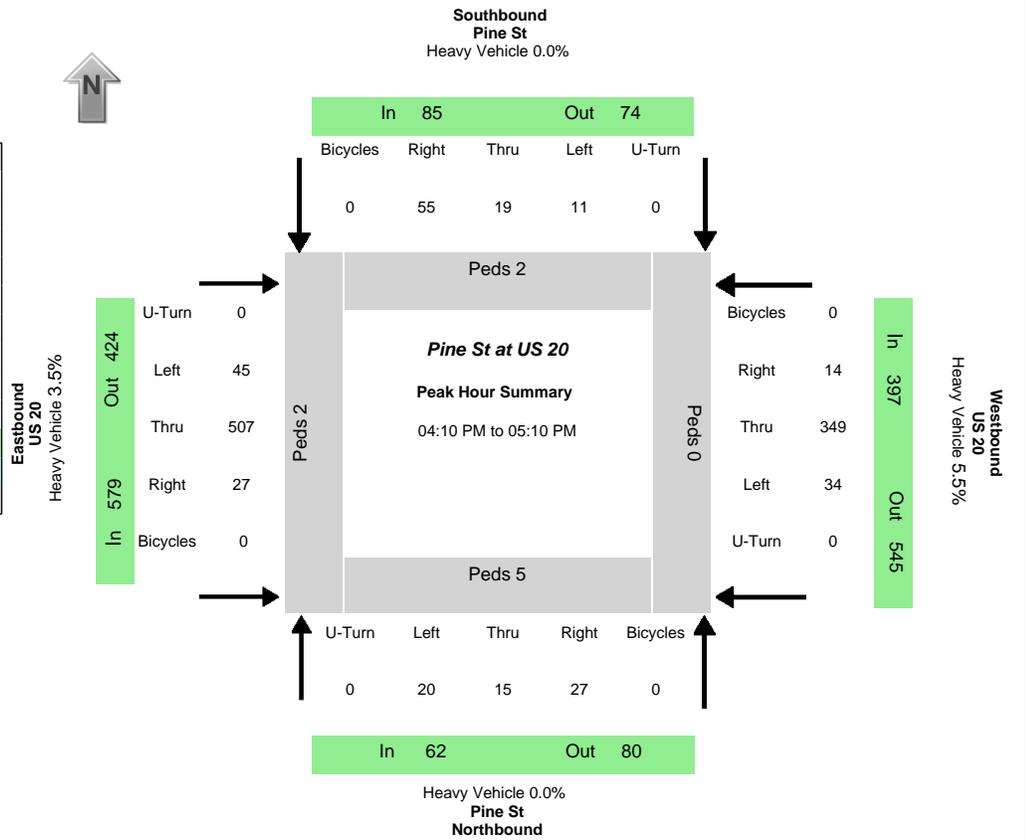
PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	2

All Vehicle Volumes																		
Time	Northbound N Pine St				Southbound N Pine St				Eastbound W Barclay Dr				Westbound W Barclay Dr				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	6	1	2	1	0	2	3	0	0	5	2	0	3	10	0	0		
04:05:00 PM	3	2	1	0	0	0	1	0	0	11	1	0	3	11	0	0		
04:10:00 PM	4	0	3	0	0	0	0	0	0	13	2	0	0	11	0	0	101	
04:15:00 PM	1	0	1	0	0	2	0	0	0	10	6	0	1	8	0	0	95	
04:20:00 PM	3	0	1	0	1	1	1	0	0	9	1	0	2	15	0	0	96	
04:25:00 PM	2	0	2	0	0	2	0	0	1	5	2	0	1	9	0	0	87	
04:30:00 PM	7	1	2	0	4	2	2	0	0	6	1	0	3	8	0	0	94	
04:35:00 PM	6	0	1	0	3	2	2	0	0	16	1	0	2	11	0	0	104	
04:40:00 PM	5	0	2	0	4	1	2	0	1	6	1	0	0	17	0	0	119	
04:45:00 PM	5	0	2	0	0	1	1	0	0	10	1	0	1	10	0	0	114	
04:50:00 PM	4	1	2	0	0	0	1	0	0	13	1	0	2	9	0	0	103	
04:55:00 PM	4	1	3	0	1	1	0	0	0	13	1	0	0	7	0	0	95	402
05:00:00 PM	3	0	2	0	1	0	2	0	0	11	1	0	1	6	0	0	91	394
05:05:00 PM	2	0	3	0	1	1	0	0	0	12	2	0	1	13	0	0	93	396
05:10:00 PM	5	1	1	0	0	1	0	0	0	14	1	0	1	12	1	0	99	400
05:15:00 PM	7	0	2	0	0	0	2	0	0	10	0	0	0	8	0	0	101	400
05:20:00 PM	3	0	0	0	0	0	0	0	1	8	0	0	0	17	1	0	96	396
05:25:00 PM	2	0	0	0	0	1	0	0	0	5	2	0	0	5	0	0	74	387
05:30:00 PM	2	1	5	0	0	0	0	0	1	7	0	0	0	7	0	0	68	374
05:35:00 PM	1	1	1	0	1	1	0	0	0	11	0	0	0	14	0	0	68	360
05:40:00 PM	6	1	0	0	0	1	0	0	0	8	2	0	0	8	0	0	79	347
05:45:00 PM	3	0	0	0	0	0	0	0	1	8	1	0	2	6	0	0	77	337
05:50:00 PM	0	0	2	0	0	0	2	0	0	10	0	0	0	16	0	0	77	334
05:55:00 PM	1	2	0	0	0	0	3	0	0	7	2	0	0	10	0	0	76	328



KEY DATA NETWORK

Data Provided by K-D-N.com 503-594-4224	
N/S street	Pine St
E/W street	US 20
City, State	Sisters OR
Site Notes	
Location	44.291346 - -121.553807
Start Date	Tuesday, October 15, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:10:00 PM
Peak 15 Min Start	04:20:00 PM
PHF (15-Min Int)	0.91



Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
20	15	27	0	11	19	55	0	45	507	27	0	34	349	14	0	62	85	579	397	80	74	424	545
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%	6.3%	0.0%	0.0%	0.0%	0.0%	3.5%	5.5%	0.0%	0.0%	5.2%	3.7%

PHV - Bicycles												PHV - Pedestrians									
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	2	2	0	9

Time	Northbound Pine St				Southbound Pine St				Eastbound US 20				Westbound US 20				15 Min Sum	1 HR Sum
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn		
04:00:00 PM	0	3	2	0	3	1	8	0	5	43	2	0	2	23	2	0		
04:05:00 PM	3	2	5	0	2	2	8	0	3	43	2	0	4	22	3	0		
04:10:00 PM	3	1	8	0	1	4	5	0	3	34	3	0	6	31	1	0	293	
04:15:00 PM	3	2	2	0	2	0	5	0	5	23	2	0	4	21	4	0	272	
04:20:00 PM	2	2	0	0	0	1	5	0	4	42	2	0	3	37	0	0	271	
04:25:00 PM	2	0	4	0	0	3	3	0	4	48	4	0	2	34	2	0	277	
04:30:00 PM	0	1	1	0	1	2	6	0	6	54	4	0	0	28	1	0	308	
04:35:00 PM	0	3	4	0	2	2	3	0	0	28	1	0	3	29	1	0	286	
04:40:00 PM	2	2	1	0	1	1	6	0	3	41	1	0	3	30	1	0	272	
04:45:00 PM	1	1	1	0	1	4	1	0	5	66	1	0	1	26	0	0	276	
04:50:00 PM	0	0	2	0	0	2	4	0	4	33	4	0	3	35	0	0	287	
04:55:00 PM	4	0	2	0	1	0	6	0	3	34	2	0	3	26	2	0	278	1120
05:00:00 PM	2	3	0	0	1	0	6	0	5	29	1	0	2	27	1	0	247	1103
05:05:00 PM	1	0	2	0	1	0	5	0	3	75	2	0	4	25	1	0	279	1123
05:10:00 PM	2	2	2	0	0	2	4	0	4	37	5	0	7	14	0	0	275	1102
05:15:00 PM	1	1	0	0	2	0	2	0	0	28	2	0	4	14	1	0	253	1084
05:20:00 PM	1	0	4	0	1	0	2	0	2	21	2	0	6	27	1	0	201	1053
05:25:00 PM	3	0	1	0	0	0	3	0	6	76	3	0	3	15	1	0	233	1058
05:30:00 PM	0	2	2	0	1	0	6	0	5	41	1	0	4	23	0	0	263	1039
05:35:00 PM	1	0	1	0	1	0	1	0	0	22	1	0	2	20	1	0	246	1013
05:40:00 PM	2	3	0	0	2	0	2	0	3	51	3	0	3	32	1	0	237	1023
05:45:00 PM	1	0	1	0	2	0	4	0	3	66	1	0	4	16	1	0	251	1014
05:50:00 PM	1	1	2	0	1	0	4	0	1	23	1	0	3	21	3	0	262	988
05:55:00 PM	1	1	0	0	0	1	5	0	1	15	3	0	2	30	2	0	221	966



KEY DATA NETWORK

Key Data Network
5477 SW Joshua St

Tualatin, Oregon, United States 97062
503.804.3294 conley@k-d-n.com
Key People serving Key Clients

Count Name: Hwy 20 at W
Barclay Rd
Site Code:
Start Date: 10/15/2019
Page No: 1

Location: 44.295756, -
121.559593

Turning Movement Data

Start Time	Hwy 20 Northbound						Hwy 20 Southbound						W McKinney Butte Rd Eastbound					W Barclay Rd Westbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:00 PM	20	59	4	0	0	83	21	85	3	0	0	109	28	12	26	0	66	15	19	17	0	0	51	309
4:15 PM	25	69	1	0	0	95	18	95	9	0	0	122	20	14	29	0	63	3	26	12	0	0	41	321
4:30 PM	31	56	3	0	0	90	14	66	6	1	0	87	21	19	31	0	71	16	30	14	0	0	60	308
4:45 PM	22	63	2	0	1	87	15	90	6	0	0	111	19	25	27	0	71	8	25	12	0	0	45	314
Hourly Total	98	247	10	0	1	355	68	336	24	1	0	429	88	70	113	0	271	42	100	55	0	0	197	1252
5:00 PM	22	43	3	0	0	68	20	102	5	0	0	127	27	21	26	0	74	4	27	13	0	0	44	313
5:15 PM	15	49	3	0	0	67	18	108	5	0	1	131	24	11	31	0	66	7	28	12	0	0	47	311
5:30 PM	21	48	5	0	0	74	13	39	1	0	1	53	18	13	29	0	60	3	28	6	0	0	37	224
5:45 PM	32	37	2	0	0	71	17	74	8	0	0	99	24	13	23	0	60	6	27	9	0	0	42	272
Hourly Total	90	177	13	0	0	280	68	323	19	0	2	410	93	58	109	0	260	20	110	40	0	0	170	1120
Grand Total	188	424	23	0	1	635	136	659	43	1	2	839	181	128	222	0	531	62	210	95	0	0	367	2372
Approach %	29.6	66.8	3.6	0.0	-	-	16.2	78.5	5.1	0.1	-	-	34.1	24.1	41.8	0.0	-	16.9	57.2	25.9	0.0	-	-	-
Total %	7.9	17.9	1.0	0.0	-	26.8	5.7	27.8	1.8	0.0	-	35.4	7.6	5.4	9.4	0.0	22.4	2.6	8.9	4.0	0.0	-	15.5	-
Lights	185	391	23	0	-	599	135	601	42	0	-	778	178	126	218	0	522	61	209	92	0	-	362	2261
% Lights	98.4	92.2	100.0	-	-	94.3	99.3	91.2	97.7	0.0	-	92.7	98.3	98.4	98.2	-	98.3	98.4	99.5	96.8	-	-	98.6	95.3
Other Vehicles	3	33	0	0	-	36	1	58	1	1	-	61	3	2	4	0	9	1	1	3	0	-	5	111
% Other Vehicles	1.6	7.8	0.0	-	-	5.7	0.7	8.8	2.3	100.0	-	7.3	1.7	1.6	1.8	-	1.7	1.6	0.5	3.2	-	-	1.4	4.7
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
All Pedestrians	-	-	-	-	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	0	-	-
% All Pedestrians	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Key Data Network
5477 SW Joshua St

Tualatin, Oregon, United States 97062
503.804.3294 conley@k-d-n.com
Key People serving Key Clients

Count Name: Hwy 20 at W
Barclay Rd
Site Code:
Start Date: 10/15/2019
Page No: 3

Location: 44.295756, -
121.559593

Approach Data

Start Time	Nb Street Northbound						Sb Street Southbound						Eb Street Eastbound				Wb Street Westbound					
	Peds CCW	Peds CW	Circul ating	Out	In	Next	Peds CCW	Peds CW	Circul ating	Out	In	Next	Circul ating	Out	In	Next	Peds CCW	Peds CW	Circul ating	Out	In	Next
4:00 PM	0	0	62	126	82	4	0	0	53	106	108	3	119	42	66	26	0	0	106	39	50	17
4:15 PM	0	0	53	126	97	1	0	0	53	100	123	9	117	59	64	29	0	0	116	32	41	12
4:30 PM	0	0	54	114	89	3	0	0	78	94	87	6	98	66	71	31	0	0	108	37	60	14
4:45 PM	0	1	60	125	88	2	0	0	57	93	112	6	114	53	72	27	0	0	106	42	46	12
Hourly Total	0	1	229	491	356	10	0	0	241	393	430	24	448	220	273	113	0	0	436	150	197	55
5:00 PM	0	0	67	132	68	3	0	0	54	83	128	5	127	53	73	26	0	0	92	44	45	13
5:15 PM	0	0	51	145	68	3	1	0	48	84	131	5	134	47	66	31	0	0	90	31	46	12
5:30 PM	0	0	46	70	74	5	0	1	52	73	53	1	55	50	62	29	0	0	86	30	36	6
5:45 PM	0	0	54	104	71	2	0	0	66	71	99	8	97	67	60	23	0	0	93	32	43	9
Hourly Total	0	0	218	451	281	13	1	1	220	311	411	19	413	217	261	109	0	0	361	137	170	40
Grand Total	0	1	447	942	637	23	1	1	461	704	841	43	861	437	534	222	0	0	797	287	367	95
Approach %	-	-	21.8	46.0	31.1	1.1	-	-	22.5	34.4	41.0	2.1	41.9	21.3	26.0	10.8	-	-	51.6	18.6	23.7	6.1
Total %	-	-	5.8	12.2	8.3	0.3	-	-	6.0	9.1	10.9	0.6	11.2	5.7	6.9	2.9	-	-	10.4	3.7	4.8	1.2
Lights	-	-	439	876	600	23	-	-	457	662	781	42	801	432	524	218	-	-	756	283	363	92
% Lights	-	-	98.2	93.0	94.2	100.0	-	-	99.1	94.0	92.9	97.7	93.0	98.9	98.1	98.2	-	-	94.9	98.6	98.9	96.8
Other Vehicles	-	-	8	66	37	0	-	-	4	41	60	1	60	5	10	4	-	-	41	4	4	3
% Other Vehicles	-	-	1.8	7.0	5.8	0.0	-	-	0.9	5.8	7.1	2.3	7.0	1.1	1.9	1.8	-	-	5.1	1.4	1.1	3.2
Bicycles on Road	-	-	0	0	0	0	-	-	0	1	0	0	0	0	0	0	-	-	0	0	0	0
% Bicycles on Road	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0
Bicycles on Crosswalk	0	1	-	-	-	-	1	0	-	-	-	-	-	-	-	-	0	0	-	-	-	-
% Bicycles on Crosswalk	-	100.0	-	-	-	-	100.0	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	0	0	-	-	-	-	0	1	-	-	-	-	-	-	-	-	0	0	-	-	-	-
% Pedestrians	-	0.0	-	-	-	-	0.0	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-

