

General Land Use Application 1 page EXHIBIT A

| Name of Project: | Bull Run Terrace Subdivision (supplemental Land Use Application) |
| :--- | :--- |
| Location or Acldress: | 40808 and 41010 Highway 26 |


| Map \& Tax Lot 数 | T: 2S | R: 5E | Section: 18CD | Tax Lot (s): <br> 900 and 1000 |
| :--- | :--- | :--- | :--- | :--- |

Request: Comprehensive Plan map amendment, Zone Change, Specific Area Plan, seven lot subdivision, and tree removal

I am the (check one) owner $\square$ lessee of the property listed above, and the statements and information contained herein are in all respects true, complete and correct to the best of my knowledge and belief.


## EXHIBIT B

## Revised <br> Project Narrative <br> for <br> Bull Run Terrace Subdivision

40808 and 41010 Highway 26, Sandy, Oregon (25E 18CD, tax lots 900 and 1000)


Revised
July 2020

Revised Narrative: This revised project narrative is intended to replace the previously submitted narrative dated December 2019.

## Project Details

Project Location: 40808 and 41010 Highway 26, south side of Highway 26; directly south across Highway 26 from Vista Loop Drive and east of Meadow Ave.

Legal Description: Map 25E 18CD, Tax Lots 900 and 1000
Existing Comprehensive Plan - V, Village
Proposed Comprehensive Plan - V, Village and POS, Parks and Open Space
Existing Zoning - R-1, Low Density Residential, R-2, Medium Density Residential and C-3, Village Commercial

Proposed Zoning - R-1, Low Density Residential, R-3, High Density Residential, C-3, Village Commercial, and POS, Parks and Open Space

Site Size: 15.91 ac. $(693,058 \mathrm{sf})$
Owner / Applicant
Roll Tide Properties Corporation
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## Consultant Team:

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Bull Run Terrace Revised Narrative

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## I. Project Description

Roll Tide Properties Corporation has submitted this application seeking the following approvals:

- Type IV, Comprehensive Plan map amendment to designate 1.43 of proposed parkland dedication Parks and Open Space (POS) and to increase density on the site by more than 20 percent;
- Type IV, Zoning Map amendment to change the current zoning designations on the property from a mix of C-3 (Village Commercial), R-2 (Medium Density Residential), and R-1 (Low Density Residential) to a mix of C-3 (Village Commercial, R-3 (High Density Residential), R-1 (Low Density Residential), and Parks and Open Space (POS);
- Type IV, Specific Area Plan to shift the zoning designations on the site;
- Type II, seven-lot subdivision;
- Type II, tree removal.

The subject property consists of two tax lots totaling 15.91 acres. The requested seven-lot subdivision includes four lots to be platted with R-1 zoning (Lots 1-4), intended to be developed with single-family detached dwellings, two lots (Lots 5 and 6 ) to be zoned R-3, proposed to be developed with multi-family units, and one lot (Lot 7) zoned C-3. The use proposed for Lot 7 has not determined at this time. Development on Lots $5-7$ will be reviewed with a subsequent design review application submitted following approval of the initial request.

In addition to platting seven lots, the applicant proposes dedicating all public streets and conveying 1.43 acres ( 62,095 square feet) of parkland (Tract A) and a 0.16 acre (7,062 square feet) storm water tract (Tract B) to the City. As shown on submitted plans, the proposed parkland dedication is located directly east of 1.4 acres of undeveloped parkland conveyed to the City as part of the Deer Pointe 2 Subdivision in 2007.

The subject property is gently sloping from the Southeast corner to the Northwest corner towards Highway 26. The primary access to the property will be from an extension of Dubarko Road constructed through the middle of site to intersect with Highway 26. In addition, a collector street (Street B) identified on the City's Transportation System Plan will be extended to the southern line of the property and an existing local street, Fawn Street, will be extended onto the property. The applicant attended pre-application conferences with the City on $1 / 30 / 18,6 / 12 / 18$, and $10 / 10 / 18$.

The table below compares the area of existing zoning designations on the property with that proposed with this application

|  | Existing (gross acres) | Existing (net acres) | Proposed (net acres) |
| :--- | :---: | :---: | :---: |
| C-3, Village Commercial | 2.84 | 2.13 | 3.61 |
| R-1, Low Density <br> Residential | 8.05 | 6.04 (48 units max.) | 0.59 (5 units max.) |
| R-2, Medium Density <br> Residential | 5.01 | 3.76 (53 units max.) | 0.00 |
| R-3, High Density <br> Residential | 0.00 | 0.00 | 7.91 (158 units max.) |
| POS, Parks and Open <br> Space | 0.00 | 0.00 | 1.43 |
| Rights of Way | 0.00 | 3.98 | 2.21 |
| Public Tracts <br> (stormwater tract) | 0.00 | 0.00 | 0.16 |
| Total Area | 15.91 | 15.91 | 15.91 |

*     - Net acres assume a $25 \%$ reduction in gross acres for public roads

As shown on this table the applicant proposes increasing the area of C-3 zoning by 1.48 acres, reducing the area of $R-1$ zoning by 5.45 acres, eliminating the area zoned R-2, adding 7.91 acres of R-3 zone property, and dedicating 1.43 acres of parkland proposed to be zoned Parks and Open Space.

## II. Approval Requests

The following approvals are requested with this application:

- Type IV Comprehensive Plan Map Amendment;
- Type IV Zoning Map amendment;
- Type IV Specific Area Plan;
- Type II Subdivision; and,
- Type II Tree Removal.


## III. Items Submitted With This Application

- Land Use Application
- Supplemental Land Use Application No. 1
- Notification List and Mailing Labels
- Exhibit A - Project Narrative (Revised July, 2020)
- Exhibit B - Civil Plans (Revised July, 2020)
- Sheet C1 - Cover Sheet and Future Street Plan
- Sheet C2 - Preliminary Plat Map
- Sheet C3 - Existing Conditions and Tree Retention Plan
- Sheet C4 - Tree Tables
- Sheet C5 - Master Street and Utility Plan
- Sheet C6 - Street Sections
- Sheet C7 - Preliminary Street Tree and Parking Plan
- Sheet C8 - Proposed Striping Plan
- Sheet C9 - Preliminary. Grading and Erosion Control Plan
- Sheet C10 - Slope Analysis
- Exhibit C - Preliminary Stormwater Report
- Exhibit D - Public Need Analysis (Revised July, 2020)
- Exhibit E - Traffic Impact Study (Revised July, 2020)
- Exhibit F - Arborist Report
- Exhibit G - Wetland Determination
- Exhibit H - DSL Offsite Determination
- Exhibit I - Geotechnical and Slope Stability Investigation
- Exhibit J - Clackamas County Record of Survey: SN 2007-384


## IV. Background

## Previous Approval

On October 9, 2006, the Planning Commission approved a residential subdivision on the subject property known as "Vista Loop South" (File No. 05-029 SUB). This application involved an 81-lot residential subdivision, dedication of 1.23 acres parkland, and a zone change to adjust the zoning district boundaries on the property. The zoning district boundaries were adjusted according to this configuration however, due to the cost of project improvements, the project was never completed or bonded within the required timeline and the subdivision approval expired. A new property owner purchase the property and on May 31, 2013, (File No. 13-021 SUB/PR) and because of the economic recession in 2008-2010, the tentative plat for this subdivision was reinstated for one year. The plat was then reinstated for a second year. The applicant did complete required public improvements or bond these improvement within the required timeline and the tentative plat expired for a second time on May 31, 2015.

## Existing Comprehensive Plan Map and Zoning Map

As shown on a portion of the Comprehensive Plan Map below, the entire property contains a "Village" Plan designation. The " N " shown on this map shows the conceptual location for a future neighborhood park when it was adopted in 1997. Arguably, this park has already been dedicated with the Deer Pointe Subdivision as detailed below.

As shown below, the current zoning designation for the property is a combination of R-1, $\mathrm{R}-2$, and $\mathrm{C}-3$ zoning designations on the property.


## 2015 Urbanization Study

The current Urbanization Study for the City was adopted by the City Council in 2015. In 2014, City staff completed a buildable lands inventory and housing needs analysis for the urban growth boundary. The results of this study indicate the city has a projected deficit of buildable land in the Low Density Residential, Medium Density Residential, and Commercial Plan designations and a surplus in the High Density Residential and Industrial Plan designations.

Table S-7. Estimate of land needs by gross acres, Sandy UGB, 2014-2034

| Land Use Type | Land Need Surplus (deficit) |
| :--- | :---: |
| Low Density Residential | $(276.8)$ |
| Medium Density Residential | $(4.5)$ |
| High Density Residential | 13.9 |
| Commercial | $(51.8)$ |
| Industrial | 45.0 |
| Total Land Needs | $\mathbf{( 3 3 3 . 1 )}$ |

Source: City of Sandy
Following adoption of this study, the City started work on a study to expand the Urban Growth Boundary. This study looked at all lands within the existing UGB and properties outside the UGB but within the Urban Reserve boundary. In February 2017, the Urban Growth Boundary Expansion Analysis was adopted by both Clackamas County and the City
and the study became final and the UGB was expanded. As shown on table below from this study, all land use categories have a projected land surplus.

Table 3.10: Area of Land Surplus (deficit) of the Preferred UGB Expansion Alternative

| Land Use Type | Existing <br> Land Needs | Efficiency <br> Measures | Expansion <br> Alternative | Adjusted UGB |
| :--- | :---: | :---: | :---: | :---: |
| LDR | $(276.8)$ | $(21.55)$ | 317.50 | $\mathbf{1 9 . 2}$ |
| MDR | $(4.5)$ | 21.55 |  | $\mathbf{1 7 . 1}$ |
| HDR | 13.9 | $(1.34)$ |  | $\mathbf{1 2 . 6}$ |
| Commercial | $(51.8)$ | 17.74 | 37.66 | $\mathbf{3 . 6}$ |
| Industrial | 45.0 | $(16.40)$ | 4.18 | $\mathbf{3 2 . 8}$ |

## Transportation System Plan

The City's 2011 Transportation System Plan identifies the location of future roads on the subject property. This plan shows that Dubarko Road, a minor arterial is planned to traverse the property from its current terminus in the Deer Point Subdivision to intersect with Highway 26. Dubarko Road is included in the city's Capital Improvement Plan. In addition, a "New Road" classified as a collector is shown intersecting with Dubarko Road extending to the southern property line of the subject property. None of the other system plans in this study show any planned improvements except the Pedestrian System Plan which shows sidewalks along the Highway 26 frontage of the site.


## Natural Resources

The subject property does not contain any areas encumbered with the Flood and Slope Overlay or are there any regulated steep slopes. The City's Local Wetland Inventory identifies an intermittent stream on the property labeled as "TCL" as shown on the figure below. Prior to submittal of this application the applicant hired a wetland consultant to evaluate the site for wetlands. This report submitted as Exhibit G did not identify any wetlands or stream resources on the site. In addition, an Offsite Wetlands Determination request form was sent to the Division of State Lands. This review also found "it is unlikely that there are jurisdictional wetlands or waterways on the property" (Exhibit H).


## Adopted Parks Master Plan

The current Parks Master Plan was adopted in 1997. As shown on a portion of the Park Facility Plan from the master plan, a Proposed Community Park is shown in the vicinity of the subject property. As shown below, 1.4 acres was dedicated as part of the Deer Point No. 2 Subdivision.


## Adjacent Parkland Dedication

As shown on the Deer Pointe No. 2 Subdivision plat below, this subdivision dedicated 1.4 acres of land for a future park. This area is located directly to the west of the subject property and at this time it has not been improved.


## Parks Master Plan Update

The City has engaged ESA, a consultant to prepare an update to the Parks and Trails Master Plan. The figure below from the city's website shows a portion of the Park System Proposed Inventory in the vicinity of the Bull Run Terrace project. The existing park shown on this plan is the park dedicated as described above. This figure does not show any proposed park on the subject property.


## V. Review of Applicable Approval Criteria

Development applications are required to meet development standards set forth in the City of Sandy Development Code. This section addresses all applicable review criteria. Pertinent code provisions are cited below in regular text followed by a response describing how the proposal complies with this standard in italics. Criteria related to the proposed Comprehensive Plan Map Amendment and Zoning Map Amendment are reviewed first followed by a review of the Specific Area Plan request and finally all relevant criteria for the proposed residential subdivision are then reviewed. The following code chapters have been reviewed in this narrative:

## Chapter Title

17.24 Comprehensive Plan Amendment Procedures
17.26 Zoning District Amendments
$17.54 \quad$ Specific Area Plan Overlay

## Subdivision Review

17.30 Zoning Districts
17.36 Low Density Residential ( $\mathrm{R}-1$ )
$17.40 \quad$ High Density Residential (R-3)
$17.56 \quad$ Hillside Development
17.80 Additional Setbacks on Collector and Arterial Streets
17.82 Special Setbacks on Transit Streets
17.84 Improvements Required with Development
$17.86 \quad$ Parkland and Open Space
17.92 Landscaping and Screening
17.98 Parking, Loading, and Access Requirements
17.100 Land Division
17.102 Urban Forestry
15.30 Dark Sky Ordinance

## CHAPTER 17.24-COMPREHENSIVE PLAN AMENDMENT PROCEDURES

RESPONSE: The subject property currently contains a Village Comprehensive Plan designation. Because the Village Plan designation as described in the Comprehensive Plan does not expressly allow Parks and Open Space zoning and the city is requiring the applicant to dedicate parkland, the city is also requiring the applicant to apply for a Comprehensive Plan Map amendment to designate the proposed 1.43 acre parkland dedication Parks and Open Space (POS). In addition, the applicant is requesting Comprehensive Plan approval to increase the maximum density on the property by more than 20 percent. As stated on Page 8 of the Comprehensive Plan, "A shifting of the underlying zoning district boundaries to accommodate development constraints and land divisions for specific development proposals may be increased or decreased up to $20 \%$. Changes greater than 20\% will require a Plan Map amendment." The applicant proposes increasing the density on the property by 61 percent. A Specific Area Plan request is also included with this application.

### 17.24.10 INTENT

This chapter sets forth review criteria and procedural requirements in order to:
A. Respond to changing conditions and community attitudes;
B. Ensure flexibility while at the same time maintain the integrity of the Comprehensive Plan; and
C. Establish procedures by which the Plan text and map may be amended. RESPONSE: As noted above the applicant requests a Comprehensive Plan Map amendment to designate parkland required by the city to Parks and Open Space (POS). In addition the applicant proposes increasing density by more than 20 percent also requiring a Plan Amendment.

### 17.24.20 INITIATION

Comprehensive Plan amendments may be initiated by one of the following:
A. An application submitted by a property's owners or their authorized agents for a specific property; or
B. A majority vote of the City Council.

RESPONSE: This request has been initiated by the property owner as allowed by Subsection (A).

### 17.24.70 REVIEW CRITERIA

Comprehensive Plan amendments shall be reviewed to assure consistency with the purposes of this chapter, policies of the Comprehensive Plan, and any other applicable policies and standards adopted by the City Council. Amendments shall be approved only when the following findings are made:
A. The change being proposed is the best means of meeting the identified public need; and,
RESPONSE: The proposed Plan Amendment will address several public needs with approval of this request and the eventual development of the property. First, development of the property will extend Dubarko Road through the property to connect with Highway 26. This road is classified as a Minor Arterial in the City's Transportation System Plan (TSP) and has been included in this plan for a number of
years. Identified as "Project M20" in this plan, this project is intended to provide an alternative transportation road generally paralleling Highway 26. With improvement of this final unbuilt section, this road will now be complete from 362nd Avenue on the West to Highway 26 on the East. Development of the property and the extension of Dubarko Road will also trigger extensive improvements along Highway 26. The cost of constructing Dubarko Road and improvements to the highway are likely the reasons the project did not move forward in 2006 and 2013.

A second public need realized is the applicant's proposal to dedicate 1.43 acres of public parkland to the City of Sandy located directly east of the 1.4 acres of previously dedicated parkland as part of the Deer Pointe 2 Subdivision in 2006. The proposed parkland dedication and the applicant's willingness to construct park improvement will ensure completion of park improvements in a timely manner.

Approval of this request also will allow this currently undeveloped commercial property to develop thereby creating additional employment opportunities and goods and services in this area of the community.

Another public need the proposal addresses is the need for additional rental housing options. Development of the property with multi-family housing units following approval of the current request strives to fill this market need. The R-3 zoning proposed for the site is the only zoning designation to provide sufficient development density (10-20 units) to help cover construction costs.

The applicant believes the proposed Comprehensive Plan amendments to designate land for Parks and Open Space and to increase the allowed density on the site is the best means to meet the public needs described above. In addition, development of the property as proposed will provide additional tax revenues to the city to provide needed services.
B. The change conforms to all applicable Statewide Planning Goals. RESPONSE: As reviewed below, the proposed Comprehensive Plan Map amendment conforms to all applicable Statewide Planning Goals.

Goal 1 - Citizen Involvement The City will provide notification of the proposal to all property owners within 500 feet of the subject property and will place a legal notice in the Sandy Post newspaper. The City will also hold legally noticed and conducted public hearings before the Sandy Planning Commission and Sandy City Council. Goal 1 is satisfied.

Goal 2 - Land Use Planning Goal 2 requires the City's decision on this application to be coordinated with other governmental agencies and to be supported by an adequate factual base. The City will send notification of the proposal to both the Department of Land Conservation and Development and the Oregon Department of Transportation. The City will consider comments from these agencies in evaluating the proposal. Goal 2 is satisfied.

Goal 3-Agricultural Lands Goal 3 is not applicable to this proposal.
Goal 4 - Forest Lands Goal 4 is not applicable to this proposal.
Goal 5 - Natural Resources No resources identified on the City's Flood and Slope Hazard map are located on the subject property. An intermittent stream is shown on the City's wetland inventory as "TCL". The applicant contracted with a wetlands consultant to evaluate the status of this resource and to determine if wetlands exist on the site (Exhibit G). The conclusion of this report is that the mapping of an intermittent stream is not accurate and the site does not contain any stream or wetland resources. The applicant then sent an Offsite Determination Request to the Department of State Lands who responded that there are unlikely to be jurisdictional wetlands or waterways located on the site (Exhibit H). The site contains a number of conifer and deciduous trees. The applicant hired an Arborist to evaluate the size, species, and condition of these trees provided with this application (Exhibit F). The applicant then reviewed the tree retention requirements in Chapter 17.102, Urban Forestry Ordinance to develop a tree retention plan that is consistent with these regulations. As reviewed in detail below, the applicant's tree retention plan exceeds the minimum required by City Code. Goal 5 is satisfied.

Goal 6 - Air, Water, and Land Quality - The proposal complies with all regulations relative to air, water, and land quality. Goal 6 is satisfied to the extent it is applicable to the proposal.

Goal 7 - Natural Hazards - The proposal to change the Comprehensive Plan designation for the subject property does not affect compliance with this goal. The site contains minimal steep slopes and no natural hazards are know to exist on the site. Goal 7 is satisfied to the extent it is applicable to the proposal.

Goal 8 - Recreational Needs - No resorts are proposed with this application. The proposal includes dedication of 1.43 acres of parkland as requested by the City of Sandy. This land is proposed to be conveyed to the City as identified on the preliminary subdivision plat. Goal 8 is satisfied to the extent it is applicable to the decision.