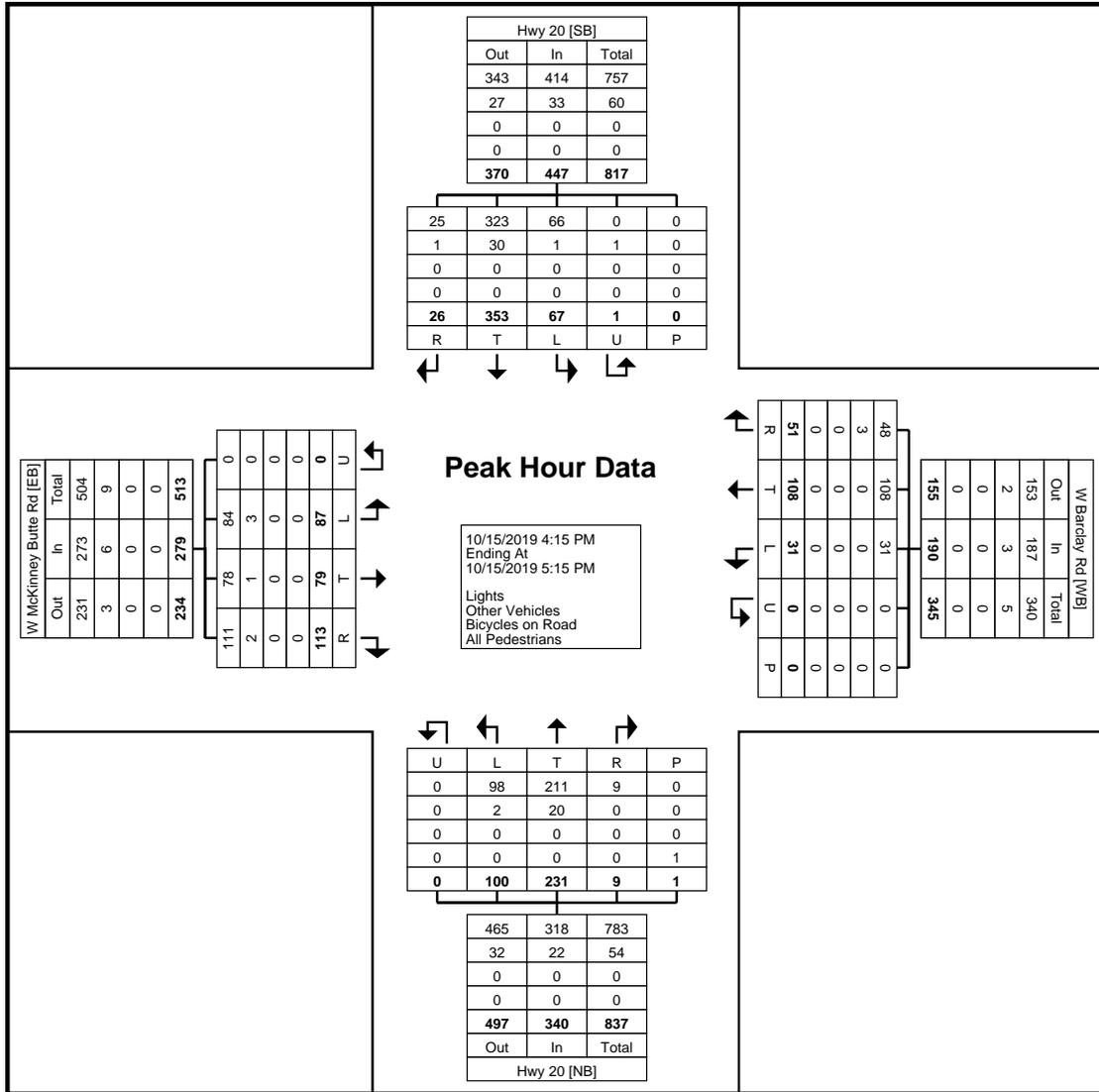


Key Data Network
5477 SW Joshua St

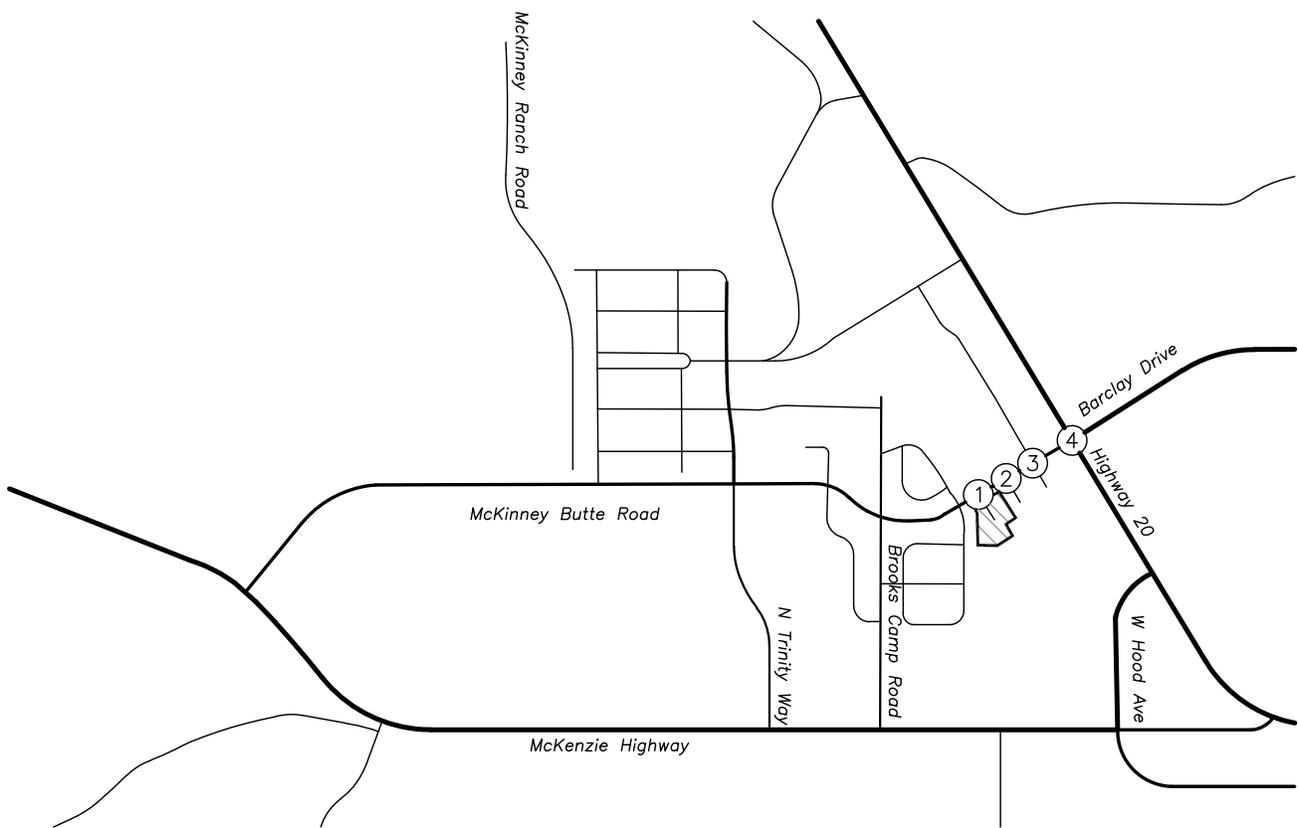
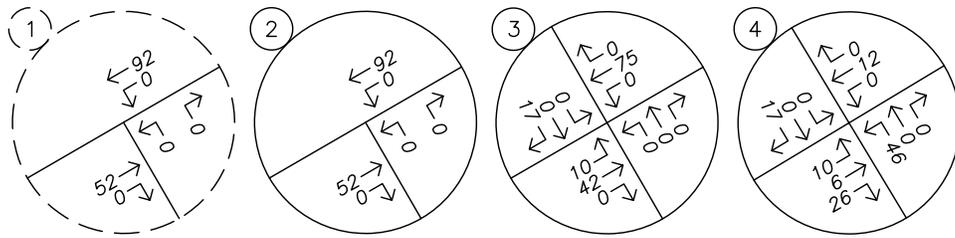
Tualatin, Oregon, United States 97062
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Count Name: Hwy 20 at W
Barclay Rd
Site Code:
Start Date: 10/15/2019
Page No: 5

Location: 44.295756, -
121.559593



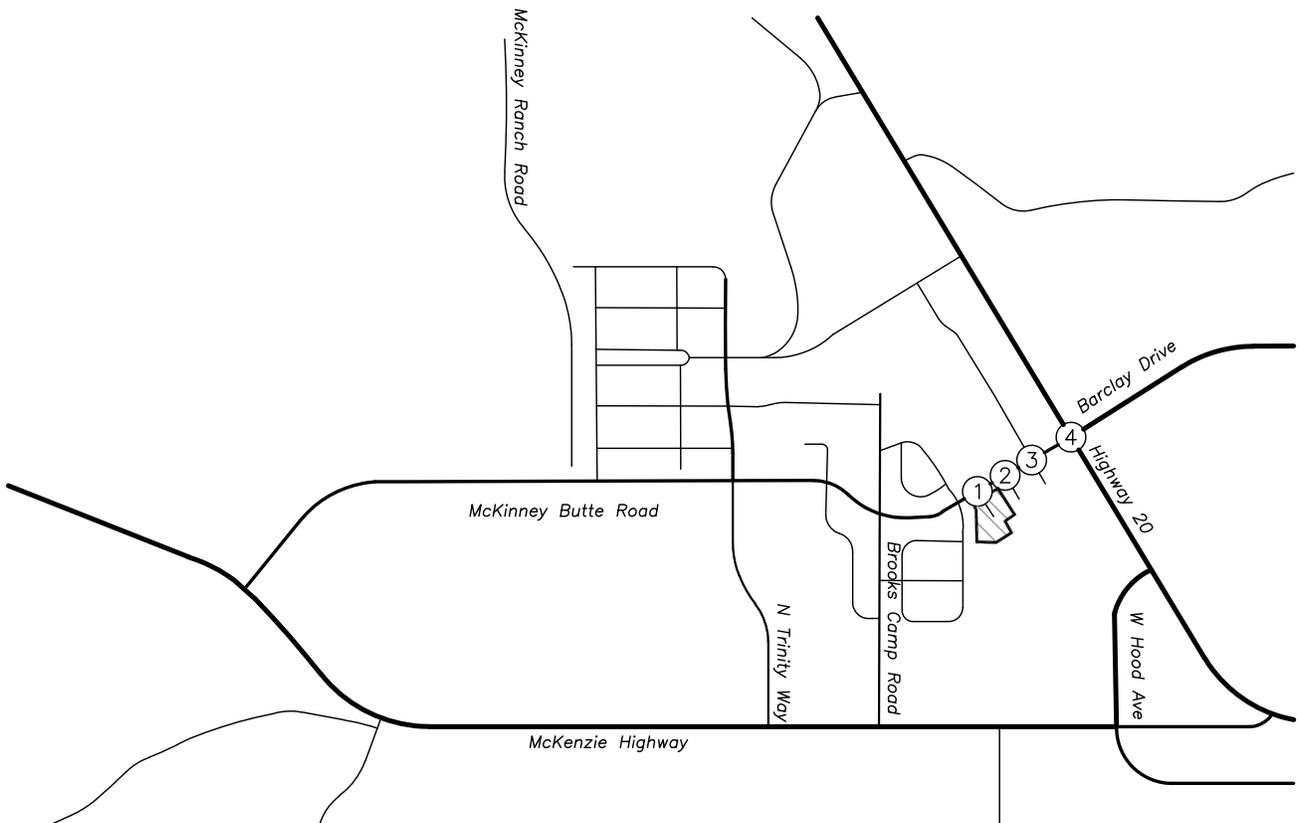
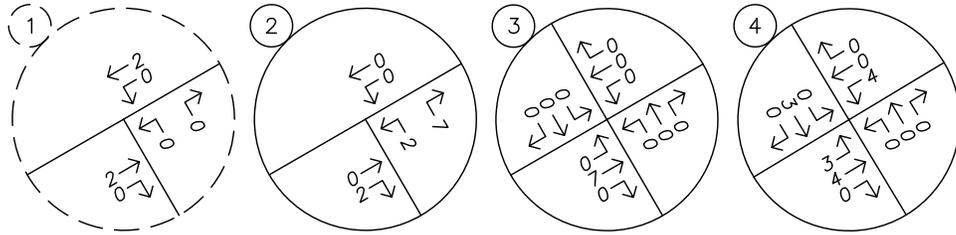
Turning Movement Peak Hour Data Plot (4:15 PM)



TRAFFIC VOLUMES
 In-Process Trips - McKenzie Meadows
 PM Peak Hour



FIGURE
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 PAGE
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TRAFFIC VOLUMES
In-Process Trips – Threewind Master Plan
PM Peak Hour



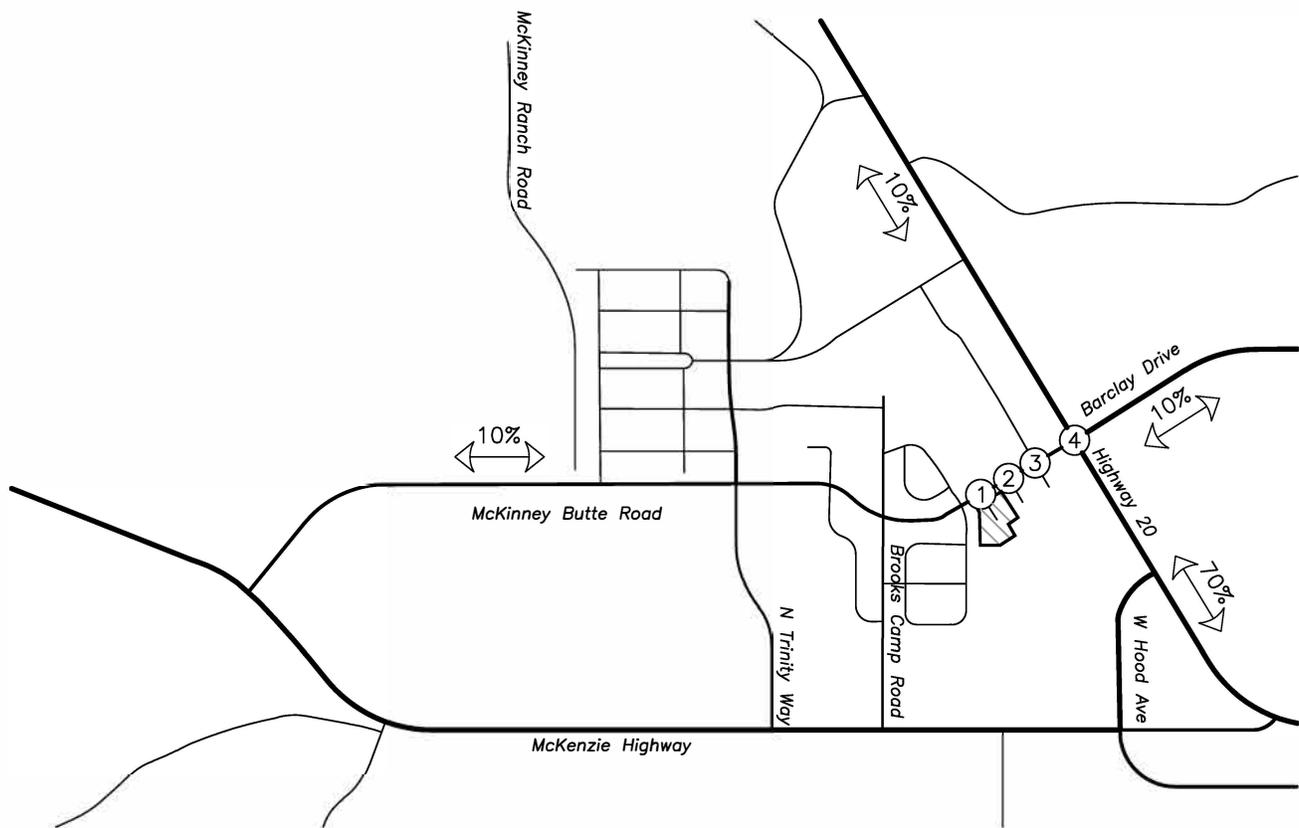
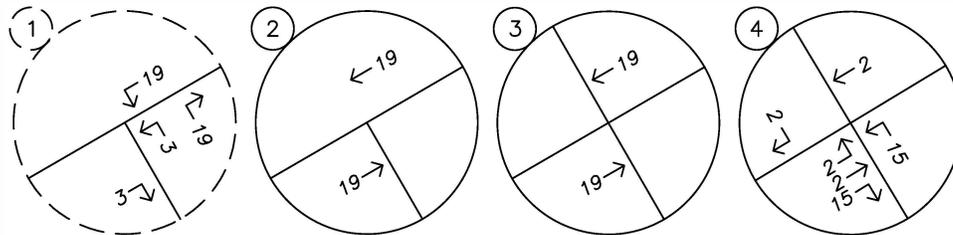
FIGURE
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PAGE
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LEGEND

XX% PERCENT OF PRIMARY TRIPS

TRIP GENERATION			
	IN	OUT	TOTAL
AM	8	3	11
PM	22	22	44



TRAFFIC VOLUMES
 In-Process Trips – Dollar General
 PM Peak Hour



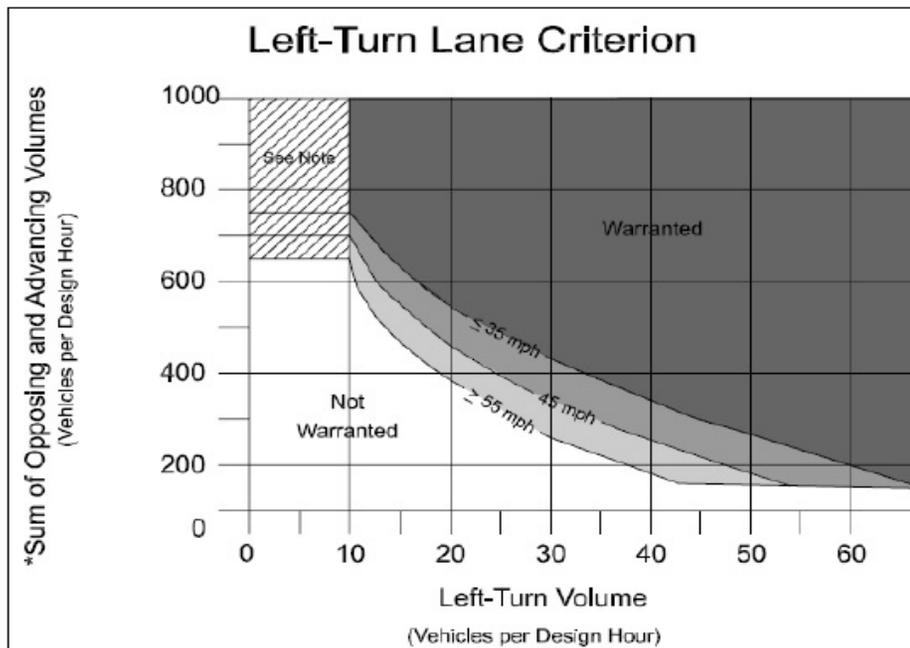
FIGURE
 5
PAGE
 10



Project: 19091 Sisters Industrial Subdivision
 Intersection: W Barclay Drive at N Pine Street
 Date: 2/25/2020
 Scenario: 2040 Buildout, Westbound Approach

Speed? 30 mph

AM Peak Hour		PM Peak Hour	
Left-Turn Volume		Left-Turn Volume	27
Approaching DHV # of Advancing Through Lanes		Approaching DHV # of Advancing Through Lanes	278 1
Opposing DHV # of Opposing Through Lanes		Opposing DHV # of Opposing Through Lanes	303 1
O+A DHV		O+A DHV	581
Lane Needed?		Lane Needed?	Yes



Source: Oregon DOT Analysis Procedures Manual 2008

$*(\text{Advancing Vol} / \# \text{ of Advancing Through Lanes}) + (\text{Opposing Vol} / \# \text{ of Opposing Through Lanes})$

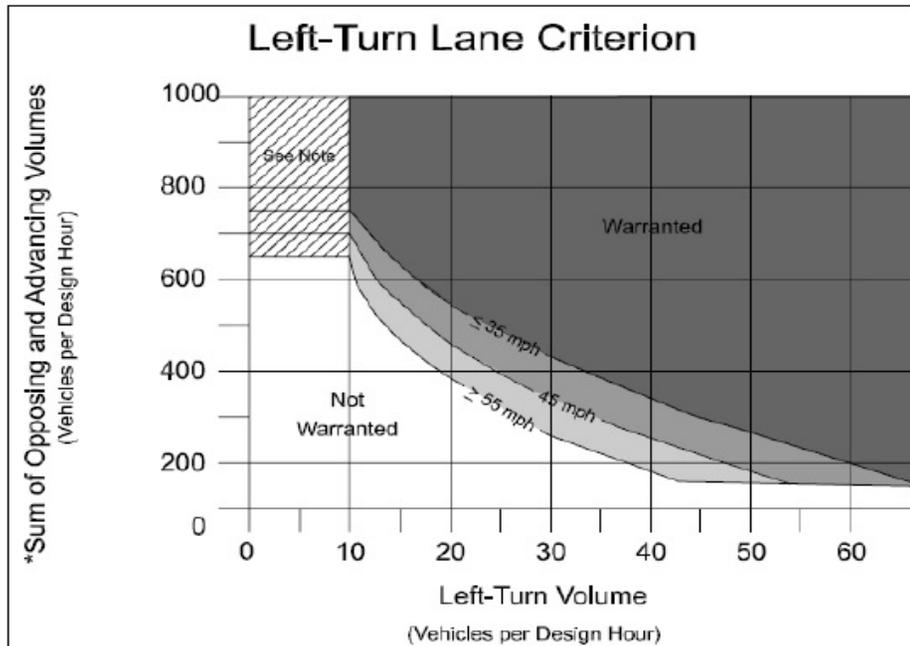
Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for accidents in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.



Project: 19091 Sisters Industrial Subdivision
 Intersection: W Barclay Drive at N Pine Street
 Date: 2/25/2020
 Scenario: 2040 Buildout, Eastbound Approach

Speed? 30 mph

AM Peak Hour		PM Peak Hour	
Left-Turn Volume		Left-Turn Volume	3
Approaching DHV # of Advancing Through Lanes		Approaching DHV # of Advancing Through Lanes	306 1
Opposing DHV # of Opposing Through Lanes		Opposing DHV # of Opposing Through Lanes	251 1
O+A DHV		O+A DHV	557
Lane Needed?		Lane Needed?	No



Source: Oregon DOT Analysis Procedures Manual 2008

$*(\text{Advancing Vol} / \# \text{ of Advancing Through Lanes}) + (\text{Opposing Vol} / \# \text{ of Opposing Through Lanes})$

Note: The criterion is not met from zero to ten left turn vehicles per hour, but careful consideration should be given to installing a left turn lane due to the increased potential for accidents in the through lanes. While the turn volumes are low, the adverse safety and operational impacts may require installation of a left turn. The final determination will be based on a field study.

Traffic Signal Warrant Analysis



Project: 19091 - Sisters Industrial Subdivision
 Date: 1/27/2020
 Scenario: SW 11th Street Extension

Major Street:	US Highway 20	Minor Street:	N Pine Street
Number of Lanes:	1	Number of Lanes:	2
PM Peak Hour Volumes:	1,680	PM Peak Hour Volumes:	121

Warrant Used:

_____ 100 percent of standard warrants used
 X 70 percent of standard warrants used due to 85th percentile speed in excess
 _____ of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	16,800	6,200	
Minor Street*	1,210	2,500	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	16,800	9,300	
Minor Street*	1,210	1,250	No
<i>Combination Warrant</i>			
Major Street	16,800	7,440	
Minor Street*	1,210	2,000	No

* Minor street right-turning traffic volumes reduced by 25%

Traffic Signal Warrant Analysis



Project: 19091 - Sisters Industrial Subdivision
 Date: 1/27/2020
 Scenario: SW 11th Street Extension

Major Street:	W Barclay Drive	Minor Street:	N Pine Street
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	584	PM Peak Hour Volumes:	116

Warrant Used:

_____ 100 percent of standard warrants used
 X 70 percent of standard warrants used due to 85th percentile speed in excess
 _____ of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
WARRANT 1, CONDITION A					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	5,840	6,200	
Minor Street*	1,160	1,850	No
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	5,840	9,300	
Minor Street*	1,160	950	No
<i>Combination Warrant</i>			
Major Street	5,840	7,440	
Minor Street*	1,160	1,480	No

* Minor street right-turning traffic volumes reduced by 25%

Vistro File: Z:\...\Spencer Industrial Park PM.vistro

Scenario 4 Existing Volumes

Report File: Z:\...\Existing.pdf

4/30/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 20 at W Barclay Drive	Roundabout	HCM 6th Edition	SEB Thru		8.9	A
2	N Pine Street at W Barclay Drive	Two-way stop	HCM 6th Edition	NB Left	0.106	12.4	B
3	N Locust Street at W Barclay Drive	Two-way stop	HCM 6th Edition	EB Left	0.145	13.0	B
4	Pine Street at US 20	Two-way stop	HCM 6th Edition	NB Left	0.232	57.2	F
5	Locust Street at US 20	Two-way stop	HCM 6th Edition	SB Left	1.103	240.7	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 20 at W Barclay Drive

Control Type:
 Analysis Method:
 Analysis Period:

Roundabout
 HCM 6th Edition
 15 minutes

Delay (sec / veh):
 Level Of Service:

8.9
 A

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right									
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	87	79	113	31	108	51	100	273	9	67	418	26
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.20	2.20	2.20	1.60	1.60	1.60	6.50	6.50	6.50	7.40	7.40	7.40
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	87	79	113	31	108	51	100	273	9	67	418	26
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	22	20	29	8	28	13	26	70	2	17	107	7
Total Analysis Volume [veh/h]	89	81	115	32	110	52	102	279	9	68	427	27
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	564			497			247			253		
Exiting Flow Rate [veh/h]	249			165			609			441		
Demand Flow Rate [veh/h]	87	79	113	31	108	51	100	273	9	67	418	26
Adjusted Demand Flow Rate [veh/h]	89	81	115	32	110	52	102	279	9	68	427	27

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.98			0.94			0.93		
Entry Flow Rate [veh/h]	292			198			416			561		
Capacity of Entry and Bypass Lanes [veh/h]	777			832			1073			1067		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	760			819			1008			993		
X, volume / capacity	0.38			0.24			0.39			0.53		

Movement, Approach, & Intersection Results

Lane LOS	A			A			A			B		
95th-Percentile Queue Length [veh]	1.75			0.92			1.85			3.16		
95th-Percentile Queue Length [ft]	43.76			23.03			46.27			78.93		
Approach Delay [s/veh]	9.44			6.95			7.75			10.20		
Approach LOS	A			A			A			B		
Intersection Delay [s/veh]	8.90											
Intersection LOS	A											

Intersection Level Of Service Report
Intersection 2: N Pine Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	12.4
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.106

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	⊕			⊕			⊕			⊕		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	50	6	22	13	14	13	2	117	20	18	126	0
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.70	7.00	0.70	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	50	6	22	13	14	13	2	117	20	18	126	0
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	15	2	7	4	4	4	1	35	6	5	38	0
Total Analysis Volume [veh/h]	60	7	26	15	17	15	2	139	24	21	150	0
Pedestrian Volume [ped/h]	0			0			0			2		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.11	0.01	0.03	0.03	0.03	0.02	0.00	0.00	0.00	0.01	0.00	0.00
d_M, Delay for Movement [s/veh]	12.35	12.31	10.00	11.84	11.87	9.44	7.50	0.00	0.00	7.56	0.00	0.00
Movement LOS	B	B	A	B	B	A	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.51	0.51	0.51	0.24	0.24	0.24	0.00	0.00	0.00	0.04	0.04	0.04
95th-Percentile Queue Length [ft/ln]	12.87	12.87	12.87	5.94	5.94	5.94	0.10	0.10	0.10	1.12	1.12	1.12
d_A, Approach Delay [s/veh]	11.69			11.08			0.09			0.93		
Approach LOS	B			B			A			A		
d_I, Intersection Delay [s/veh]	3.74											
Intersection LOS	B											

Intersection Level Of Service Report
Intersection 3: N Locust Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	13.0
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.145

Intersection Setup

Name	Northbound		Southbound		Eastbound	
Approach						
Lane Configuration	↰		↱		↵	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		No		No	

Volumes

Name	Northbound		Southbound		Eastbound	
Base Volume Input [veh/h]	86	87	88	39	77	94
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.70	1.70	1.60	1.60	0.60	0.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	86	87	88	39	77	94
Peak Hour Factor	0.9300	0.9300	0.9300	0.9300	0.9300	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	23	23	24	10	21	25
Total Analysis Volume [veh/h]	92	94	95	42	83	101
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Free	Stop
Flared Lane			No
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance			No
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.06	0.00	0.00	0.00	0.15	0.11
d_M, Delay for Movement [s/veh]	7.65	0.00	0.00	0.00	12.95	10.49
Movement LOS	A	A	A	A	B	B
95th-Percentile Queue Length [veh/ln]	0.20	0.20	0.00	0.00	1.00	1.00
95th-Percentile Queue Length [ft/ln]	5.08	5.08	0.00	0.00	24.96	24.96
d_A, Approach Delay [s/veh]	3.79		0.00		11.60	
Approach LOS	A		A		B	
d_I, Intersection Delay [s/veh]	5.60					
Intersection LOS	B					

**Intersection Level Of Service Report
Intersection 4: Pine Street at US 20**

Control Type: Two-way stop
 Analysis Method: HCM 6th Edition
 Analysis Period: 15 minutes

Delay (sec / veh): 57.2
 Level Of Service: F
 Volume to Capacity (v/c): 0.232

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	20	15	27	11	19	55	45	600	27	34	413	14
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	3.50	3.50	3.50	5.50	5.50	5.50
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	20	15	27	11	19	55	45	600	27	34	413	14
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	5	4	7	3	5	15	12	165	7	9	113	4
Total Analysis Volume [veh/h]	22	16	30	12	21	60	49	659	30	37	454	15
Pedestrian Volume [ped/h]	5			2			2			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.23	0.11	0.07	0.11	0.15	0.10	0.05	0.01	0.00	0.04	0.00	0.00
d_M, Delay for Movement [s/veh]	57.25	44.40	27.24	48.87	40.18	11.68	8.49	0.00	0.00	9.26	0.00	0.00
Movement LOS	F	E	D	E	E	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.81	1.81	1.81	0.98	0.98	0.33	0.14	0.00	0.00	0.13	0.00	0.00
95th-Percentile Queue Length [ft/ln]	45.35	45.35	45.35	24.50	24.50	8.31	3.56	0.00	0.00	3.28	0.00	0.00
d_A, Approach Delay [s/veh]	40.99			22.91			0.56			0.68		
Approach LOS	E			C			A			A		
d_I, Intersection Delay [s/veh]	4.04											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:	Two-way stop	Delay (sec / veh):	240.7
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.103

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach	Northbound			Southbound			Northwestbound			Southeastbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	1	0	0	0	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	200.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			Yes		

Volumes

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	7	2	33	78	3	64	11	542	138	72	733	6
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	2.10	2.10	2.10	5.60	5.60	5.60	3.90	3.90	3.90
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	7	2	33	78	3	64	11	542	138	72	733	6
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	1	9	21	1	17	3	144	37	19	195	2
Total Analysis Volume [veh/h]	7	2	35	83	3	68	12	577	147	77	780	6
Pedestrian Volume [ped/h]	0			0			0			3		