Goal 9 - Economy - Goal 9 requires the city to maintain a 20 year supply of buildable employment land within the UGB. In 2015 the City completed an Economic Opportunities Analysis (EOA) in accordance with the methodology required by OAR 660-009-0015. This study included an analysis and update of the City's Comprehensive Plan with respect to Goal 9 and concluded that the Urban Growth Boundary did not contain sufficient employment land to meet projected employment needs. Based on the results of this study, the City then completed an Urban Growth Boundary Expansion Analysis to resolve this issue and the City Council adopted this study and it was acknowledged by DLCD in February 2017. As shown on Table 3.10 from this study below, the city added approximately 38 acres of commercial land and four acres of industrial land to the UGB. In addition, approximately 18 acres of other properties were changed to commercial zoning. With expansion of the UGB
and designation of lands as contained in the study, the city is projected to have a surplus of land in all land use categories through the year 2034.

Table 3.10: Area of Land Surplus (deficit) of the Preferred UGB Expansion Alternative

| Land Use Type | Existing <br> Land Needs | Efficiency <br> Measures | Expansion <br> Alternative | Adjusted UGB |
| :--- | :---: | :---: | :---: | :---: |
| LDR | $(276.8)$ | $(21.55)$ | 317.50 | $\mathbf{1 9 . 2}$ |
| MDR | $(4.5)$ | 21.55 |  | $\mathbf{1 7 . 1}$ |
| HDR | 13.9 | $(1.34)$ |  | $\mathbf{1 2 . 6}$ |
| Commercial | $(51.8)$ | 17.74 | 37.66 | $\mathbf{3 . 6}$ |
| Industrial | 45.0 | $(16.40)$ | 4.18 | $\mathbf{3 2 . 8}$ |

The table below shows data from Table 3.10 from the UGB Expansion Analysis reduced by 2.47 acres (Commercial to HDR) as a result of a previously approved Plan Amendment and the adjusted area based on the applicant's proposal. As shown on this table, a surplus in all employment land use categories will be maintained over the 20 year planning horizon and Goal 9 is satisfied.

Adjusted UGB Area

| Land Use Type | Adjusted UGB <br> area (Table 3.10) | Adjusted area <br> previous approval <br> 2.47 acres <br> Commercial to HDR | Proposed <br> area changes <br> (reductions) | Adjusted <br> area with <br> proposal |
| :--- | :---: | :---: | :---: | :---: |
| LDR | 19.2 |  | $(5.54)$ | 13.63 |
| MDR | 17.1 |  | $(3.76)$ | 13.34 |
| HDR | 12.6 | 15.07 | 7.91 | 22.98 |
| Commercial | 3.6 | 1.13 | 1.48 | 2.61 |
| Industrial | 32.8 |  | 0.00 | 32.8 |

Goal 10 - Housing - The 2015 Urbanization Report included an analysis and update of the City's comprehensive plan with respect to Goal 10 and concluded the existing UGB did not contain sufficient residential lands to meet the City's housing needs to 2034. To meet this need, the City expanded the Urban Growth Boundary by adding approximately 318 acres of low density residential land and changed the zoning on approximately 22 acres of land zoned another designation to medium density residential. As shown on the Adjusted UGB Area table above, the proposal to reduce the area of LDR designated land, eliminate MDR designated land, and add HDR designated land does not adversely affect the city's 20 year buildable lands supply of residential lands. Goal 10 is satisfied.

Goal 11 - Public Facilities - The proposal to change zoning designations on the subject property does not affect the ability of the City to comply with Goal 11. Public facilities are guided by City master plans and the Development Code and the
proposal does not affect the assumptions or conclusions in these documents. Goal 11 is satisfied to the extent it is applicable to the proposal.

Goal 12 - Transportation - In order to evaluate compliance with this goal, the applicant contracted with a Traffic Engineer to prepare a Traffic Impact Study (Exhibit E) for the project. The scope of this study was coordinated with both the City of Sandy and the Oregon Department of Transportation. With development of the project, Dubarko Road will be extended through the property to connect with Highway 26. The subject property currently contains a mix of $R-1, R-2$, and $C-3$ zoning. The proposal changes zoning to a combination of $R-1, R-3, C-3$, and POS (Parks and Open Space). As shown on Table 3 of the traffic study below the proposed zone change results in a slight increase in vehicle trips compared to uses under existing zoning.

The submitted traffic study evaluated five existing intersections to determine if they are expected to operate acceptably under the proposal. The conclusion of the study is that all study intersections are expected to operate within capacity under year 2022 traffic conditions either with or without with the addition of site trips from the proposed development. In addition, the study also concluded that under a reasonable worst case scenario, the proposed zone change would result in fewer than 400 average daily trips than would be allowed under the existing zoning and this increase is considered a "small increase in traffic". As such, the proposed zone change is not expected to degrade the performance of any existing or planned transportation facilities and no mitigation is necessary or recommended. As reviewed in this study, the Transportation Planning Rule and Goal 12 are satisfied.

Table 3 - Zone Change Trip Generation Summary

|  | AM Peak Hour |  |  | PM Peak Hour |  |  | Daily |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total |  |
| Existing R1, R2 and C3 Zoning |  |  |  |  |  |  |  |
| 8.05 Acres R-1 (52 Homes) | 10 | 28 | 38 | 32 | 19 | 51 | 490 |
| 5.01 Acres R-2 (56 Homes) | 10 | 31 | 41 | 35 | 20 | 55 | 528 |
| 2.84 Acres C-3 (30,900 sf Retail) | 18 | 11 | 29 | 57 | 61 | 118 | 1166 |
| -Pass-by Trips (34\%) | -5 | -5 | -10 | -20 | -20 | -40 | -396 |
| Net Trips (Existing Zoning) | $\mathbf{3 3}$ | $\mathbf{6 5}$ | $\mathbf{9 8}$ | $\mathbf{1 0 4}$ | $\mathbf{8 0}$ | $\mathbf{1 8 4}$ | $\mathbf{1 7 8 8}$ |
| Proposed Zoning |  |  |  |  |  |  |  |
| 0.75 Acres R-1 (6 Homes) | 1 | 3 | 4 | 4 | 2 | 6 | 56 |
| 7.91 Acres R-3 (158 Apartments) | 17 | 56 | 73 | 55 | 33 | 88 | 1156 |
| 3.12 Acres C-3 (34,000 sf Retail) | 20 | 12 | 32 | 62 | 68 | 130 | 1284 |
| -Pass-by Trips (34\%) | -5 | -5 | -10 | -22 | -22 | -44 | -436 |
| 1.43 Acres POS (Public Park) | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Net Trips (Proposed Zoning) | $\mathbf{3 3}$ | $\mathbf{6 6}$ | $\mathbf{9 9}$ | $\mathbf{9 9}$ | $\mathbf{8 1}$ | $\mathbf{1 8 0}$ | $\mathbf{2 0 6 2}$ |
| Net Change In Site Trips | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{1}$ | $\mathbf{- 5}$ | $\mathbf{1}$ | $\mathbf{- 4}$ | $\mathbf{2 7 4}$ |

Goal 13 - Energy Conservation - The City's Development Code contains various criteria to implement Goal 13. The proposal to increase the area designated $R-3$ and convey parkland to the City ensures Goal 13 is satisfied.

Goal 14 - Urbanization - The Urbanization Report adopted in 2015 and the Urban Growth Boundary Expansion Analysis adopted in 2017 have both been acknowledged and are part of the City's Comprehensive Plan. As reviewed in Goals 9, Economy and Goal 10, Housing above, the applicant's proposal to change Comprehensive Plan and Zoning designations on the subject property will not affect compliance with these studies. Goal 14 is satisfied.

Goals 15-19 - Sandy is not subject to these Goals and they are not applicable.

## CHAPTER 17.26-ZONING DISTRICT AMENDMENTS

### 17.26.00 INTENT

This chapter sets forth review criteria and procedural requirements for quasi-judicial and legislative zoning map amendments to accomplish the following:
A. Maintain sound, stable, and desirable development within the City;
B. Permit changes in zoning district boundaries where appropriate;
C. Ensure zoning changes are consistent with the community's land use policies and goals; and
D. Lessen the influence of private economic interests in the land use decision-making process.
RESPONSE: The applicant is requesting a quasi-judicial zoning map amendment to modify the zoning district boundaries for the site. As contained in this submittal, the applicant believes the proposed zone changes are critical in developing an economically successful project.

### 17.26.40 QUASI-JUDICIAL AMENDMENT PROCEDURES

A. Initiation-Quasi-Judicial. Initiation of a zoning district change that is quasi-judicial in nature may be accomplished by one of the following ways:

1. Filing of an application by the owner(s) of the subject property(ies); or
2. A majority vote of the City Council or Planning Commission following the same procedures used for legislative amendments discussed above.
RESPONSE: The property owner filed this application for a quasi-judicial zone change as provided by this section.
B. Review Criteria. Quasi-judicial zoning district changes shall be reviewed to:
3. Determine the effects on City facilities and services;

RESPONSE: The proposed zone change is necessary to facilitate development of the property. With this development Dubarko Road will be extended from its current terminus through the site to connect with Highway 26. This road is identified as a necessary future minor arterial in the City's Transportation System Plan. Due to the cost of these improvements, the applicant has determined it is unlikely this road will ever be built without development of the property. A Traffic Impact Study (Exhibit E) completed by a Traffic Engineer evaluated the
impacts of the proposed development and the connection of Dubarko Road with Highway 26. The conclusion of this study is that the proposal is expected to result in a slight increase of traffic from what would be expected under current zoning and there would be no significant traffic impact to any roads caused by the proposal. An existing water line is located in the future alignment of Dubarko Road and this facility will be accommodated as this road is constructed. All public facilities will be extended to the farthest extent of the subject property as required. With these facts in mind, the proposal will have a positive effect on City facilities and services in compliance with this criteria.
2. To assure consistency with the purposes of this chapter;

RESPONSE: Chapter 17.26 contains the relevant criteria and procedural requirements for quasi-judicial and legislative zoning map amendments. The intent of these standards as stated in Section 17.26.00 includes the following statements:
A. Maintain sound, stable, and desirable development within the City;
B. Permit changes in zoning district boundaries where appropriate;
C. Ensure zoning changes are consistent with the community's land use policies and goals; and
D. Lessen the influence of private economic interests in the land use decisionmaking process.
The proposal to change zoning on the property represents an appropriate zoning boundary modification and the development represents a sound, stable, and desirable development proposal as detailed in the submitted Economic Analysis submitted with this application. As discussed in this review, the proposed zoning designation changes are consistent with the Comprehensive Plan and Statewide Planning Goals.
3. To assure consistency with the policies of the Comprehensive Plan;

RESPONSE: The applicant requests Comprehensive Plan Map approval to designate 1.43 acres of the property as Parks and Open Space as required by the city, to shift the current zoning designations, and to increase density on the site by more than 20 percent. A review of all applicable goals and policies of the City of Sandy Comprehensive Plan is included below.