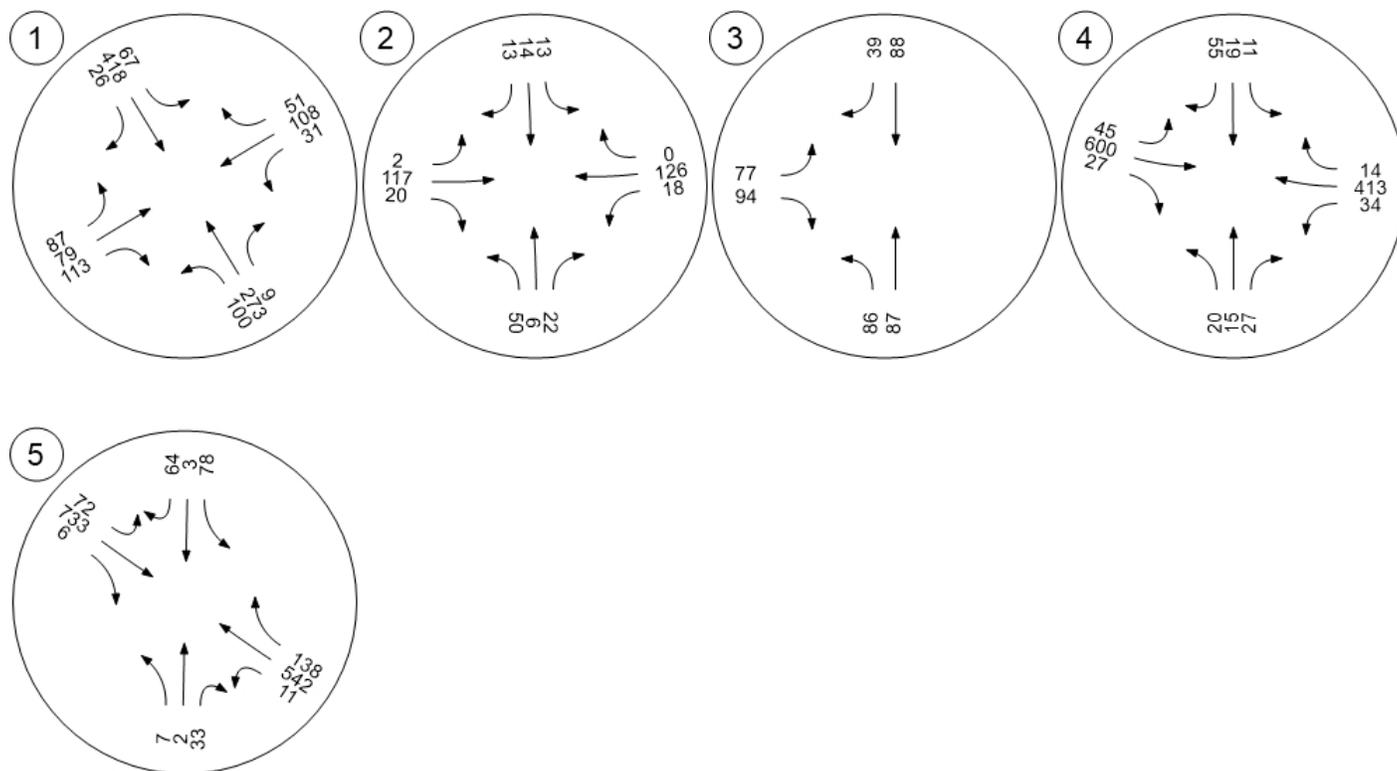
Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.11	0.02	0.09	1.10	0.03	0.13	0.01	0.01	0.00	0.09	0.01	0.00
d_M, Delay for Movement [s/veh]	68.46	52.75	19.33	240.74	227.97	13.10	9.47	0.00	0.00	9.54	0.00	0.00
Movement LOS	F	F	C	F	F	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0.83	0.83	0.83	6.34	6.34	0.46	0.04	0.04	0.00	0.29	0.00	0.00
95th-Percentile Queue Length [ft/ln]	20.85	20.85	20.85	158.51	158.51	11.38	1.12	1.12	0.00	7.26	0.00	0.00
d_A, Approach Delay [s/veh]	28.67			139.97			0.15			0.85		
Approach LOS	D			F			A			A		
d_I, Intersection Delay [s/veh]	13.17											
Intersection LOS	F											

Traffic Volume - Base Volume



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Scenario 2 2040 Background Volumes

Report File: Z:\...\Background 2040.pdf

4/30/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 20 at W Barclay Drive	Roundabout	HCM 6th Edition	SEB Thru		22.3	C
2	N Pine Street at W Barclay Drive	Two-way stop	HCM 6th Edition	NB Left	0.236	18.0	C
3	N Locust Street at W Barclay Drive	Two-way stop	HCM 6th Edition	SB Thru	0.315	18.1	C
4	Pine Street at US 20	Two-way stop	HCM 6th Edition	NB Left	2.083	1,126.6	F
5	Locust Street at US 20	Roundabout	HCM 6th Edition	SEB Thru		44.6	E

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 20 at W Barclay Drive

Control Type:	Roundabout	Delay (sec / veh):	22.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes		

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right									
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	132	120	171	47	164	77	152	331	14	102	507	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.20	2.20	2.20	1.60	1.60	1.60	6.50	6.50	6.50	7.40	7.40	7.40
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	15	12	41	4	14	0	61	0	0	0	3	19
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	147	132	212	51	178	77	213	331	14	102	510	58
Peak Hour Factor	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	38	34	54	13	45	20	54	84	4	26	130	15
Total Analysis Volume [veh/h]	150	135	216	52	182	79	217	338	14	104	520	59
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	723			744			403			469		
Exiting Flow Rate [veh/h]	479			265			832			594		
Demand Flow Rate [veh/h]	147	132	212	51	178	77	213	331	14	102	510	58
Adjusted Demand Flow Rate [veh/h]	150	135	216	52	182	79	217	338	14	104	520	59

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.98			0.94			0.93		
Entry Flow Rate [veh/h]	513			319			606			734		
Capacity of Entry and Bypass Lanes [veh/h]	661			646			915			856		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	646			636			859			797		
X, volume / capacity	0.78			0.49			0.66			0.86		

Movement, Approach, & Intersection Results

Lane LOS	D			B			C			D		
95th-Percentile Queue Length [veh]	7.37			2.73			5.15			10.41		
95th-Percentile Queue Length [ft]	184.32			68.14			128.86			260.30		
Approach Delay [s/veh]	26.01			13.49			15.33			29.40		
Approach LOS	D			B			C			D		
Intersection Delay [s/veh]	22.29											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 2: N Pine Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	18.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.236

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	76	9	33	20	21	20	3	177	30	27	191	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.70	7.00	0.70	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	12	0	0	18	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	76	9	33	20	21	20	3	189	30	27	209	2
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	23	3	10	6	6	6	1	56	9	8	62	1
Total Analysis Volume [veh/h]	90	11	39	24	25	24	4	225	36	32	249	2
Pedestrian Volume [ped/h]	0			0			0			2		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.24	0.03	0.05	0.06	0.06	0.03	0.00	0.00	0.00	0.02	0.00	0.00
d_M, Delay for Movement [s/veh]	18.01	17.09	13.08	15.79	15.08	10.90	7.73	0.00	0.00	7.81	0.00	0.00
Movement LOS	C	C	B	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.31	1.31	1.31	0.54	0.54	0.54	0.01	0.01	0.01	0.07	0.07	0.07
95th-Percentile Queue Length [ft/ln]	32.74	32.74	32.74	13.46	13.46	13.46	0.23	0.23	0.23	1.87	1.87	1.87
d_A, Approach Delay [s/veh]	16.56			13.94			0.12			0.88		
Approach LOS	C			B			A			A		
d_I, Intersection Delay [s/veh]	4.75											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 3: N Locust Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	18.1
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.315

Intersection Setup

Name	Northbound		Southbound		Eastbound	
Approach						
Lane Configuration	↰		↱		↵	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		Yes		No	

Volumes

Name	Northbound		Southbound		Eastbound	
Base Volume Input [veh/h]	130	132	133	59	117	142
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.70	2.00	2.00	2.00	2.00	0.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	16	0	0	2	1	11
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	146	132	133	61	118	153
Peak Hour Factor	0.9300	1.0000	1.0000	1.0000	1.0000	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	39	33	33	15	30	41
Total Analysis Volume [veh/h]	157	132	133	61	118	165
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Stop	Free
Flared Lane		No	
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance		No	
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.32	0.07	0.09	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	18.08	13.95	7.93	0.00
Movement LOS	A	A	C	B	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	1.83	1.83	0.29	0.29
95th-Percentile Queue Length [ft/ln]	0.00	0.00	45.71	45.71	7.19	7.19
d_A, Approach Delay [s/veh]	0.00		16.78		3.31	
Approach LOS	A		C		A	
d_I, Intersection Delay [s/veh]	5.47					
Intersection LOS	C					

**Intersection Level Of Service Report
Intersection 4: Pine Street at US 20**

Control Type:	Two-way stop	Delay (sec / veh):	1,126.6
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	2.083

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	⊕			⊕⇈			⇈⊕			⇈⊕		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	30	23	41	17	29	83	68	827	41	52	569	21
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	3.50	3.50	3.50	5.50	5.50	5.50
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	41	0	0	61	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	30	23	41	17	29	83	68	868	41	52	630	21
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	6	11	5	8	23	19	238	11	14	173	6
Total Analysis Volume [veh/h]	33	25	45	19	32	91	75	954	45	57	692	23
Pedestrian Volume [ped/h]	5			2			2			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	2.08	0.47	0.15	0.86	0.61	0.21	0.09	0.01	0.00	0.08	0.01	0.00
d_M, Delay for Movement [s/veh]	1126.61	967.11	911.20	556.38	462.51	15.40	9.50	0.00	0.00	10.84	0.00	0.00
Movement LOS	F	F	F	F	F	C	A	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	11.48	11.48	11.48	5.51	5.51	0.78	0.28	0.00	0.00	0.28	0.00	0.00
95th-Percentile Queue Length [ft/ln]	286.90	286.90	286.90	137.77	137.77	19.39	7.01	0.00	0.00	6.91	0.00	0.00
d_A, Approach Delay [s/veh]	993.79			188.54			0.66			0.80		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	62.39											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:
Analysis Method:
Analysis Period:

Roundabout
HCM 6th Edition
15 minutes

Delay (sec / veh):
Level Of Service:

44.6
E

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	T			T			T			T		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name												
Base Volume Input [veh/h]	11	3	50	118	5	97	17	708	209	109	958	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	2.10	2.10	2.10	5.60	5.60	5.60	3.90	3.90	3.90
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	10	0	0	0	61	14	0	41	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	3	50	128	5	97	17	769	223	109	999	9
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	13	34	1	26	5	205	59	29	266	2
Total Analysis Volume [veh/h]	12	3	53	136	5	103	18	818	237	116	1063	10
Pedestrian Volume [ped/h]	0			0			0			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	1364			895			136			163		
Exiting Flow Rate [veh/h]	35			374			1296			981		
Demand Flow Rate [veh/h]	11	3	50	128	5	97	17	769	223	109	999	9
Adjusted Demand Flow Rate [veh/h]	12	3	53	136	5	103	18	818	237	116	1063	10

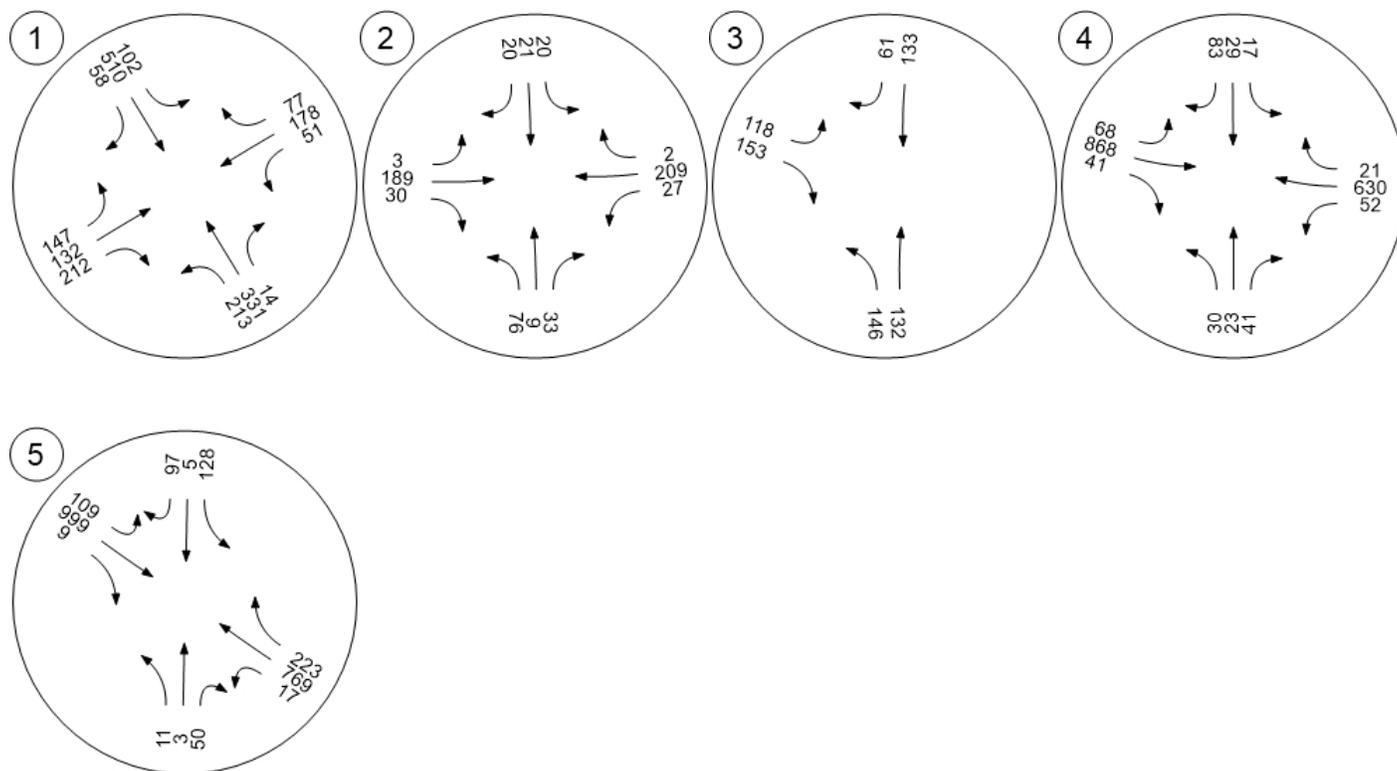
Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.98			0.95			0.96		
Entry Flow Rate [veh/h]	68			250			1134			1236		
Capacity of Entry and Bypass Lanes [veh/h]	344			554			1202			1169		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	344			543			1139			1125		
X, volume / capacity	0.20			0.45			0.94			1.06		

Movement, Approach, & Intersection Results

Lane LOS	B			B			D			F		
95th-Percentile Queue Length [veh]	0.73			2.31			16.40			25.54		
95th-Percentile Queue Length [ft]	18.14			57.72			409.97			638.53		
Approach Delay [s/veh]	14.05			14.19			33.84			62.27		
Approach LOS	B			B			D			F		
Intersection Delay [s/veh]	44.58											
Intersection LOS	E											

Traffic Volume - Future Background Volume



Vistro File: Z:\...\Spencer Industrial Park PM.vistro

Scenario 5 5 2040 Buildout Volumes

Report File: Z:\...\Buildout 2040.pdf

4/30/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 20 at W Barclay Drive	Roundabout	HCM 6th Edition	SEB Thru		25.0	D
2	N Pine Street at W Barclay Drive	Two-way stop	HCM 6th Edition	NB Left	0.303	22.3	C
3	N Locust Street at W Barclay Drive	Two-way stop	HCM 6th Edition	SB Thru	0.378	22.3	C
4	Pine Street at US 20	Two-way stop	HCM 6th Edition	NB Left	3.613	2,121.4	F
5	Locust Street at US 20	Roundabout	HCM 6th Edition	SEB Thru		54.8	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 20 at W Barclay Drive

Control Type:	Roundabout	Delay (sec / veh):	25.0
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes		

Intersection Setup

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right									
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			35.00			35.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northeastbound			Southwestbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	132	120	171	47	164	77	152	331	14	102	507	39
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	2.20	2.20	2.20	1.60	1.60	1.60	6.50	6.50	0.00	7.40	7.40	7.40
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	15	12	41	4	14	0	61	0	0	0	3	19
Site-Generated Trips [veh/h]	0	7	0	17	13	13	0	0	4	7	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	147	139	212	68	191	90	213	331	18	109	510	58
Peak Hour Factor	0.9800	0.9800	0.9800	1.0000	0.9800	0.9800	0.9800	0.9800	1.0000	0.9800	0.9800	0.9800
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	38	35	54	17	49	23	54	84	5	28	130	15
Total Analysis Volume [veh/h]	150	142	216	68	195	92	217	338	18	111	520	59
Pedestrian Volume [ped/h]	0			0			1			0		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	747			744			418			498		
Exiting Flow Rate [veh/h]	493			282			848			607		
Demand Flow Rate [veh/h]	147	139	212	68	191	90	213	331	18	109	510	58
Adjusted Demand Flow Rate [veh/h]	150	142	216	68	195	92	217	338	18	111	520	59

Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	0.98			0.98			0.94			0.93		
Entry Flow Rate [veh/h]	520			361			609			742		
Capacity of Entry and Bypass Lanes [veh/h]	645			646			902			831		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	631			636			848			773		
X, volume / capacity	0.81			0.56			0.68			0.89		

Movement, Approach, & Intersection Results

Lane LOS	D			C			C			D		
95th-Percentile Queue Length [veh]	8.13			3.45			5.40			11.72		
95th-Percentile Queue Length [ft]	203.26			86.36			135.07			292.94		
Approach Delay [s/veh]	29.13			15.38			15.99			34.52		
Approach LOS	D			C			C			D		
Intersection Delay [s/veh]	25.04											
Intersection LOS	D											

Intersection Level Of Service Report
Intersection 2: N Pine Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	22.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.303

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+			+			+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	76	9	33	20	21	20	3	177	30	27	191	2
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.70	0.70	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	12	0	0	18	0
Site-Generated Trips [veh/h]	6	6	0	39	5	0	0	39	5	0	22	22
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	82	15	33	59	26	20	3	228	35	27	231	24
Peak Hour Factor	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400	0.8400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	24	4	10	18	8	6	1	68	10	8	69	7
Total Analysis Volume [veh/h]	98	18	39	70	31	24	4	271	42	32	275	29
Pedestrian Volume [ped/h]	0			0			0			2		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No	No		
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.30	0.05	0.05	0.22	0.08	0.03	0.00	0.00	0.00	0.03	0.00	0.00
d_M, Delay for Movement [s/veh]	22.32	20.97	16.01	20.81	19.55	14.47	7.86	0.00	0.00	7.93	0.00	0.00
Movement LOS	C	C	C	C	C	B	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	1.90	1.90	1.90	1.43	1.43	1.43	0.01	0.01	0.01	0.08	0.08	0.08
95th-Percentile Queue Length [ft/ln]	47.60	47.60	47.60	35.75	35.75	35.75	0.24	0.24	0.24	1.96	1.96	1.96
d_A, Approach Delay [s/veh]	20.58			19.28			0.10			0.76		
Approach LOS	C			C			A			A		
d_I, Intersection Delay [s/veh]	6.31											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 3: N Locust Street at W Barclay Drive

Control Type:	Two-way stop	Delay (sec / veh):	22.3
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.378

Intersection Setup

Name	Northbound		Southbound		Eastbound	
Approach						
Lane Configuration	↰		↱		↵	
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00		30.00		30.00	
Grade [%]	0.00		0.00		0.00	
Crosswalk	No		Yes		No	

Volumes

Name	Northbound		Southbound		Eastbound	
Base Volume Input [veh/h]	130	132	133	59	117	142
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.70	2.00	2.00	2.00	2.00	0.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	16	0	0	2	1	11
Site-Generated Trips [veh/h]	36	0	0	7	13	65
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	182	132	133	68	131	218
Peak Hour Factor	0.9300	1.0000	1.0000	1.0000	1.0000	0.9300
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	49	33	33	17	33	59
Total Analysis Volume [veh/h]	196	132	133	68	131	234
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Free	Stop	Free
Flared Lane		No	
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance		No	
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.38	0.09	0.10	0.00
d_M, Delay for Movement [s/veh]	0.00	0.00	22.30	16.70	8.07	0.00
Movement LOS	A	A	C	C	A	A
95th-Percentile Queue Length [veh/ln]	0.00	0.00	2.41	2.41	0.33	0.33
95th-Percentile Queue Length [ft/ln]	0.00	0.00	60.32	60.32	8.37	8.37
d_A, Approach Delay [s/veh]	0.00		20.40		2.90	
Approach LOS	A		C		A	
d_I, Intersection Delay [s/veh]	5.77					
Intersection LOS	C					

**Intersection Level Of Service Report
Intersection 4: Pine Street at US 20**

Control Type:	Two-way stop	Delay (sec / veh):	2,121.4
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	3.613

Intersection Setup

Name	Northbound			Southbound			Eastbound			Westbound		
Approach												
Lane Configuration	+			+r			r+			r+		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	1	1	0	0	1	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			25.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Eastbound			Westbound		
Base Volume Input [veh/h]	30	23	41	17	29	83	68	827	41	52	569	21
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	0.00	0.00	0.00	3.50	3.50	3.50	5.50	5.50	5.50
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	41	0	0	61	0
Site-Generated Trips [veh/h]	0	11	0	0	10	0	0	0	10	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	30	34	41	17	39	83	68	868	51	52	630	21
Peak Hour Factor	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100	0.9100
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	9	11	5	11	23	19	238	14	14	173	6
Total Analysis Volume [veh/h]	33	37	45	19	43	91	75	954	56	57	692	23
Pedestrian Volume [ped/h]	5			2			2			0		

Intersection Settings

Priority Scheme	Stop	Stop	Free	Free
Flared Lane	No			
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance	No	No		
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	3.61	0.70	0.15	1.27	0.84	0.21	0.09	0.01	0.00	0.09	0.01	0.00
d_M, Delay for Movement [s/veh]	2121.44	1795.68	1739.24	919.15	747.74	15.40	9.50	0.00	0.00	10.91	0.00	0.00
Movement LOS	F	F	F	F	F	C	A	A	A	B	A	A
95th-Percentile Queue Length [veh/ln]	14.19	14.19	14.19	7.27	7.27	0.78	0.28	0.00	0.00	0.28	0.00	0.00
95th-Percentile Queue Length [ft/ln]	354.85	354.85	354.85	181.85	181.85	19.39	7.01	0.00	0.00	6.99	0.00	0.00
d_A, Approach Delay [s/veh]	1867.07			333.45			0.66			0.81		
Approach LOS	F			F			A			A		
d_I, Intersection Delay [s/veh]	125.68											
Intersection LOS	F											

**Intersection Level Of Service Report
Intersection 5: Locust Street at US 20**

Control Type:	Roundabout	Delay (sec / veh):	54.8
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes		

Intersection Setup

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Approach												
Lane Configuration	⤴			⤵			⤴			⤵		
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	0	0	0	0	0	0	0	0	0	0	0	0
Pocket Length [ft]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	25.00			20.00			20.00			20.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	Northbound			Southbound			Northwestbound			Southeastbound		
Base Volume Input [veh/h]	11	3	50	118	5	97	17	708	209	109	958	9
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	0.00	0.00	2.10	2.10	2.10	5.60	5.60	5.60	3.90	3.90	3.90
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	10	0	0	0	61	14	0	41	0
Site-Generated Trips [veh/h]	0	0	0	45	0	0	0	0	25	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	11	3	50	173	5	97	17	769	248	109	999	9
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	1	13	46	1	26	5	205	66	29	266	2
Total Analysis Volume [veh/h]	12	3	53	184	5	103	18	818	264	116	1063	10
Pedestrian Volume [ped/h]	0			0			0			3		

Intersection Settings

Number of Conflicting Circulating Lanes	1			1			1			1		
Circulating Flow Rate [veh/h]	1413			895			136			212		
Exiting Flow Rate [veh/h]	35			402			1345			981		
Demand Flow Rate [veh/h]	11	3	50	173	5	97	17	769	248	109	999	9
Adjusted Demand Flow Rate [veh/h]	12	3	53	184	5	103	18	818	264	116	1063	10

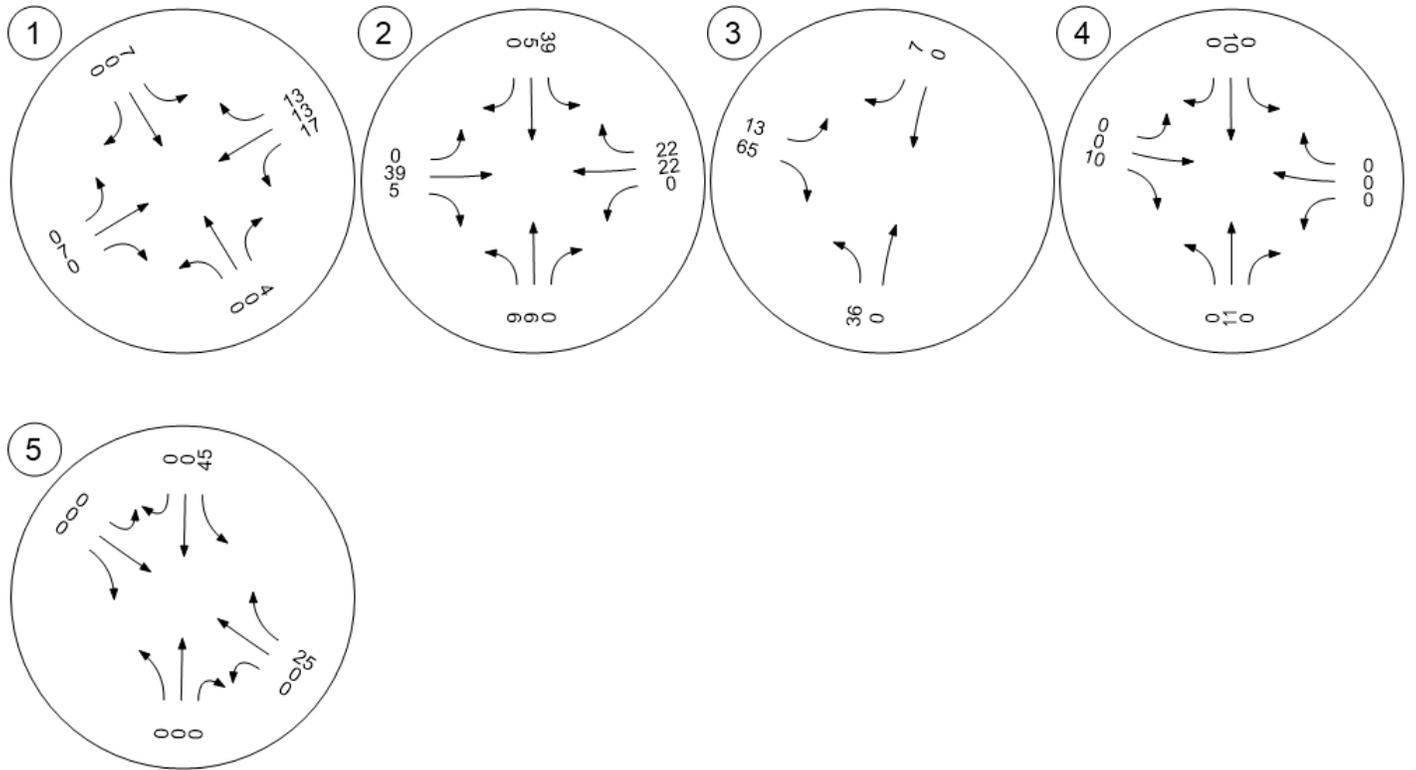
Lanes

Overwrite Calculated Critical Headway	No			No			No			No		
User-Defined Critical Headway [s]	4.00			4.00			4.00			4.00		
Overwrite Calculated Follow-Up Time	No			No			No			No		
User-Defined Follow-Up Time [s]	3.00			3.00			3.00			3.00		
A (intercept)	1380.00			1380.00			1380.00			1380.00		
B (coefficient)	0.00102			0.00102			0.00102			0.00102		
HV Adjustment Factor	1.00			0.98			0.95			0.96		
Entry Flow Rate [veh/h]	68			299			1162			1236		
Capacity of Entry and Bypass Lanes [veh/h]	327			554			1202			1112		
Pedestrian Impedance	1.00			1.00			1.00			1.00		
Capacity per Entry Lane [veh/h]	327			543			1139			1070		
X, volume / capacity	0.21			0.54			0.97			1.11		

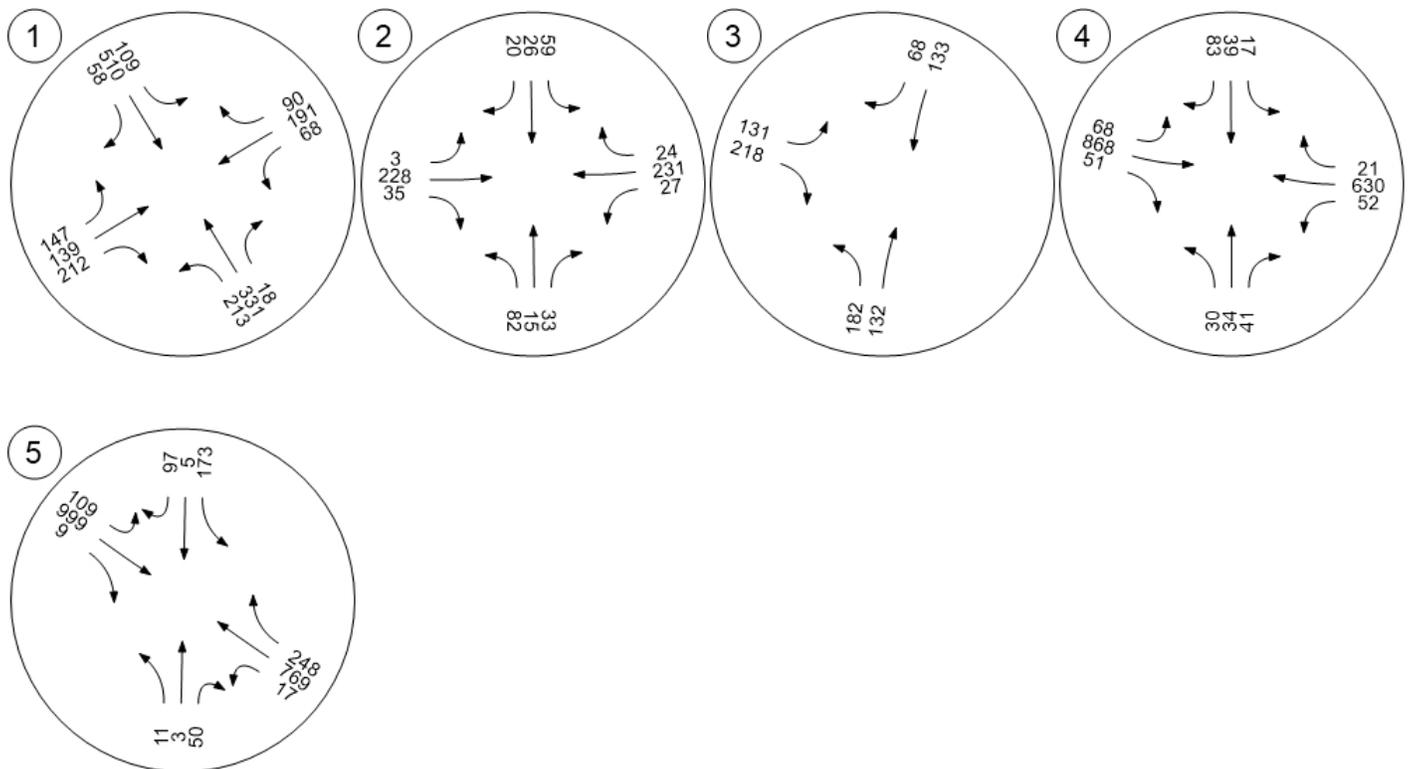
Movement, Approach, & Intersection Results