## CITY OF SANDY COMPREHENSIVE PLAN

Goal 2 - Land Use Planning

## Specific Area Plans

3. The City may use Specific Area Plans to refine the Comprehensive Plan and/or the zoning ordinance in order to further implement the Comprehensive Plan policies. A Specific Area Plan designates specific land uses and transportation elements through broad local participation. Specific Area Plans may be developed in a single linear process, including neighborhood workshops, Planning Commission hearing(s), and City Council adoption hearing(s).
RESPONSE: The applicant has applied for Specific Area Plan approval concurrently with this application.
4. Specific Area Plans may be used as a tool for coordinating development in a specific area plan, such as a village area. Specific Area Plans should implement coordinated residential and commercial development while integrating surrounding uses and transportation linkages.
RESPONSE: The subject property is located within a designated Village as identified on the Comprehensive Plan Map and the applicant has applied for a Specific Area Plan concurrently with this request. The proposal includes a seven lot subdivision including the extension of Dubarko Drive through the site.
5. A Specific Area Plan is developed through an extensive public process that relies upon the contributions of citizens and stakeholders. The creation of a Specific Area Plan Overlay District in the zoning ordinance shall further implement the policies of the Comprehensive Plan.
RESPONSE: The City of Sandy will send notices to affected property owners and agencies as required by SDC Chapter 17.22. In addition, the city will hold public hearings before both the Planning Commission and City Council as required by SDC Chapter 17.20.

## Land Use Regulations

6. The uses, area, and household number projected for each of the villages may be modified by a Specific Area Plan.
RESPONSE: The subject property is located within an area designated as Village on the Comprehensive Plan map. The applicant is proposing to dedicate 1.43 acres of parkland and designating this area POS as required by the city. The applicant proposes shifting zoning district boundaries and increasing the residential density of the site and has applied for Specific Area Plan approval concurrently with this application.
7. Land development proposals shall be consistent with the Sandy Development Code, Municipal Code, and all adopted standards and enforcement codes of the City of Sandy. The burden of proof with regard to consistency with the applicable standards and codes lies with the prospective developer.
RESPONSE: The applicant proposes constructing a seven-lot subdivision to include four lots (Lots 1-4) zoned R-1, Low Density Residential, two lots (Lots 5 and 6) zoned R-3, High Density Residential proposed to contain multi-family dwellings, and one lot (Lot 7) to be zoned C-3. In addition, the proposal includes dedication of 1.43 acres of parkland (Tract A) and a public stormwater facility (Tract B). The details of the development of multi-family units on Lots 5 and 6 and uses permitted in the C-3 zoning district will be evaluated at a later date. As discussed in this application, the proposal is consistent with the Sandy Development Code, Municipal Code, and all relevant standards and codes in compliance with this policy.
8. Where a development offers greater improvement to the community infrastructure than is normally required, or extraordinarily serves to fulfill the objectives of the Sandy Comprehensive Plan, the City of Sandy may provide relief from city standards or requirements in consideration thereof. Relief from
standards or requirements can be considered only where there is no infringement to PUBLIC health or safety.
RESPONSE: The proposed subdivision includes the construction of Dubarko Road and a new collector street stubbed to the southern property line. Both of these roads are included in the city's Transportation System and are sized larger than is necessary to provide access to the proposed development. The city has indicated that system development charge credits will be provided to the applicant for constructing these facilities.
12.It is important that land divisions do not preclude the development of the property or nearby property to planned urban densities. For that reason, land partitioning and subdivision will be controlled to the extent that there are options remaining for the future extension of public facilities and services.
RESPONSE: The submitted subdivision design will require Dubarko Road to be extended through the site to connect to Highway 26. In addition, the City's Transportation System Plan identifies a future collector street intersecting Dubarko Road extended to the South. Both of these roads will be dedicated with the proposed subdivision. All public facilities will be constructed on the subject property as required to facilitate their extension to adjacent properties as necessary.

## Interpretation of Comprehensive Plan Map

14.Proposed plan elements such in as parks, roadways, schools, etc., are intended to be conceptual. Actual locations and quantities should be determined through the development process.
RESPONSE: As specified in this policy the neighborhood park " $N$ " shown on the Comprehensive Plan map is intended to be conceptual.

## Land Use Designations

Parks and Open Space (POS)
This designation is intended to recognize those publicly-owned lands designated or proposed for parks and open spaces. Parks include publicly developed parks and undeveloped park land where typical uses include active and passive outdoor recreation activities, trails, open space, cultural activities, park buildings and structures, concessions, general park operations and maintenance, and storm drainage facilities. Open space includes publicly developed and undeveloped lands and sensitive areas such as wetlands, steep slopes, forested areas, and stream corridors.
RESPONSE: The proposal includes dedication of 1.43 acres of parkland (Tract A) as shown on the Preliminary Plat submitted with this application. Although a proposed park is not shown on the city's draft release of the Parks and Trails Master Plan Update available for viewing on the city's website, the applicant is proposing to dedicate parkland anyway. The proposed parkland will expand the 1.4 acre parkland dedication provided in 2006 with development Deer Pointe 2 Subdivision located directly west of the subject property. The proposed 1.43 acre parkland dedication will increase the total parkland in this neighborhood of the city to area 2.83 acres. The applicant is aware the city has contracted with a consultant to prepare a master
plan for this park and has offered to work with the city by constructing park improvements in exchange for SDC credits.

Low Density Residential (LDR)
The Low Density Residential (R-1) district is intended for 5 to 8 dwelling units per net acre. Intended uses are single family detached and attached units. Duplexes, subject to siting standards, are also allowed in these areas. Low Density Residential districts are located outside village boundaries and on the periphery of the villages.
RESPONSE: The subject property does not contain any restricted development areas. The area proposed for $R$ - 1 zoning contains 0.59 net acres after removing the proposed public stormwater tract (Tract B). The minimum density for this area is 2 units ( $0.59 \times 5=2.95$, rounded down to 2 units) and the maximum density is 5 units ( $0.59 \times 8=4.72$, rounded up to 5 units). Four lots are proposed to contain single family detached dwellings in compliance with the allowed housing type and required density range.

## High Density Residential (HDR)

The High Density Residential (R-3) district is intended for high density residential development at 10 to 20 dwelling units per net acre. Intended uses are apartments, row houses, and townhouses, duplexes, single-family planned developments, and manufactured home parks including existing developed areas and areas suitable for development at this density.

High density residential areas are generally located immediately adjacent to village commercial centers or the Central Business District. Commercial development, including home businesses and limited neighborhood retail, is considered appropriate in high density residential developed in conjunction with villages or immediately north of the Central Business District. High density residential areas are generally located nearby Village Commercial Centers, the Central Business District and/or public facilities such as schools or parks. The HDR Plan designation encompasses one zoning district designation.
RESPONSE: The area proposed for $R$ - 3 zoning contains 7.91 net acres requiring $a$ minimum density of 79 units $(7.91 \times 10=79.1)$ and a maximum density of 158 units ( $7.91 \times 20=158.2$ ). Two lots (Lots 5 and 6 ) are proposed to contain multi-family dwellings an allowed housing type in this zoning district. Lot 5 is located immediately adjacent and diagonally across Dubarko Drive from Lot 7 proposed to be zoned C-3, Village Commercial and Lot 6 is located across Dubarko Road directly east of Lot 7. The exact number of dwelling units proposed on these lots will be determined with submittal of a separate design review application following approval of the current application.

## Village

The Village (V) designation provides for a mixture of commercial and residential uses within the context of a village. The village designation is intended to provide flexibility in developing specific area plans. Permitted zoning in a village includes single family residential (when identified as part of a specific area plan), low density
residential, medium density residential, high density residential, and village commercial.

A shifting of the underlying zoning district boundaries to accommodate development constraints and land divisions for specific development proposals may be allowed through approval of a Specific Area Plan. Area and density increases may be increased or decreased up to $20 \%$. Changes greater than $20 \%$ will require a Plan Map amendment.
RESPONSE: As described in this section the Village ( $V$ ) designation is intended to provide a mix of commercial and residential uses within the context of a village. Proposed zoning includes low density residential, high density residential, village commercial, and parks and open space. The applicant is requesting approval to include parks and open space in this village as required by this city. Also as specified in this section, the applicant has requested approval to shift underlying zoning district boundaries through a Specific Area Plan and a Comprehensive Plan amendment to allow density on this site to be increased by more than 20 percent.

The applicant proposes increasing the area devoted to $C-3$ zoning by 1.48 acres from 2.13 net acres to 3.61 net acres, decreasing the area of $R-1$ zoning, eliminating $R-2$ zoning, and adding $R-3$ and POS zoning. The addition of $R-3$ zoning is projected to increase residential density by 61 percent from a maximum of 101 units under current zoning to a maximum of 163 units with proposed zoning. The submitted application includes both Specific Area Plan approval and a Plan Map amendment as required.