Lane LOS	B			C			F			F		
95th-Percentile Queue Length [veh]	0.77			3.17			18.07			29.87		
95th-Percentile Queue Length [ft]	19.26			79.35			451.70			746.65		
Approach Delay [s/veh]	14.94			16.79			38.31			81.63		
Approach LOS	B			C			F			F		
Intersection Delay [s/veh]	54.78											
Intersection LOS	F											

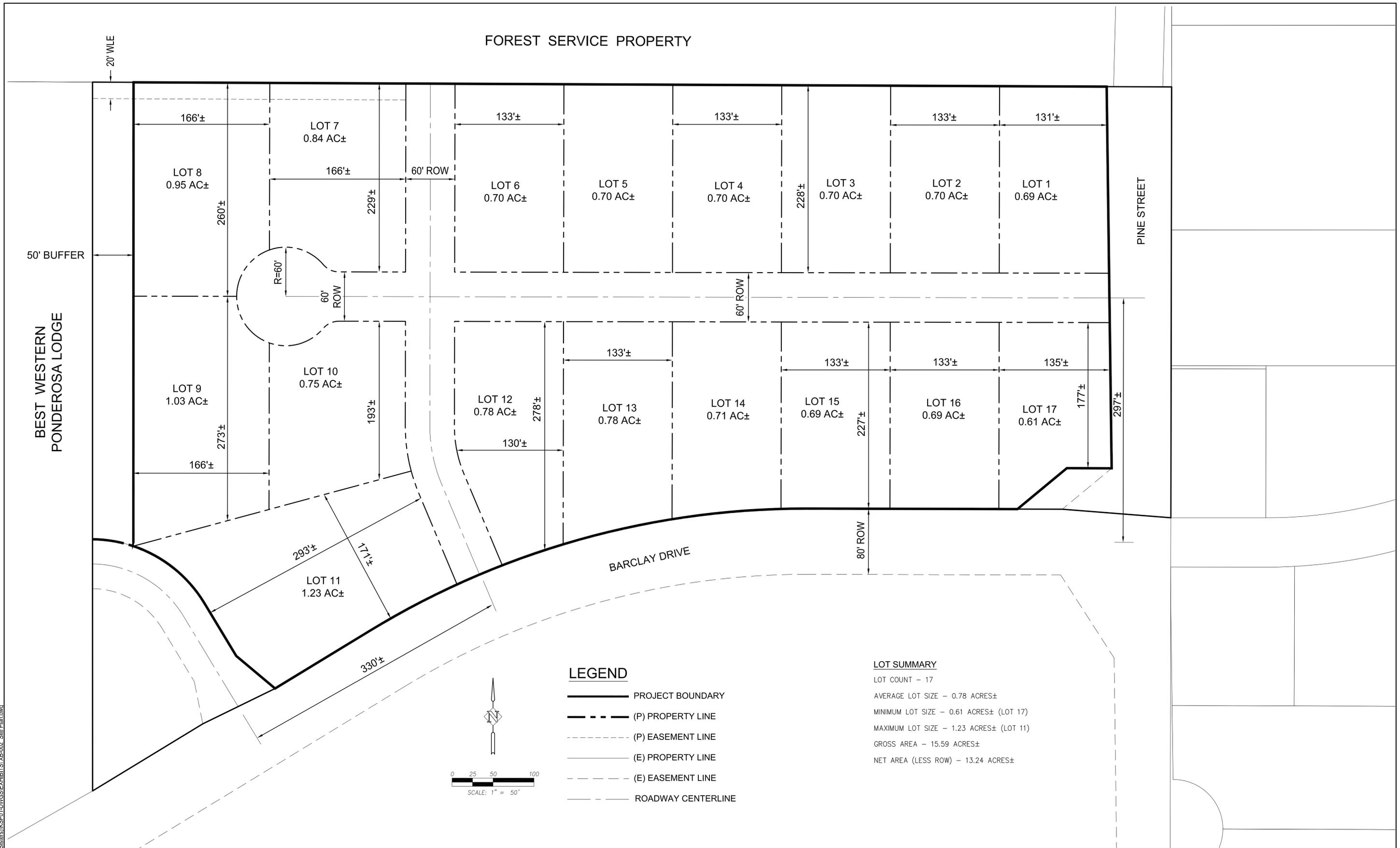
Traffic Volume - Net New Site Trips



Traffic Volume - Future Total Volume



FOREST SERVICE PROPERTY



BEST WESTERN
PONDEROSA LODGE

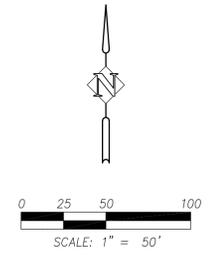
PINE STREET

BARCLAY DRIVE

- LEGEND**
- PROJECT BOUNDARY
 - (P) PROPERTY LINE
 - (P) EASEMENT LINE
 - (E) PROPERTY LINE
 - (E) EASEMENT LINE
 - ROADWAY CENTERLINE

LOT SUMMARY

LOT COUNT - 17
 AVERAGE LOT SIZE - 0.78 ACRES±
 MINIMUM LOT SIZE - 0.61 ACRES± (LOT 17)
 MAXIMUM LOT SIZE - 1.23 ACRES± (LOT 11)
 GROSS AREA - 15.59 ACRES±
 NET AREA (LESS ROW) - 13.24 ACRES±



DATE	NO.	DESCRIPTION
R E V I S I O N S		

DESIGNED:	
DRAWN:	
CHECKED:	
DATE:	FEBRUARY 12, 2020

HHPR Harper Houf Peterson Righellis Inc.
 ENGINEERS • PLANNERS
 LANDSCAPE ARCHITECTS • SURVEYORS
 250 NW Franklin Avenue, Suite 404, Bend, OR 97703
 phone: 541.318.1161 www.hhpr.com fax: 541.318.1141

CONCEPTUAL SITE PLAN
USFS PARCEL 3 - BARCLAY DRIVE
 SISTERS, OREGON

P:\KSP (Kevin Spencer)\KSP-01 (Sisters)\KSP01-DWGSEX\HBIT\XB-002_Site Plan.dwg

May 6, 2020
Job No.: KSP-001

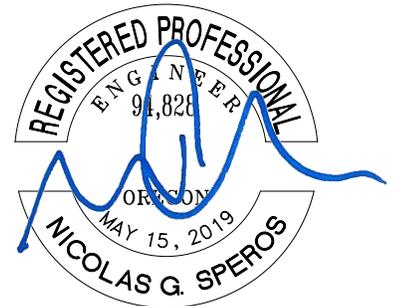
MEMORANDUM

TO: Erik Huffman, PE, PLS, CWRE, LEED AP
BECON, Engineer of Record, City of Sisters

FROM: Nicolas Speros, P.E., HHPR

CC: Kevin Spencer, Three Sisters Holdings, LLC, et al

SUBJECT: USFS Parcel 3 – Barclay Drive
Sanitary Sewer and Water Infrastructure Re-Zone Impact Summary



EXPIRES: 06/30/20

INTRODUCTION AND PURPOSE

The subject USFS Parcel 3 property is currently zoned Urban Area Reserve (UAR). The property has a gross area of 15.58 acres. The property is bounded by Barclay Drive to the south, Pine Street to the east, United States Forest Service property to the north, and the Best Western Ponderosa Lodge to the west. The property is proposed to be rezoned to Light Industrial (LI). Per the City of Sisters Development Code, Section 4.7.300 B.3, for a Land Use District Map change, the applicant shall demonstrate that the property and affected area shall be served with adequate public facilities.

This memo addresses the City of Sisters sanitary sewer and water infrastructure and any associated impacts of the proposed land use change.

SANITARY SEWER ANALYSIS

The City's Sanitary Sewer infrastructure is outlined in the Wastewater System Capital Facilities Plan Update (WSCFPU), current version dated February 2016. In this document, design flows for the City's collection system are calculated on an Equivalent Dwelling Unit (EDU) basis. The report is prepared with a 20-year outlook and identifies the City's anticipated infrastructure needs in the year 2035. In order to determine the design flows in the system, a specific amount of square footage was designated per EDU for each land use zone to determine the total design flow from each tributary area by land use. The specifics of the design flow determinations is discussed in Section 6.2 of the WSCFPU and this method is noted to be conservative for planning purposes.

As noted previously, the property is currently zoned UAR with a proposed change to LI. Per City staff, UAR zoned areas were excluded from the WSCFPU planning document and therefore zero flow was assumed to be generated from these properties. Accordingly, there was also no SDC funds assumed to be collected from this property that would contribute to system-wide improvements.

After the recent Property Line Adjustment with the Best Western Ponderosa Lodge, the resultant project area is 15.58 gross acres. Per Table 6.1 of the WSCFPU, Light Industrial property is assumed to be one EDU per 20,000 SF of area. The EDU count with a Light Industrial land use is calculated as follows:

15.58 acres Light Industrial x (43,560 SF / acre) x (1 EDU / 20,000 SF Light Industrial) = 34 EDU's. As requested by city staff, a 10% increase was conservatively added to account for some potential higher sewer uses within the development. The EDU project total then becomes $34.0 \times 1.1 = 37.4$ EDU's.

The corresponding design flow in gallons per minute can then be calculated. In the WSCFPU, a design flow of 125 gpd is assigned to each EDU, however City staff has stated the actual flow is 165 gpd per EDU (75 gpcd x 2.2 capita/dwelling) and requested the design flow calculation utilize this value. Utilizing this more conservative value, the design flow of the project is:

$37.4 \text{ EDU} \times 165 \text{ gpd} / \text{EDU} \times (1 \text{ day} / 1,440 \text{ minutes}) \times 2.4 \text{ peak factor} = 10.3 \text{ gpm}$, rounded to 10 gpm.

The analysis of the downstream sanitary sewer infrastructure components confirms that the existing system is adequate to accommodate the additional design flow of 10 gpm.

Pump Station # 2 (PS#2)

As confirmed with City staff, the current calculated 2035 design flow into PS#2 is approximately 51 gpm. With the additional 10 gpm flow generated by the subject property the design flow increases to approximately 61 gpm, which is well below the WSCFPU stated pump station capacity of 150 gpm.

In addition, the property to the south of Barclay Drive is also tributary to PS#2 and planned for development. The total property is approximately 35.8 acres but 32.2 acres is tributary to PS#2. Based on its current UAR (4.8 acres), PF (25.2 acres), and OS (2.2) zoning (32.2 acres total) the design flow

associated with this portion of the property is calculated to be 115 EDU's which is equivalent to approximately 32 gpm that is already accounted for in the WSCFPU. Assuming a MF land use for the entire 32.2 acres yields 281 EDU's which is equivalent to approximately 59 gpm, an increase of 27 gpm relative to the assumed 32 gpm. The increase in flow to PS#2 is then approximated to be $10 \text{ gpm} + 27 \text{ gpm} = 37 \text{ gpm} + 51 \text{ gpm existing} = 88 \text{ gpm}$ which is still well below the pump capacity of 150 gpm. Based on this calculation the subject property contributes 10 gpm of the 37 gpm increase, or 27%. Based on existing topography constraints and consistent with the current WSCFPU, it is reasonable to assume the entire 32.2 acres will be tributary to PS#2.

10" Gravity Main Sewer

Per data provided by the City, the total tributary land uses (2035 build out) to the 10" gravity main are equivalent to 141 Commercial EDU's, 99 Industrial EDU's, and 418 Residential EDU's totaling 658 EDU's which corresponds to a design flow of 181 gpm (utilizing the EDU flow rate of 165 gpd). With the additional 10 gpm added for the subject property this design flow is 191 gpm, which is well below the WSCFPU stated 10" gravity main capacity of 260 gpm.

The peak flow condition in the 10" gravity pipe is further analyzed as follows:

Per data provided by the City, the total tributary land uses (2035 build out) to the 10" gravity main EXCLUDING flow from the two tributary pump stations is equivalent to 141 Commercial EDU's, 67 Industrial EDU's, and 257 Residential EDU's totaling 465 EDU's which corresponds to a design flow of 128 gpm (utilizing the EDU flow rate of 165 gpd).

If the 150 gpm flow from PS#2 is added to the 128 gpm gravity peak flow in the basin, the total flow in the 10" pipe would be 278 gpm, which results in the pipe flowing 54% full where the pipe was constructed at minimum slope. Although this flow exceeds 50%, many municipalities allow much higher flow depth ratios (d/D) including the City of Bend which is 0.8 or 80%.

In the worst case condition where both PS#2 (150 gpm) and PS#4 (270 gpm) are operating simultaneously and the peak flow is occurring from the gravity fed tributary areas (128 gpm), the total combined flow in the 10" pipe would be 548 gpm, which results in the pipe flowing 90% full. This condition only occurs in the location where the pipe is constructed at minimum slope (S=0.28%) and the entire tributary area is being conveyed by the pipe. In other words, this 2035 worst case peak design flow scenario only occurs in Black Butte Avenue just upstream of Rope Place.

In addition, based on field observations by City staff, the concentrated and combined flows from PS#2 and PS#4 evident at the Barclay Drive/Sun Ranch Drive intersection were not observed at downstream manhole locations on the 10" gravity main pipe; specifically at the T-intersection of Black Butte Avenue/Tamarack Street and Black Butte Avenue/Dee Wright Street.

In all of the 10" gravity main peak flow scenarios noted above, none of them are impacted by the additional 10 gpm of the subject property. Regardless of the additional subject project flows, PS#2 discharges flow at a maximum and constant rate of 150 gpm when operating.

Pump Station # 1 (PS#2)

Currently, the entire City of Sisters sanitary system flows through PS#1. As noted above the addition of the 10 gpm of the subject property will not affect the maximum peak flow condition in the 10” gravity pipe and similarly therefore will not affect the maximum peak flow into PS#1. The design flow of 10 gpm for the subject property is approximately 1% of the total 2035 design flow of 850 gpm in PS#1.

WATER ANALYSIS

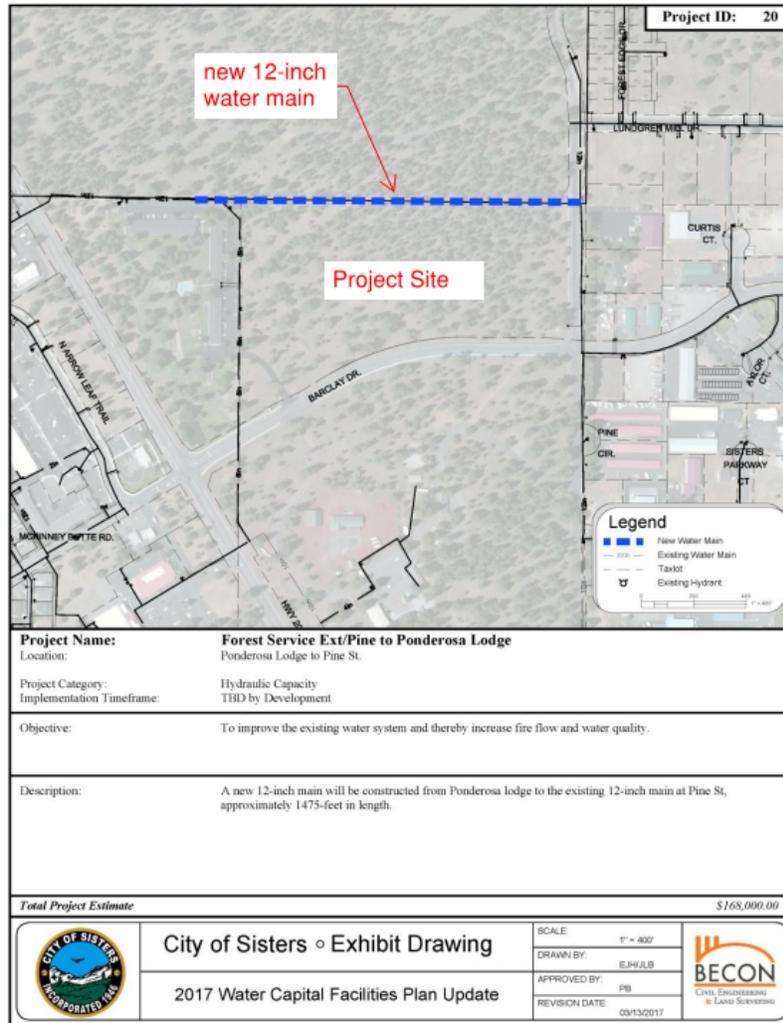
The City’s Water infrastructure is outlined in the 2017 Water Capital Facilities Plan Update (WCFPU), current version dated April 2017. As reflected in the WCFPU, Section 10.6 and Table 10.1, the subject property will be required to connect the existing 12-inch water main on the Ponderosa Lodge property to the existing 12-inch water main in North Pine Street, which will improve system fire flow capacity and water quality.