## Commercial

The Village Commercial ( $\mathrm{C}-3$ ) district is primarily oriented to serve residents of the village and the immediately surrounding residential area. The Village Commercial area is intended to help form the core of the villages. Allowing a mixture of residential uses beside and/or above commercial uses will help create a mixed use environment which integrates uses harmoniously and increases the intensity of activity in the area. The orientation of the uses should integrate pedestrian access and provide linkages to adjacent residential areas, plazas and/or parks, and amenities.
RESPONSE: The proposal includes a single lot (Lot 7) zoned C-3 proposed to contain 3.61 acres. As detailed above, the subject property currently contains 2.13 net acres ( 2.84 gross acres) zoned C-3. The proposal is to increase the area zoned C-3 by 1.48 acres. As noted in this section, the Village Commercial area is intended to help form the core of the village. The location proposed to be zoned C-3 is located adjacent to parkland, has frontage on both Highway 26 and Dubarko Drive and is across the street from two lots zoned for high density residential development and four lots zoned for low density residential. This lot is well positioned to serve as a central component of this village. The use proposed for this lot is not known at this time and will be determined following approval of the current application with a subsequent land use application.

## Goal 6 - Air, Water, and Land Resources

This goal is to establish policies to maintain and improve the quality of the air, water, and land resources of the state.

1. Maintain environmental quality by guiding future development and land use activities. Allow activities that will not significantly deteriorate the existing high quality of air, water and land resources.
RESPONSE: As noted above, the subject property does not contain any known protected natural resources. The applicant intends dedicating 1.43 acres of parkland with this application in addition to retaining and protecting a significant number of trees on the site.
2. Reduce congestion and delay on major streets to lessen localized pollution impacts of automobile travel through methods such as signal timing, access management, intersection improvements, etc.
RESPONSE: As noted in the Traffic Impact Study submitted with this application (Exhibit E), the proposal will not have a significant effect on the operation of area roadways and intersections at the planning horizon as defined by the Oregon Transportation Planning Rule.

## Goal 8 - Parks and Recreation

1. Ensure that new residential development contributes equitably to park land acquisition, development, and maintenance.
RESPONSE: The applicant proposes dedicating 1.43 acres. This area has been sized based on the maximum density proposed for the both the $R-1$ and $R-3$ lots based on the parkland calculation formula specified in Chapter 17.86.
2. The conceptual location of community and neighborhood parks and areas of open space have been indicated on the City of Sandy Land Use Map. Actual park locations may be determined based on more site-specific information RESPONSE: As noted above, the Comprehensive Plan map and current Parks Master Plan show a future park in the vicinity of the subject property. The Deer Pointe 2 Subdivision dedicated a 1.4 acre park when it was platted in 2006. The current Parks and Trails Master Plan preliminary mapping does not show any proposed parkland on the subject property. Despite current mapping the applicant proposes dedicating 1.43 acres of parkland with this proposal. The applicant reviewed this proposal with the city's Parks and Trails Advisory Committee on two separate occasions.

## Goal 9 - Economic Development

## Commercial

1. The City of Sandy shall ensure, at each periodic review, an adequate supply of land to meet the forecast 20 -year commerce and service needs of the city's residents and trade area.
RESPONSE: As shown on the table below and discussed in the review of Goal 9, with approval of the proposal the city will continue to have an adequate supply of employment lands to meet the forecasted 20 -year buildable lands supply. Goal 9 is satisfied with the proposal.

## Adjusted UGB Area

| Land Use Type | Adjusted UGB <br> area (Table 3.10) | Adjusted area <br> previous approval <br> 2.47 ares <br> Commercial to HDR | Proposed <br> area changes <br> (reductions) | Adjusted UGB <br> with proposal |
| :--- | :---: | :---: | :---: | :---: |
| LDR | 19.2 |  | $(5.54)$ | 13.63 |
| MDR | 17.1 |  | $(3.76)$ | 13.34 |
| HDR | 12.6 | 15.07 | 7.91 | 22.98 |
| Commercial | 3.6 | 1.13 | 1.48 | 2.61 |
| Industrial | 32.8 |  | 0.00 | 32.8 |

## Village Commercial Policies

28. One of the central themes in the Comprehensive Plan is the use of Village areas. These are compact neighborhoods (160-200 acres) which are designed to encourage travel on foot, and reduce reliance on the car. The center of each village includes housing, retail shops, public uses, a village green or park, and, potentially, a transit stop. The street pattern is connected and designed to provide direct and convenient access to the village center.
RESPONSE: The subject property is located in a designated village on the Comprehensive Plan map. The applicant's proposal to increase the area zoned C-3, dedicate a 1.43 park, and adjust zoning district boundaries will positively ensure compliance with this policy.

Goal 10 - Housing - This goal is to establish policies to provide for housing needs of the state.

1. Assure an adequate supply of developable land for low, medium, and high density housing to meet the 20-year population projections.
RESPONSE: As reviewed in Goal 10 above and shown on the Adjusted UGB Area table, approval of the proposal will result in a surplus of all residential land categories to meet the city's 20-year population projections.

## Residential Districts

7. Provide for distinct mixed use villages separate from the central core of the city. Villages are to be developed around a commercial center or other focal point. RESPONSE: The proposal will increase the area of property zoned C-3, Village Commercial by 1.48 acres. The applicant intends developing this property following approval of a subsequent land use application.
8. Assure that residential densities are appropriately related to site conditions, including slopes, potential hazards, and natural features.
RESPONSE: The proposed project has been designed in consideration of the site conditions as stated in this policy. No steep slopes, potential hazards, or significant natural features exist on the site. The details of the design of
structures on the R-3 and C-3 lots will be determined following submittal of a subsequent land use application.
10.Link housing density and location to reduce automobile travel by locating higher density housing near village centers, schools, and potential transit routes. RESPONSE: Lots 5 and 6 proposed to contain R-3, High Density Residential zoning are located directly across Dubarko Road from Lot 7 zoned C-3, Village Commercial, the proposed village center. Dubarko Road will be constructed through the property and will serve as a transit route. The City's Transit Manager is requiring construction of two bus shelter pads and the installation of two benches on these pads in locations accessible to all residents. The subject property is well suited for residential development.

## Goal 11 - Public Facilities and Services

9. Require developers to install and extend all public utilities to, and through, the property to serve the needs of the development and surrounding properties in a logical manner.
RESPONSE: The applicant is aware that public facilities will need to be installed to and through the site. Following construction these facilities will be available to be extended to adjacent properties as appropriate.

## Goal 12 - Transportation

## Neighborhood Street System

1. Support a pattern of connected streets, sidewalks, and bicycle routes to: a) provide safe and convenient options for cars, bikes, and pedestrians; b) create a logical, recognizable pattern of circulation; and, c) spread traffic over local streets so that collector and arterial streets are not overburdened.
RESPONSE: The proposed design includes the extension of Dubarko Road through the site and a new collector street stubbed to the southern property line. All proposed streets will contains sidewalks and bike lanes will be included on streets as required.

## Major Roadway Circulation

22. Submit notice of development proposals impacting Highways 26 and 211 to ODOT for review and comment.
RESPONSE: The scope of the submitted Transportation Impact Study (Exhibit E) was coordinated with the Oregon Department of Transportation and the City's Traffic Consultant. ODOT attended the pre-application conference for the proposal and the City will send notification of the proposal to ODOT as part of the required notification process.

## Goal 14 - Land Use and Urbanization

Urbanization Policies

1. Maintain an urban growth boundary with sufficient residential, commercial, industrial, and public use lands necessary to support forecast population and employment for a 20-year horizon. The City will evaluate and update the 20-year land supply at each periodic review plan update.


#### Abstract

RESPONSE: As reviewed in Goal 9 and 10 and shown on the Adjusted UGB Area table above, the proposal does not adversely impact the City's adopted Buildable Lands Inventory and the findings of the UGB Expansion Analysis. With approval of the proposal, an adequate supply of all land use categories to meet the city's 20year population projections will remain.


4. To assure consistency with the Statewide Planning Goals as may be necessary, and any other applicable policies and standards adopted by the City Council.
RESPONSE: A review of all applicable Statewide Planning Goals is included as part of the review of the Comprehensive Plan amendment request in Chapter 17.24 above. As discussed in this review, the proposal is consistent with all applicable Statewide Planning Goals and this policy is satisfied.

## CHAPTER 17.54-SPECIFIC AREA PLAN OVERLAY

### 17.54.00 - SPECIFIC AREA PLAN DEVELOPMENT AND APPROVAL PROCESS

A. Purpose. The purpose of a specific area plan overlay zone is to allow development and approval of specific area plans in the city. A specific area plan is a master plan coordinating and directing development in terms of transportation, utilities, open space and land use, however, no phasing or timeline is required. Specific area plans may be located anywhere within the Urban Growth Boundary and are intended to promote coordinated planning concepts and pedestrian-oriented mixed-use development.
Response: The City of Sandy Comprehensive Plan, Goal 2, Land Use Designations, Village states: "shifting of the underlying zoning district boundaries to accommodate development constraints and land divisions for specific development proposals may be allowed through approval of a Specific Area Plan". The applicant proposes shifting zoning district boundaries as noted above and has submitted a Specific Area Plan request according to the standards in this chapter as required.
B. Initiation. The process to establish a specific area plan shall be initiated by the City Council. The Planning Commission or interested property owners may submit requests to the City Council to initiate the specific area plan process. If owners request initiation of a specific area plan process, the City Council may require an application fee to cover the cost of creating the plan.
Response: The proposed Specific Area Plan application requests approval to shift zoning district boundaries currently existing on the property to add $R-3$ and POS zoning and to remove $R-2$ zoning. As a result of these changes, the projected residential density for the property will be increased by more than 20 percent and the applicant has requested a Comprehensive Plan Map amendment as discussed in Chapter 17.24 above. The Village ( $V$ ) land use designation as described in the Comprehensive Plan allows a mix of residential and commercial uses including low density residential, medium density residential, high density residential, and village commercial. The applicant's proposal includes a mix of Low Density Residential, High Density Residential, and Village Commercial. In addition, the applicant proposes dedicating 1.43 acres of parkland to be zoned Parks and Open Space.
D. Adoption. A specific area plan shall be adopted through a Type IV process, and shall be evaluated for compliance with the criteria for zoning district amendments and/ or comprehensive plan amendments where applicable.
Response: This Specific Area Plan request will be reviewed through a Type IV process and shall comply with the criteria for zoning district and Comprehensive Plan amendments. The criteria in Chapter 17.24, Comprehensive Plan Amendment Procedures and Chapter 17.26, Zoning District Amendments are reviewed above and as reviewed in these chapters, the proposal is found to comply with all required criteria.
F. Comprehensive Plan Amendment. A specific area plan is similar to a master plan and does not automatically require a comprehensive plan amendment. A comprehensive plan amendment shall only be required if a need for such an amendment is identified during development of the specific area plan.
Response: The applicant has applied for a Comprehensive Plan Amendment concurrently with this request.
G. Compliance with Specific Area Plan Standards and Procedures. New construction and land divisions shall meet any development, land division and design standards of the applicable specific area plan. Base zone and land division standards shall apply where no different standard is referenced for the specific plan area.
Response: As reviewed below, the proposal complies with all relevant standards and criteria found in applicable code chapters.
H. Specific Area Plan Standards. Specific standards for adopted specific area plans are defined below.
Response: Each of these standards are reviewed below.