10.6 TOTAL CAPITAL IMPROVEMENTS

A summary of capital improvements to the City of Sisters Water System appears in Table 10.1, which includes prioritization (timing), and project cost.

Table 10.1: Timing and Cost Summary

ID	Project Description	Timing	Project Cost
20	Forest Service Ext/Pine to Ponderosa Lodge	TBD by Development	\$168,000



This memo addresses two water service issues. Available Fire Flow and Water Rights.

Fire Flow - As shown on Attachments 1 and 2, Conceptual FH Layout and Fire Flow Calculation Worksheets, although a 12-inch water main will need to be constructed to meet the City’s water system needs, a minimum sized 8-inch water main is adequate to serve the property and meet required fire flows of 2,500 gpm (or 1,500 gpm if the facilities are sprinklered). In conjunction with a future Preliminary Plat package submittal, the water system layout will be finalized, fire flow calculations re-verified, and any potential reimbursements identified.

City staff has previously confirmed adequate water is available to serve the property.

Water Rights – As requested, a water volume analysis based on land use was performed to determine the acreage of water mitigation rights necessary to be purchased by the City and the corresponding fee required to be paid at building permit issuance to offset this City cost. Water volumes are typically calculated on a per capita basis, but this approach is not applicable to non-residential uses and the WCFPU does identify any water usage rates associated with non-residential uses.

As directed by City staff, the water volume analysis shall utilize a volume of 2,000 gallons per acre per day (gpad) for the subject property.

With this water usage rate the acres of water rights to be purchased and the associated fee is calculated as follows:

$$15.58 \text{ acres} \times (2,000 \text{ gallons} / \text{acre} / \text{day}) = 11,373,400 \text{ gallons} / \text{year} = 34.90 \text{ acre-ft} / \text{year}$$

Reduce by 180 days per year (use 0.5) and 40% consumption factor →

$$(34.90 \text{ acre-ft} / \text{year}) \times 0.5 \times 0.40 = 6.98 \text{ acre-ft} / \text{year}$$

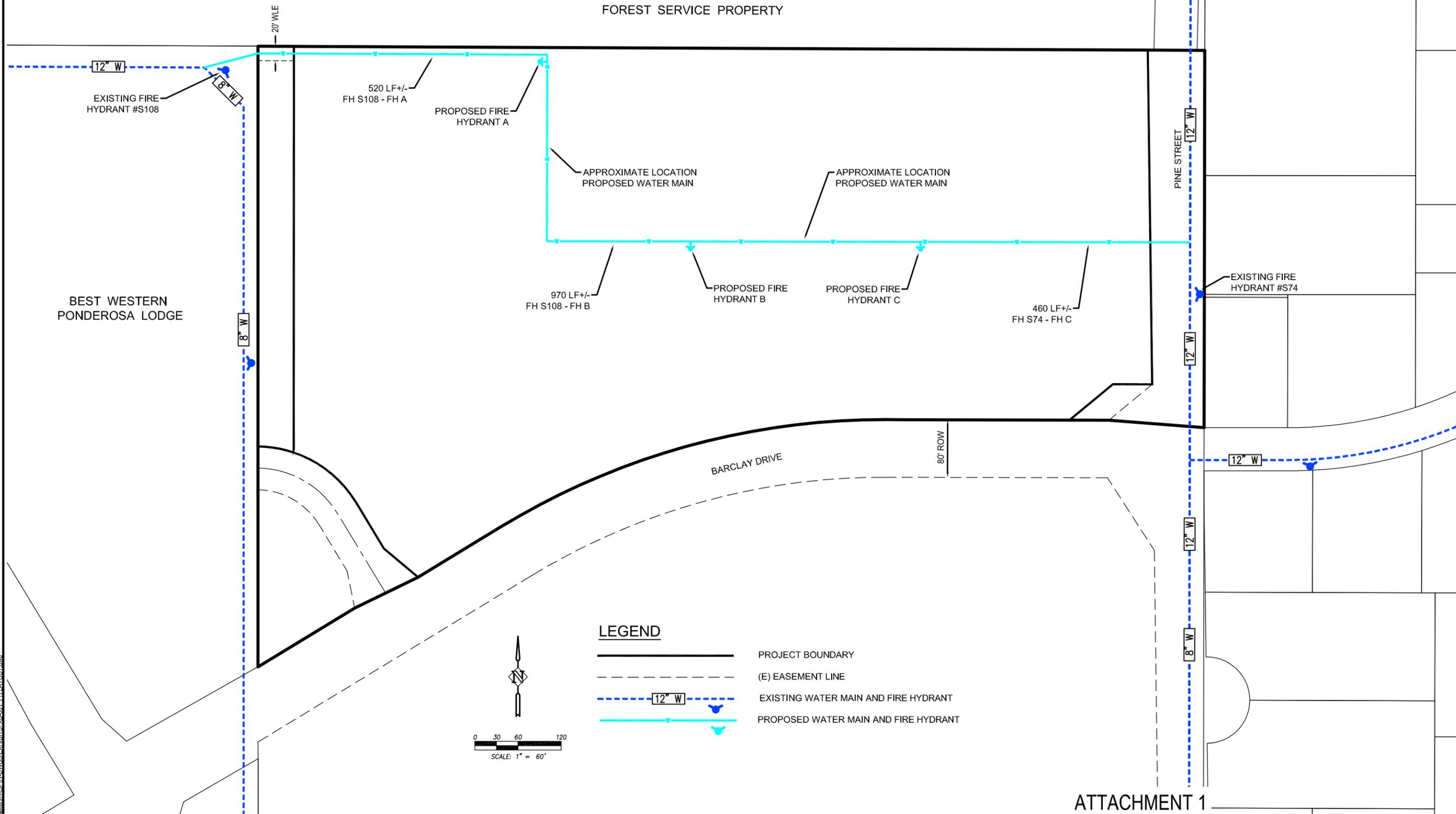
One acre purchased of water rights provides 1.8 acre-ft / acre / year at a cost of \$6,800 / acre.

$$\text{Acres needed to be purchased} \rightarrow (6.98 \text{ acre-ft}) / (1.8 \text{ acre-ft} / \text{acre}) = 3.88 \text{ acres}$$

Fee Calculation → 3.88 acres x (\$6,800 / acre) = \$26,384 total due at building permit issuance.

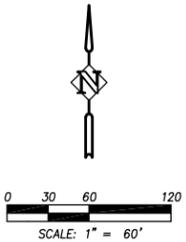
The fee total is for the entire project and will be divided on a per lot/acreage basis.

FOREST SERVICE PROPERTY



LEGEND

- PROJECT BOUNDARY
- (E) EASEMENT LINE
-



ATTACHMENT 1

P:\VSP\1\Keith_Sapich\1\SP-01_Sisters\KSPD\CWGS\EXHIBITS\XB-001_FH_LAYOUT.dwg

DATE	NO.	DESCRIPTION
REVISIONS		

DESIGNED:	
DRAWN:	
CHECKED:	
DATE:	FEBRUARY 6, 2020



Harper Houf Peterson Righellis Inc.
 ENGINEERS • PLANNERS
 LANDSCAPE ARCHITECTS • SURVEYORS
 250 NW Franklin Avenue, Suite 404, Bend, OR 97703
 phone: 541.318.1161 www.hpr.com fax: 541.318.1141

CONCEPTUAL FIRE HYDRANT LAYOUT PLAN
 USFS PARCEL 3 PROPERTY
 SISTERS, OREGON

ATTACHMENT 2 - FIRE FLOW WORKSHEET

USFS PARCEL 3

KSP-01 - February 4, 2020

Fire Flow Calculations

Prepared by: Jennifer VanCamp, P.E.

Proposed Hydrant #A

Residual Pressure @ 2500 gpm

Existing Fire Hydrant #S108

Static pressure	90	psi	
Residual pressure	67	psi	
Flow (Q)	1058	gpm	
Elevation	3186	surface elevation	
Hydrant Elevation	3187.5	hydrant	1.5 feet above surface elevation

$$K = Q / (p_{\text{static}} - p_{\text{residual}})^{0.54} = 195$$

$$Q_{20} = K(p_{\text{static}} - p_{20})^{0.54} = 1930 \text{ gpm}$$

Proposed FH

Flow Rate	2500	gpm
Surface Elev	3184	surface elevation
Hydrant Elev	3185.5	hydrant

1.5 feet above surface elevation

Proposed Pipe Segment 1 (Main to FH Tee):

Diameter	8	inches
Length	520	LF
Hazen C-value	120	ductile iron

Minor Losses:		Equiv. Length	Total
0	8" Tee Thru	14	0
2	8" Tee Branch	40.0	80
1	8" Bend Other	10.0	10
4	8" GV	4.5	18
<i>Total Equiv L:</i>			<i>108</i>

$$h_f = \frac{(10.44)(L)(Q_{\text{gpm}})^{1.85}}{(C)^{1.85}(d_{\text{inches}})^{4.8655}}$$

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	8	628	73

Proposed Pipe Segment 2 (FH Tee to FH):

Diameter	6	inches
Length	10	LF
Hazen C-value	120	ductile iron
Riser Pipe	5	LF

Minor Losses:		Equiv. Length	Total
1	6" Tee Branch	30.0	30
1	6" GV	3.5	3.5
1	6" 90-deg	16.0	16
<i>Total Equiv L:</i>			<i>33.5</i>

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	6	48.5	23

Static pressure	90	psi
Elev Losses	-2.0	ft
Pipe Losses	96	ft
Total Losses (ft)	94	ft
Total Losses (psi)	41	psi
Resulting Pressure at Proposed Hydrant	49	psi

Flow Rate	3350	gpm	Available Flow @ 20 psi
Elev Losses	-2.0	ft	
Pipe Losses	164	ft	
Total Losses (ft)	162	ft	
Total Losses (psi)	70	psi	
Resulting Pressure at Proposed Hydrant	20	psi	

USFS PARCEL 3

KSP-01 - February 4, 2020

Fire Flow Calculations

Prepared by: Jennifer VanCamp, P.E.

Proposed Hydrant #B

Residual Pressure @ 2500 gpm

Existing Fire Hydrant #S108

Static pressure	90	psi	
Residual pressure	67	psi	
Flow (Q)	1058	gpm	
Elevation	3186	surface elevation	
Hydrant Elevation	3187.5	hydrant	1.5 feet above surface elevation

$$K = Q / (p_{\text{static}} - p_{\text{residual}})^{0.54} = 195$$

$$Q_{20} = K(p_{\text{static}} - p_{20})^{0.54} = 1930 \text{ gpm}$$

Proposed FH

Flow Rate	2500	gpm	
Surface Elev	3183	surface elevation	
Hydrant Elev	3184.5	hydrant	1.5 feet above surface elevation

Proposed Pipe Segment 1 (Main to FH Tee):

Diameter	8	inches
Length	970	LF
Hazen C-value	120	ductile iron

Minor Losses:		Equiv. Length	Total
0	8" Tee Thru	14	0
3	8" Tee Branch	40.0	120
1	8" Bend Other	10.0	10
6	8" GV	4.5	27
<i>Total Equiv L:</i>			<i>157</i>

$$h_f = \frac{(10.44)(L)(Q_{\text{gpm}})^{1.85}}{(C)^{1.85}(d_{\text{inches}})^{4.8655}}$$

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	8	1127	131

Proposed Pipe Segment 2 (FH Tee to FH):

Diameter	6	inches
Length	10	LF
Hazen C-value	120	ductile iron
Riser Pipe	5	LF

Minor Losses:		Equiv. Length	Total
1	6" Tee Branch	30.0	30
1	6" GV	3.5	3.5
1	6" 90-deg	16.0	16
<i>Total Equiv L:</i>			<i>33.5</i>

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	6	48.5	23

Static pressure	90	psi
Elev Losses	-3.0	ft
Pipe Losses	154	ft
Total Losses (ft)	151	ft
Total Losses (psi)	65	psi
Resulting Pressure at Proposed Hydrant	25	psi

Flow Rate	2600	gpm	Available Flow @ 20 psi
Elev Losses	-3.0	ft	
Pipe Losses	165	ft	
Total Losses (ft)	162	ft	
Total Losses (psi)	70	psi	
Resulting Pressure at Proposed Hydrant	20	psi	

USFS PARCEL 3

KSP-01 - February 4, 2020

Fire Flow Calculations

Prepared by: Jennifer VanCamp, P.E.

Proposed Hydrant #C

Residual Pressure @ 2500 gpm

Existing Fire Hydrant #S74

Static pressure	96	psi	
Residual pressure	53	psi	
Flow (Q)	1843	gpm	
Elevation	3178	surface elevation	
Hydrant Elevation	3179.5	hydrant	1.5 feet above surface elevation

$$K = Q / (p_{\text{static}} - p_{\text{residual}})^{0.54} = 242$$

$$Q_{20} = K(p_{\text{static}} - p_{20})^{0.54} = 2507 \text{ gpm}$$

Proposed FH

Flow Rate	2500	gpm
Surface Elev	3180	surface elevation
Hydrant Elev	3181.5	hydrant
		1.5 feet above surface elevation

Proposed Pipe Segment 1 (Main to FH Tee):

Diameter	8	inches
Length	460	LF
Hazen C-value	120	ductile iron

Minor Losses:		Equiv. Length	Total
0	8" Tee Thru	14	0
1	8" Tee Branch	40.0	40
0	8" Bend Other	10.0	0
2	8" GV	4.5	9
<i>Total Equiv L:</i>			<i>49</i>

$$h_f = \frac{(10.44)(L)(Q_{\text{gpm}})^{1.85}}{(C)^{1.85}(d_{\text{inches}})^{4.8655}}$$

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	8	509	59

Proposed Pipe Segment 2 (FH Tee to FH):