### 17.54.10 - SPECIFIC AREA PLAN CONTENT

At a minimum, a specific area plan shall include the following text and diagrams:
A. Plan Objectives. A narrative shall set forth the goals and objectives of the plan.

Response: The details of the goals and objectives of this proposal are articulated throughout the submitted project narrative. In general, the applicant strives to create a mixed-use development to include detached single family dwellings, multi-family dwellings, and village commercial. In addition, the applicant proposes dedicating 1.43 acres to the city for a future park. With this plan Dubarko Road will be extended through the site to complete this TSP identified road segment.
B. Site and Context. A map of the site and existing context shall identify the project area.
Response: A map showing the site and context are included with this application.
C. Land Use Diagram. The land use diagram shall indicate the distribution and location of planned land uses, including open space and parks, within the area covered by the specific area plan.
Response: The submitted plan set clearly identifies the distribution of all proposed land uses.
D. Density. If residential uses are proposed, a narrative shall describe planned residential densities.
Response: Density calculations are included in Chapter 17.30, Zoning Districts above.
E. Facilities Analysis. The plan shall include an analysis of the general location and extent of major components of sanitary sewer, water, and other essential facilities proposed to be located within the specific plan area and needed to support the land uses and densities described in the plan. A review of existing facilities master plans shall be sufficient if these master plans indicate there is adequate capacity to serve the specific plan area.
Response: A Utility Plan is included with the plan set showing the location of all public facilities proposed to serve the development.
F. Circulation/Transportation Diagram. The circulation diagram shall indicate the proposed street pattern for the specific area plan area, including pedestrian pathways and bikeways. Design standards and street cross sections shall be included, if different than normal City standards.
Response: The submitted plan set shows the location and dimensions of all proposed roads and cross-section drawings of these streets are also included.
G. Market Analysis. Specific area plans that include amendments to the zoning map affecting the acreage of Village Commercial (C-3) land within the plan area shall include a market analysis of supportable retail space that verifies demand for the proposed acreage of C-3 land. The analysis should include a market delineation, a regional and local economic review, and a retail market evaluation.
Response: An Economic Analysis (ExhibitD) is included as part of the application package.
H. Design and Development Standards. If standards differ from normal City standards, design and development standards shall be included in the plan. Response: The proposal is anticipated to comply with all design and development standards. The details of this review will be addressed with submittal of subsequent land use applications for development on Lot 5-7.

## SUBDIVISION REVIEW

The applicant requests approval to construct a seven-lot subdivision with this application. Four lots (Lots 1-4) are to be zoned R-1, Low Density Residential and will be constructed with single-family residential dwellings, two lots (Lots 5 and 6) are to be zoned R-3, High Density Residential and will contain multi-family units, and one lot (Lot 7) is proposed to be zoned C-3, Village Commercial. In addition, the applicant proposes
dedicating 1.43 acres of parkland (Tract A) and constructing and dedicating a public stormwater facility (Tract B).

## CHAPTER 17.30-ZONING DISTRICTS

### 17.30.20 RESIDENTIAL DENSITY CALCULATION PROCEDURE

The number of dwelling units permitted on a parcel of land is calculated after the determination of the net site area and the acreage of any restricted development areas (as defined by Chapter 17.60). Limited density transfers are permitted from restricted development areas to unrestricted areas consistent with the provisions of the Flood and Slope Hazard Area Overlay District, Chapter 17.60. No areas within the FSH Overlay are located on the subject property.
Response: The applicant proposes a seven-lot subdivision with two tracts to be dedicated to the city. The subject property contains a gross site area of 15.91 acres. After deducting public rights-of-way and proposed dedications (park and stormwater facility), the net developable site area (NSA) is 12.11 acres with three zoning districts. Six of the seven lots are proposed to contain residential development, Lots 1-4 zoned $R-1$ and Lots 5 and 6 zoned $R-3$ and one lot (Lot 7 ) will be zoned $C-3$, Village Commercial.

The area identified to be zoned $R$ - 1 contains 0.59 net acres after removing the proposed public stormwater tract (Tract B). This zone allows a minimum of 5 and a maximum of 8 units per net acre. The minimum density is calculated by multiplying the NSA $x$ the required minimum density ( 0.59 acres $\times 5$ units/net acres $=2.95$ units round down to 2 units). The maximum density is determined by multiplying the NSA x the allowed maximum density ( 0.59 acres $x 8$ units/net acre $=4.72$, rounded up to 5 units). As a result of these calculations the density range for this part of the property is a minimum of two units and a maximum of five units. The applicant proposes platting four units in compliance with the required density range.

The area identified to be zoned $R-3$ (Lot 5 and 6) contains a net area of 7.91 acres. The $R-3$ zone allows a minimum of 10 and a maximum of 20 units per net acre. The minimum density is calculated by multiplying the NSA x the required minimum density (7.91 acres $x 10$ units/acre $=79$ units). The maximum density is determined by multiplying the NSA x the allowed maximum density ( 7.91 acres $\times 20$ units/acre $=158$ units).

As a result of these calculations the density range for the residential portion of the subject property is a minimum of 81 units ( $2+79$ ) and a maximum of 163 units ( $5+158$ ). At this time the applicant does not know the exact number of units that will be constructed on Lot 5 and 6 zoned $R$-3. This number is likely to be less that the maximum allowed and will be determined with a design review application submitted at a later date.

## CHAPTER 17.32 - PARKS \& OPEN SPACE (POS)

### 17.32.00-INTENT

This district is intended to recognize those publicly-owned lands designated or proposed for parks and open spaces. Parks include publicly developed parks and undeveloped park Revised Bull Run Terrace Narrative
land where typical uses include active and passive outdoor recreation activities, trails, open space, cultural activities, park buildings and structures, concessions, general park operations and maintenance, and storm drainage facilities. Open space includes publicly developed and undeveloped lands and sensitive areas such as wetlands, steep slopes, forested areas, and stream corridors.
Response: The applicant proposes dedicating 1.43 acres (Tract A) to be designated and used as public parkland. The land proposed for parkland abuts the 1.4 acres of parkland dedicated in 2007 with the Deer Pointe 2 Subdivision approval along its entire western line. The subject property is generally level and suitable for parkland.

### 17.32.10-PERMITTED USES

A. Primary Uses Permitted Outright:

1. Park improvements identified in the Parks Master Plan or Park Specific Master Plans adopted by the City Council.
Response: The City has indicated a consultant has been hired to prepare a master plan for the Deer Pointe Park. With dedication of the additional land with the current proposal, this master plan can now be designed to include park improvements and amenities for a new 2.83 acre neighborhood park.

### 17.32.40 - DEVELOPMENT STANDARDS

A. Parks \& Open Space

Lot Area - No minimum
Lot Dimension - No minimum
Setbacks - No minimum or maximum
Lot Coverage - No maximum
Structure Height - 35 ft . maximum
Off-Street Parking - See Chapter 17.98
Design Review Standards - See Section 17.90.120
Response: The proposal complies with all applicable development standards. The city will need to determine compliance as the master plan for this new park is prepared and as part of the approval process.

### 17.32.50 - ADDITIONAL REQUIREMENTS

A. Where applicable, park improvements shall comply with city design standards.
B. Provisions for pedestrian and vehicular off-street access to adjoining properties shall be included in park master plans
Response: These items are required to be addressed with preparation of the master plan for this park.

## CHAPTER 17.36-LOW DENSITY RESIDENTIAL (R-1)

### 17.36.00-INTENT

This district is intended to implement the Low Density Residential Comprehensive Plan designation by providing for an urban level of low-density residential development. It is to be used as a transition between the Single Family Residential zone and the higher densities of a village. The uses are to be fully serviced by public facilities. This zone is intended to provide walkable neighborhoods with excellent linkage between residential areas, schools, parks, and village commercial. This zone is one of four zones included in
a village area and is designed as a mixed-use neighborhood with a range of housing types and accessible commercial areas. Density shall not be less than 5 or more than 8 units per net acre.
Response: As detailed in Chapter 17.30 above, the four lots (Lots 1-4) proposed to contain $R-1$ zoning fall within the density range (2-5 units) for this area.

### 17.36.10-PERMITTED USES

A. Primary Uses Permitted Outright:

1. Single detached dwelling subject to design standards in Chapter 17.90; Response: The applicant proposes constructing single-family detached dwellings as permitted in this zoning district.