Diameter	6	inches
Length	10	LF
Hazen C-value	120	ductile iron
Riser Pipe	5	LF

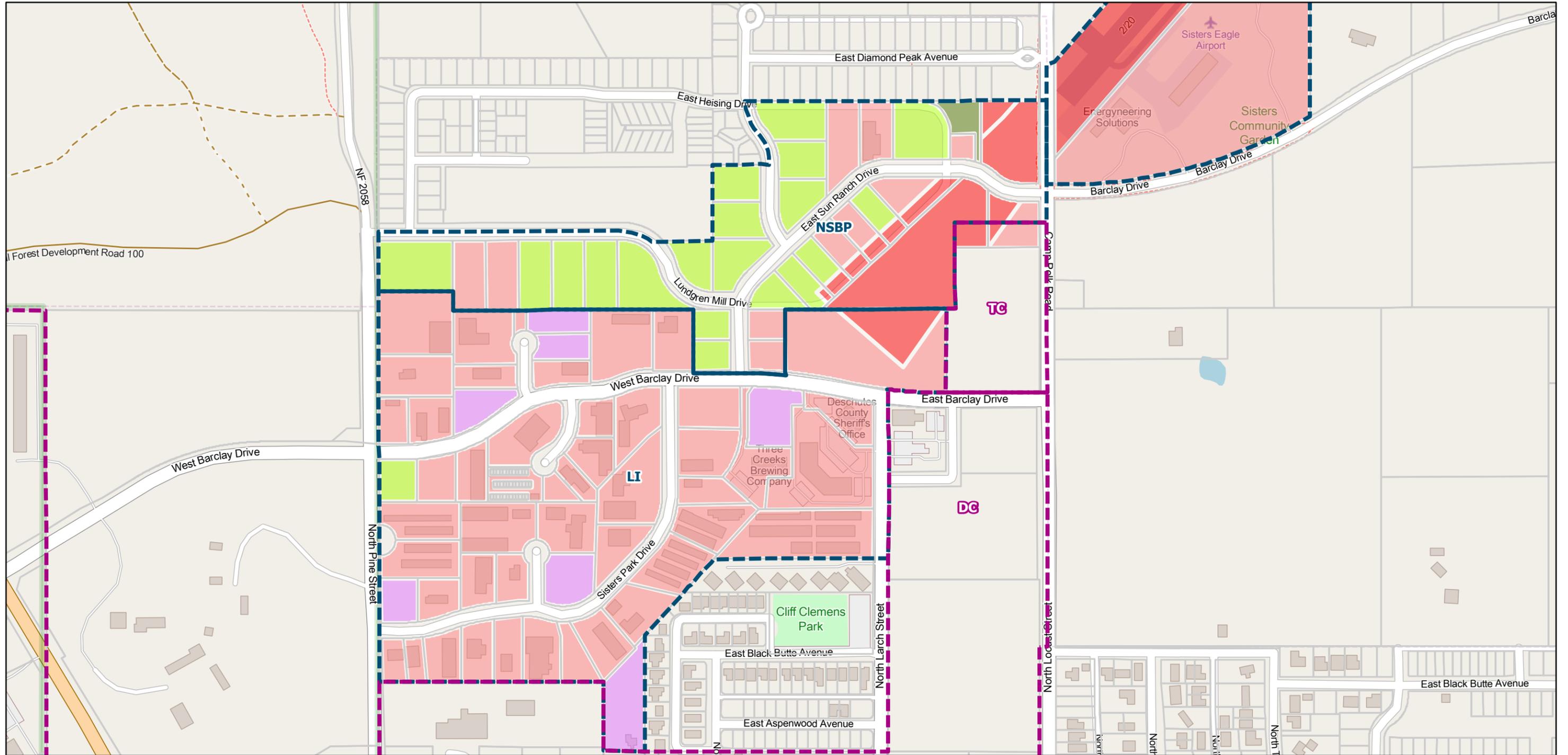
Minor Losses:		Equiv. Length	Total
1	6" Tee Branch	30.0	30
1	6" GV	3.5	3.5
1	6" 90-deg	16.0	16
<i>Total Equiv L:</i>			<i>33.5</i>

Q (gpm)	d (in)	L (ft)	head loss (ft)
2500	6	48.5	23

Static pressure	96	psi
Elev Losses	2.0	ft
Pipe Losses	82	ft
Total Losses (ft)	84	ft
Total Losses (psi)	36	psi
Resulting Pressure at Proposed Hydrant	60	psi

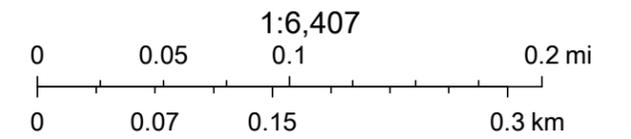
Flow Rate	3750	gpm	Available Flow @ 20 psi
Elev Losses	2.0	ft	
Pipe Losses	173	ft	
Total Losses (ft)	175	ft	
Total Losses (psi)	76	psi	
Resulting Pressure at Proposed Hydrant	20	psi	

Employment BLI - Industrial Districts



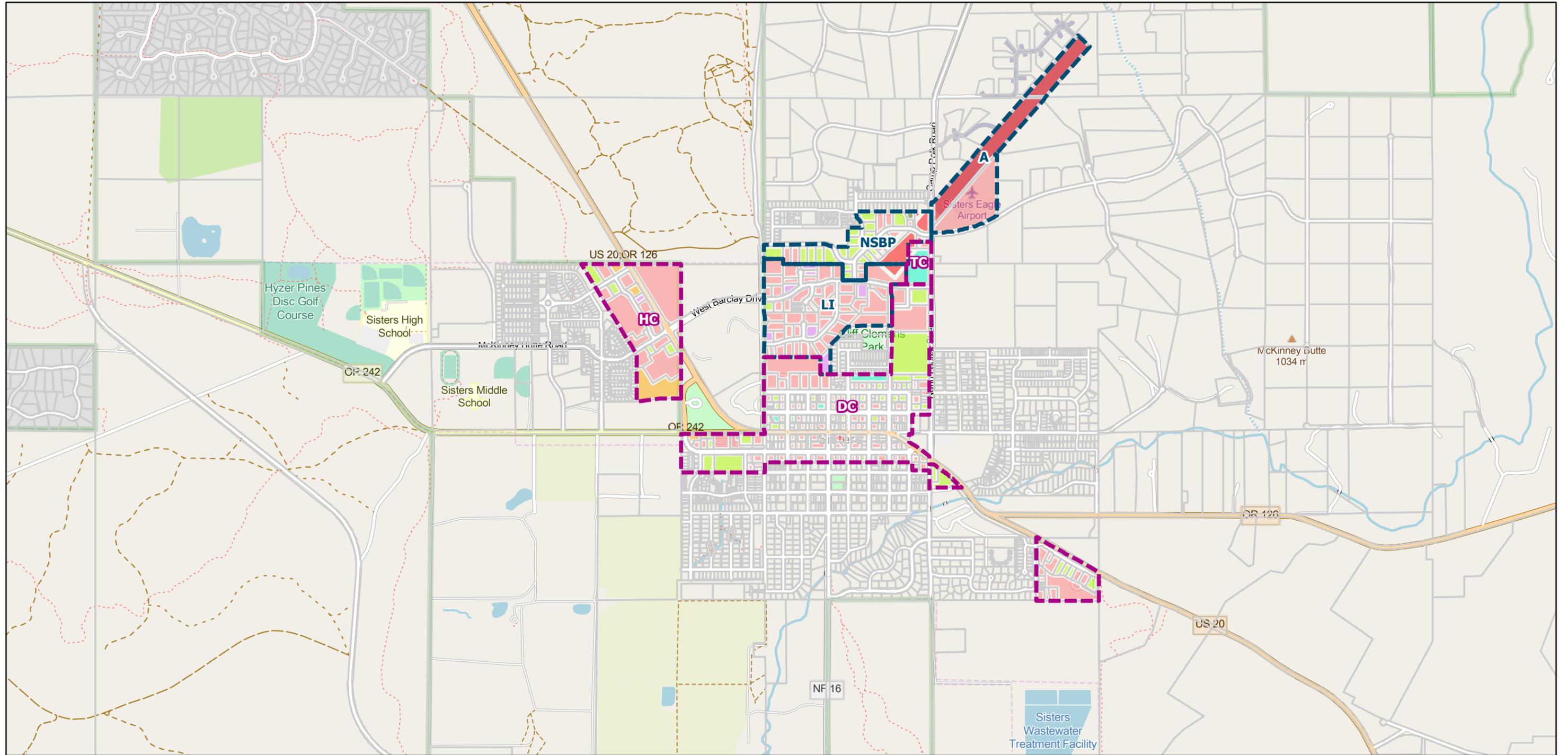
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- | | | |
|-------------------------------------|---------------------------------------|---------------------------------|
| Employment Lands - Commercial Zones | Employment Lands - Industrial Taxlots | Developed |
| Employment Lands - Industrial | Vacant | Undevelopable: Constrained |
| Taxlots | Vacant with Active Use | Non-Employment Use: Future Park |



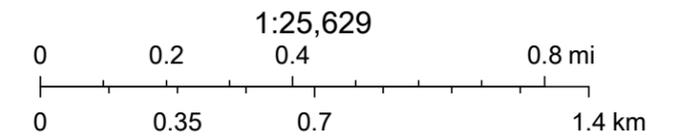
Map data © OpenStreetMap contributors, Map layer by Esri

Employment BLI - All Districts



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|---------------------------------------|---------------------------------------|----------------------------|
| Employment Lands - Commercial Zones | Vacant with Active Use | Partially Vacant |
| Employment Lands - Industrial | Developed | Vacant with Active Use |
| Taxlots | Undevelopable: Constrained | Approved Site Plan |
| Employment Lands - Industrial Taxlots | Non-Employment Use: Future Park | Developed |
| Vacant | Employment Lands - Commercial Taxlots | Undevelopable: Constrained |
| | Vacant | |



Map data © OpenStreetMap contributors, Map layer by Esri



as of 04.03.20

EMPLOYMENT BUILDABLE LANDS INVENTORY INDUSTRIAL- DISTRICTS

TAXLOT	BLI Category	ZONE	GIS Acres	NOTES
AIRPORT DISTRICT				
151004A000800	Developed	A	13.83	
141033D001300	Undevelopable: Constrained	A	6.75	Ruway Primary Surface
151004A001100	Undevelopable: Constrained	A	14	Ruway Primary Surface
LIGHT INDUSTRIAL (LI) DISTRICT				
151004CA00100	Developed	LI	0.8	
151004CA00201	Developed	LI	1.11	
151004CA00300	Developed	LI	2.72	
151004CA00400	Developed	LI	2.42	
151004CA02000	Developed	LI	3.21	
151004CB00200	Developed	LI	1.04	
151004CB00300	Developed	LI	1.33	
151004CB00400	Developed	LI	1.03	
151004CB00500	Developed	LI	1.02	
151004CB00600	Developed	LI	0.56	
151004CB00700	Developed	LI	0.68	
151004CB00800	Developed	LI	0.59	
151004CB01000	Developed	LI	0.36	
151004CB01001	Developed	LI	0.3	
151004CB01100	Developed	LI	0.64	
151004CB01200	Developed	LI	0.7	
151004CB01300	Developed	LI	0.67	
151004CB01400	Developed	LI	0.84	
151004CB01401	Developed	LI	0.55	
151004CB01600	Developed	LI	0.85	
151004CB01700	Developed	LI	0.93	

151004CB01800	Developed	LI	1.09
151004CB01900	Developed	LI	1.01
151004CB02000	Developed	LI	0.6
151004CB02100	Developed	LI	0.99
151004CB02200	Developed	LI	0.94
151004CB02300	Developed	LI	0.78
151004CB02400	Developed	LI	1.56
151004CB02500	Developed	LI	1
151004CB02600	Developed	LI	0.88
151004CB02700	Developed	LI	1.47
151004CB02800	Developed	LI	0.53
151004CB03100	Developed	LI	0.1
151004CB03200	Developed	LI	1.19
151004CB03400	Developed	LI	0.55
151004CB03600	Developed	LI	0.72
151004CB03700	Developed	LI	0.5
151004CB03800	Developed	LI	0.63
151004CB03900	Developed	LI	0.35
151004CB03901	Developed	LI	0.28
151004CB04100	Developed	LI	1.16
151004CB04300	Developed	LI	0.65
151004CB04400	Developed	LI	0.63
151004CB04600	Developed	LI	1.68
151004CB04700	Developed	LI	1.11
151004CB04800	Developed	LI	0.48
151004CB90000	Developed	LI	0.44
151004CB90001	Developed	LI	0.01
151004CB90002	Developed	LI	0.01
151004CB90003	Developed	LI	0.01
151004CB90004	Developed	LI	0.01
151004CB90005	Developed	LI	0.01
151004CB90006	Developed	LI	0.01
151004CB90007	Developed	LI	0.01
151004CB90008	Developed	LI	0.01
151004CB90009	Developed	LI	0.01
151004CB90010	Developed	LI	0.01
151004CB90011	Developed	LI	0.01

151004CB90012	Developed	LI	0.01	
151004CB90013	Developed	LI	0.01	
151004CB90014	Developed	LI	0.01	
151004CB90015	Developed	LI	0.01	
151004CB90016	Developed	LI	0.01	
151004CB90017	Developed	LI	0.01	
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151004CB90019	Developed	LI	0.01	
151004CB90020	Developed	LI	0.01	
151004CB90021	Developed	LI	0.01	
151004CB90022	Developed	LI	0.01	
151004CB90023	Developed	LI	0.01	
151004CB90024	Developed	LI	0.01	
151004CB90025	Developed	LI	0.01	
151004CB90026	Developed	LI	0.01	
151004CB90027	Developed	LI	0.01	
151004CB90028	Developed	LI	0.01	
151004CB90029	Developed	LI	0.01	
151004CB90030	Developed	LI	0.01	
151004CB90031	Developed	LI	0.01	
151004CB90032	Developed	LI	0.01	
151004CB90033	Developed	LI	0.01	
151004CB90034	Developed	LI	0.01	
151004CB90035	Developed	LI	0.01	
151004CB90036	Developed	LI	0.01	
151004CA02000	Undevelopable: Constrained	LI	1.12	Airport Safety Overlay: Runway Protection Zone
151004CB04799	Undevelopable: Constrained	LI	0.01	Too Narrow to Develop and owned by Deschutes County
			1.13	Subtotal of Constrained acres in LI zoning district
151004CA00200	Vacant with Active Use	LI	1	
151004CB00100	Vacant with Active Use	LI	0.9	
151004CB00900	Vacant with Active Use	LI	0.58	
151004CB02900	Vacant with Active Use	LI	0.53	
151004CB03000	Vacant with Active Use	LI	0.53	
151004CB03500	Vacant with Active Use	LI	0.71	
151004CC05100	Vacant with Active Use	LI	1.37	

5.61 Subtotal of Vacant acreage with an Active Use but with no taxable real

151004CB04500 Vacant LI

0.58 Subtotal of Vacant Acreage in LI District

NORTH SISTERS BUSINESS PARK (NSBP) DISTRICT

151004BC01800	Developed	NSBP	0.82
151004BC01900	Developed	NSBP	0.82
151004BD00135	Developed	NSBP	0.23
151004BD00300	Developed	NSBP	0.71
151004BD00400	Developed	NSBP	0.96
151004BD01500	Developed	NSBP	0.41
151004BD01600	Developed	NSBP	0.41
151004BD01800	Developed	NSBP	0.54
151004BD01900	Developed	NSBP	0.57
151004CA01600	Developed	NSBP	0.42
151004CA01700	Developed	NSBP	0.41

151004BD00134 Non-Employment Use: Future Park NSBP 0.5

151004BD00136	Undevelopable: Constrained	NSBP	1.35	Airport Safety Overlay: Runway Protection Zone
151004BD01300	Undevelopable: Constrained	NSBP	0.05	Airport Safety Overlay: Runway Protection Zone
151004BD01400	Undevelopable: Constrained	NSBP	0.14	Airport Safety Overlay: Runway Protection Zone
151004BD01500	Undevelopable: Constrained	NSBP	0.14	Airport Safety Overlay: Runway Protection Zone
151004BD01600	Undevelopable: Constrained	NSBP	0.14	Airport Safety Overlay: Runway Protection Zone
151004BD01700	Undevelopable: Constrained	NSBP	0.14	Airport Safety Overlay: Runway Protection Zone
151004BD01800	Undevelopable: Constrained	NSBP	0.37	Airport Safety Overlay: Runway Protection Zone
151004BD01900	Undevelopable: Constrained	NSBP	0.32	Airport Safety Overlay: Runway Protection Zone
151004BD01901	Undevelopable: Constrained	NSBP	3.74	Airport Safety Overlay: Runway Protection Zone

6.4 Subtotal of Constrained acres in NSBP zoning district

151004BC01300	Vacant	NSBP	0.62
151004BC01400	Vacant	NSBP	1.15
151004BC01500	Vacant	NSBP	0.82
151004BC01600	Vacant	NSBP	0.82
151004BC01700	Vacant	NSBP	0.82
151004BC02000	Vacant	NSBP	1.35

151004BD00200	Vacant	NSBP	1.12
151004BD00500	Vacant	NSBP	0.66
151004BD00600	Vacant	NSBP	0.67
151004BD00700	Vacant	NSBP	0.93
151004BD00900	Vacant	NSBP	0.64
151004BD01000	Vacant	NSBP	0.66
151004BD01100	Vacant	NSBP	0.79
151004BD01200	Vacant	NSBP	0.5
151004BD01300	Vacant	NSBP	0.49
151004BD01400	Vacant	NSBP	0.41
151004BD01700	Vacant	NSBP	0.41
151004CA01800	Vacant	NSBP	0.41
151004CA01900	Vacant	NSBP	0.41

13.68 Subtotal of Vacant Acreage in NSBP District

14.26 Total of all Vacant Acreage in all Industrial Districts (LI and N

↓SBP) - without an Active Use and not constrained