### 17.36.30 - DEVELOPMENT STANDARDS

| Type | Standard | Proposed |
| :---: | :---: | :---: |
| A. Minimum Lot Area <br> - Single detached dwelling | 5,500 square ft. | Lot 1-5,708 s.f. <br> Lot 2-5,791 s.f. <br> Lot 3-7,389 s.f. <br> Lot 4-6,671 s.f. |
| B. Minimum Average Lot Width - Single detached dwelling | 50 ft | Complies |
| C. Minimum Lot Frontage | 20 ft . except as allowed by Section 17.100.160 | Complies. |
| D. Minimum Average Lot Depth | No minimum | Complies |
| E. Setbacks (Main Building) <br> Front yard <br> Rear yard <br> Side yard (interior) <br> Corner Lot <br> Garage | 10 ft . minimum <br> 15 ft . minimum <br> 5 ft . minimum <br> 10 ft . minimum on side abutting the street <br> 22 ft . minimum for front vehicle access <br> 15 ft . minimum if entrance is perpendicular <br> to the street (subject to Section 17.90.220) | All lots are capable of complying with setbacks. Setbacks will be confirmed with submittal of building permits. |
| F. Projections into Required Setbacks | See Chapter 17.74 | No projections are proposed at this time. |
| G. Accessory Structures in Required Setbacks | See Chapter 17.74 | No accessory structures are proposed at this time. |
| H. Structure Height | 35 ft . maximum | To be determined. |
| I. Building Site Coverage | No minimum | Complies |
| J. Off-Street Parking | See Chapter 17.98 | See Chapter 17.98. |

Response: As shown on Sheet C2 of the plan set, all lots in the proposed subdivision contain at least 5,500 square feet, have at least 20 feet of street frontage, and contain an average lot width of at least 50 feet as required. Lot 4 fronts Dubarko Road but will be accessed from Street A across an easement on Lot 3. All lots are capable of complying with applicable setbacks in the zone. All development standards will be reviewed with submittal of building permits. Compliance with required off-street parking is shown on Sheet C7 and is reviewed in Chapter 17.98 below.

### 17.36.40 - MINIMUM REQUIREMENTS

A. Must connect to municipal water.

Response: The applicant proposes extending water service to serve all dwellings in the new subdivision.
B. Must connect to municipal sewer if service is currently within 200 feet of the site. Sites more than 200 feet from municipal sewer, may be approved to connect to an alternative disposal system provided all of the following are satisfied:

1. A county septic permit is secured and a copy is provided to the city;
2. The property owner executes a waiver of remonstrance to a local improvement district and/or signs a deed restriction agreeing to complete improvements, including but not limited, to curbs, sidewalks, sanitary sewer, water, storm sewer or other improvements which directly benefit the property;
3. The minimum size of the property is one acre or is a pre-existing buildable lot, as determined by the city;
4. Site consists of a buildable parcel(s) created through dividing property in the city, which is less than five acres in size.
Response: All proposed units will be connected to sanitary sewer service.
C. The location of any real improvements to the property must provide for a future street network to be developed.
Response: A new street network will be constructed to serve each dwelling as required.
D. Must have frontage or approved access to public streets.

Response: All lots contain frontage on a public street and all lots will gain access directly from a public street with the exception of Lot 4 which fronts Dubarko but will gain access across an easement on Lot 3 fronting Fawn Street (Street A).

### 17.36.50-ADDITIONAL REQUIREMENTS

A. Design review as specified in Chapter 17.90 is required for all uses.

Response: Only Section 17.90.150, Residential Design Standards of Chapter 17.90 is applicable to residential developments. This section is reviewed below.
B. Lots with 40 feet or less of street frontage shall be accessed by a rear alley or a shared private driveway.
Response: All lots contain at least 40 feet of street frontage.

## CHAPTER 17.40-HIGH DENSITY RESIDENTIAL (R-3)

### 17.40.00 - INTENT

This district is intended to implement the High Density Residential Comprehensive Plan designation by providing for housing in close proximity to retail, public amenities; major transportation routes and transit services where public sewer, water and other services are readily accessible. R-3 uses are designed to be a transition area between commercial and industrial uses and low density single family uses. Pedestrian connections are required to ensure a direct walking route to retail shops. All development shall also provide access to the surrounding neighborhood with excellent linkage between
residential areas, schools, parks, and commercial. Density shall not be less than 10 or more than 20 units per net acre.
Response: As detailed in Section 17.30 above, the applicant proposes two lots (Lots 5 and 6) to be zoned $R-3$ allowing a maximum of 158 dwelling units. The exact number of units will be determined with a future design review application.

### 17.40.10 - PERMITTED USES

A. Primary Uses Permitted Outright:
6. Multi-family dwellings

Response: The applicant proposes constructing multi-family dwellings as permitted in this zoning district.

### 17.40.30-DEVELOPMENT STANDARDS

Response: The details of this section will be addressed with a design review application for the proposed multi-family dwelling project.

### 17.40.40 - MINIMUM REQUIREMENTS

A. Must connect to municipal water.

Response: The applicant proposes extending water service to serve all dwellings.
B. Must connect to municipal sewer.

Response: The applicant proposes extending water service to serve all dwellings.
C. The location of any real improvements to the property must provide for a future street network to be developed.
Response: A new street network will be constructed to serve each dwelling as required.
D. Must have frontage or approved access to public streets.

Response: Each lot will be served by construction of a new public street. Units constructed on the lots will be served by a private driveway and parking lot.

### 17.40.50-ADDITIONAL REQUIREMENTS

A. Design review as specified in Chapter 17.90 is required for all uses.

Response: The requirements of Section 17.90.160, Additional Requirements - Multifamily Development Standards will be addressed as part of a future design review application.
B. Lots with 40 feet or less of street frontage shall be accessed by a rear alley or a shared private driveway.
Response: No lots contain less than 40 feet of street frontage.
C. Zero Lot Line Dwellings: Prior to building permit approval, the applicant shall submit a recorded easement between the subject property and the abutting lot next to the yard having the zero setback. This easement shall be sufficient to guarantee rights for maintenance purposes of structures and yard, but in no case shall it be less than 5 feet in width.

Response: No zero lot dwellings are proposed.

## CHAPTER 17.56-HILLSIDE DEVELOPMENT

### 17.56.10 APPLICABILITY

These regulations shall apply to any parcel with slopes greater than twenty-five percent (25\%) as shown on the Hillside Development Overlay District Map or with slope hazards mapped by the Department of Geology and Mineral Industries (DOGAMI). This chapter shall apply only to activities and uses that require a building, grading, tree removal and/ or land use permit.
Response: As shown on the slope analysis submitted with the plan set (Sheet C10) the site contains a small area of slopes exceeding 25 percent. A Geotechnical and Slope Stability Investigation (Exhibit I) is included with the submittal.

## CHAPTER 17.80 - ADDITIONAL SETBACKS ON COLLECTOR AND ARTERIAL STREETS

### 17.80.20-SPECIFIC SETBACKS

Any structure located on streets listed above or identified in the Transportation System Plan as arterials or collectors shall have a minimum setback of 20 feet measured from the property line. This applies to applicable front, rear and side yards.
Response: The City's Transportation System Plan identifies Dubarko Road through the subject property as a "Minor Arterial" street, Highway 26 a "Major Arterial", and Street B ("New" street) terminating to tax lot 900 a "Collector Street". The Preliminary Plat shows a 20 foot setback for all lots adjacent to Dubarko Road and Street B. The requirements of this section will be confirmed with submittal of a design review application to construct the proposed dwellings and building permits on these lots.

## CHAPTER 17.82 - SPECIAL SETBACKS ON TRANSIT STREETS 17.82.10 APPLICABILITY

This chapter applies to all residential development located adjacent to a transit street. A transit street is defined as any street designated as a collector or arterial, unless otherwise designated in the Transit System Plan.
Response: Lots 3-7 of the proposed subdivision are located adjacent to Dubarko Road, a transit street. Lots 3 and 4 will be zoned R-1, Lots 5-6 will be zoned R-3 and Lot 7 will be zoned C-3. The requirements of this chapter will be addressed with the design review application for the dwellings on these lots as applicable.

### 17.82.20 BUILDING ORIENTATION

A. All residential dwellings shall have their primary entrances oriented toward a transit street rather than a parking area, or if not adjacent to a transit street, toward a public right-of-way or private walkway which leads to a transit street.
Response: Lot 4 will be accessed by an easement across Lot 3 and will be designed in accordance with this standard. Lot 3 will be located at the corner of Dubarko Drive and a new local street. The dwelling on this lot can be designed in compliance with this standard as required.
B. Dwellings shall have a primary entrance connecting directly between the street and building interior. A clearly marked, convenient, safe and lighted pedestrian route shall be provided to the entrance, from the transit street. The pedestrian route shall consist of materials such as concrete, asphalt, stone, brick, permeable pavers, or other materials as approved by the Director. The pedestrian path shall be permanently affixed to the ground with gravel subsurface or a comparable subsurface as approved by the Director.
Response: The dwellings on Lots 3 and 4 will be designed in accordance with this standard. The future dwellings on Lots 5-6 and future development on Lot 7 will address this requirement as part of the design review application for these lots.
C. Primary dwelling entrances shall be architecturally emphasized and visible from the street and shall include a covered porch at least 5 feet in depth.
Response: The dwellings on Lots 3 and 4 will be designed in accordance with this standard. The multi-family dwellings on Lots 5-6 and future development on Lot 7 will address this requirement during design review.
D. If the site has frontage on more than one transit street, the dwelling shall provide one main entrance oriented to a transit street or to a corner where two transit streets intersect.
Response: It is unclear if Highway 26 is identified as a transit street adjacent to the site. If Highway 26 is considered a transit street, Lots 6 will contain frontage on both Dubarko Road and Highway 26 and Lot 7 will contain frontage on Highway 26, Dubarko Road, and Street B ("New Street"). The details of this design will be determined with the future design review application for these lots.

## CHAPTER 17.84-IMPROVEMENTS REQUIRED WITH DEVELOPMENT

### 17.84.20 - TIMING OF IMPROVEMENTS

A. All improvements required by the standards in this chapter shall be installed concurrently with development, as follows:

1. Where a land division is proposed, each proposed lot shall have required public and franchise utility improvements installed or financially guaranteed in accordance with the provisions of Chapter 17 prior to approval of the final plat. Response: All lots in the proposed subdivision will install public and franchise utility improvements or financially guarantee these improvements prior to final plat approval.
2. Where a land division is not proposed, the site shall have required public and franchise utility improvements installed or financially guaranteed in accordance with the provisions of Chapter 17 prior to temporary or final occupancy of structures.
Response: This section is not applicable because a land division is proposed.
B. Where specific approval for a phasing plan has been granted for a planned development and/or subdivision, improvements may similarly be phased in accordance with that plan.
Response: The applicant does not propose constructing the subdivision in phases.

### 17.84.30 - PEDESTRIAN AND BICYCLIST REQUIREMENTS

A. Sidewalks shall be required along both sides of all arterial, collector, and local streets, as follows:

1. Sidewalks shall be a minimum of 5 ft . wide on local streets. The sidewalks shall be separated from curbs by a tree planting area that provides separation between sidewalk and curb, unless modified in accordance with Subsection 3 below. Response: All proposed sidewalks on local streets will be five feet wide as required and separated from curbs by a tree planting area.
2. Sidewalks along arterial and collector streets shall be separated from curbs with a planting area, except as necessary to continue an existing curb-tight sidewalk. The planting area shall be landscaped with trees and plant materials approved by the City. The sidewalks shall be a minimum of 6 ft . wide.
Response: As shown on Sheet C6, six-foot sidewalks are proposed to be constructed along Highway 26, Dubarko Road north of Street B and on Street B. These frontages will include a planter strip as required.
3. Sidewalk improvements shall be made according to city standards, unless the city determines that the public benefit in the particular case does not warrant imposing a severe adverse impact to a natural or other significant feature such as requiring removal of a mature tree, requiring undue grading, or requiring modification to an existing building. Any exceptions to the standards shall generally be in the following order.
a) Narrow landscape strips
b) Narrow sidewalk or portion of sidewalk to no less than 4 feet in width
c) Eliminate landscape strips
d) Narrow on-street improvements by eliminating on-street parking
e) Eliminate sidewalks

Response: No exceptions or modifications to the sidewalk standards of this section are requested with this application except, the applicant proposes constructing the sidewalk in this section at five feet rather than six feet due to the increased median width along Dubarko Road north of Street B.
4. The timing of the installation of sidewalks shall be as follows:
a) Sidewalks and planted areas along arterial and collector streets shall be installed with street improvements, or with development of the site if street improvements are deferred.
b) Sidewalks along local streets shall be installed in conjunction with development of the site, generally with building permits, except as noted in (c) below.
c) Where sidewalks on local streets abut common areas, drainageways, or other publicly owned or semi-publicly owned areas, the sidewalks and planted areas shall be installed with street improvements.
Response: The applicant intends constructing all sidewalk improvements as required by this section. The sidewalks along Highway 26, Dubarko Road and Street B will be constructed prior to final plat approval, or at the time of
home construction whichever the city prefers. Sidewalks along Street A will be constructed at the time of home construction.
B. Safe and convenient pedestrian and bicyclist facilities that strive to minimize travel distance to the extent practicable shall be provided in conjunction with new development within and between new subdivisions, planned developments, commercial developments, industrial areas, residential areas, public transit stops, school transit stops, and neighborhood activity centers such as schools and parks, as follows:

1. For the purposes of this section, "safe and convenient" means pedestrian and bicyclist facilities that: are reasonably free from hazards which would interfere with or discourage travel for short trips; provide a direct route of travel between destinations; and meet the travel needs of pedestrians and bicyclists considering destination and length of trip.
Response: No pedestrian or bicycle facilities other than sidewalks and on-street bicycle lanes have been identified or are proposed.
2. To meet the intent of " $B$ " above, right-of-ways connecting cul-de-sacs or passing through unusually long or oddly shaped blocks shall be a minimum of 15 ft . wide with 8 feet of pavement.
Response: As noted above, no facilities are proposed.
3. 12 feet wide pathways shall be provided in areas with high bicycle volumes or multiple use by bicyclists, pedestrians, and joggers.
Response: No facilities of this type are proposed with the subdivision.
4. Pathways and sidewalks shall be encouraged in new developments by clustering buildings or constructing convenient pedestrian ways. Pedestrian walkways shall be provided in accordance with the following standards:
a) The pedestrian circulation system shall be at least five feet in width and shall connect the sidewalk on each abutting street to the main entrance of the primary structure on the site to minimize out of direction pedestrian travel.
b) Walkways at least five feet in width shall be provided to connect the pedestrian circulation system with existing or planned pedestrian facilities which abut the site but are not adjacent to the streets abutting the site.
c) Walkways shall be as direct as possible and avoid unnecessary meandering. Response: No pedestrian pathways are proposed, only sidewalks adjacent to public streets.
d) Walkway/driveway crossings shall be minimized. Internal parking lot design shall maintain ease of access for pedestrians from abutting streets, pedestrian facilities, and transit stops.
e) With the exception of walkway/driveway crossings, walkways shall be separated from vehicle parking or vehicle maneuvering areas by grade, different paving material, painted crosshatching or landscaping. They shall be constructed in accordance with the sidewalk standards adopted by the City. (This provision does not require a separated walkway system to collect drivers
and passengers from cars that have parked on site unless an unusual parking lot hazard exists).
f) Pedestrians amenities such as covered walk-ways, awnings, visual corridors and benches will be encouraged. For every two benches provided, the minimum parking requirements will be reduced by one, up to a maximum of four benches per site. Benches shall have direct access to the circulation system.
Response: The requirements of these sections are not applicable to the proposed subdivision.
C. Where a development site is traversed by or adjacent to a future trail linkage identified within the Transportation System Plan, improvement of the trail linkage shall occur concurrent with development. Dedication of the trail to the City shall be provided in accordance with 17.84.80.
Response: No trails are identified in the City's Transportation System Plan or Parks Master Plan on the subject property and none are proposed.
D. To provide for orderly development of an effective pedestrian network, pedestrian facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies).
Response: No pedestrian facilities, except sidewalks are proposed.
E. To ensure improved access between a development site and an existing developed facility such as a commercial center, school, park, or trail system, the Planning Commission or Director may require off-site pedestrian facility improvements concurrent with development.
Response: No off-site pedestrian improvements have been identified.

### 17.84.40 - TRANSIT AND SCHOOL BUS TRANSIT REQUIREMENTS

A. Development sites located along existing or planned transit routes shall, where appropriate, incorporate bus pull-outs and/or shelters into the site design. These improvements shall be installed in accordance with the guidelines and standards of the transit agency. School bus pull-outs and/or shelters may also be required, where appropriate, as a condition of approval for a residential development of greater than 50 dwelling units where a school bus pick-up point is anticipated to serve a large number of children.
Response: The subject property is located along Dubarko Road, a future transit street. During the pre-application conference for the project the city Transit Manager identified two required transit amenities. These facilities are shown on Sheet C5 of the plan set.
B. New developments at or near existing or planned transit or school bus transit stops shall design development sites to provide safe, convenient access to the transit system, as follows:

1. Commercial and civic use developments shall provide a prominent entrance oriented towards arterial and collector streets, with front setbacks reduced as much as possible to provide access for pedestrians, bicycles, and transit.
2. All developments shall provide safe, convenient pedestrian walkways between the buildings and the transit stop, in accordance with the provisions of 17.84.30 B.

Response: The proposed subdivision complies with the requirements of this section.

### 17.84.50-STREET REQUIREMENTS

A. Traffic evaluations may be required of all development proposals in accordance with the following:

1. A proposal establishing the scope of the traffic evaluation shall be submitted for review to the City Engineer. The evaluation requirements shall reflect the magnitude of the project in accordance with accepted traffic engineering practices. Large projects should assess all nearby key intersections. Once the scope of the traffic evaluation has been approved, the applicant shall present the results with and an overall site development proposal. If required by the City Engineer, such evaluations shall be signed by a Licensed Professional Civil Engineer or Licensed Professional Traffic Engineer licensed in the State of Oregon.
2. If the traffic evaluation identifies level-of-service conditions less than the minimum standard established in the Transportation System Plan, improvements and funding strategies mitigating the problem shall be considered concurrent with a development proposal.
Response: A Traffic Impact Study is included with this application as requested by the City and ODOT (Exhibit E). This study does not identify any required mitigation.
B. Location of new arterial streets shall conform to the Transportation System Plan in accordance with the following:
3. Arterial streets should generally be spaced in one-mile intervals.
4. Traffic signals should generally not be spaced closer than 1500 ft . for reasonable traffic progression.
Response: The extension of Dubarko Road is classified as a minor arterial street. This street has been designed in accordance with this standard as applicable. The applicant understands improvement of this street is eligible for SDC credits.
C. Local streets shall be designed to discourage through traffic. NOTE: for the purposes of this section, "through traffic" means the traffic traveling through an area that does not have a local origination or destination. To discourage through traffic and excessive vehicle speeds the following street design characteristics shall be considered, as well as other designs intended to discourage traffic:
5. Straight segments of local streets should be kept to less than a quarter mile in length. As practical, local streets should include traffic calming features, and design features such as curves and " $T$ " intersections while maintaining pedestrian connectivity.
6. Local streets should typically intersect in " $T$ " configurations rather than 4-way intersections to minimize conflicts and discourage through traffic. Adjacent "T" intersections shall maintain a minimum of 150 ft . between the nearest edges of the 2 rights-of-way.

Response: The proposed subdivision does not include any long straight street segments. All streets have been designed in accordance with the requirements of these sections.
3. Cul-de-sacs should generally not exceed 400 ft . in length nor serve more than 20 dwelling units, except in cases where existing topography, wetlands, or drainage systems or other existing features necessitate a longer cul-de-sac in order to provide adequate access to an area. Cul-de-sacs longer than 400 feet or developments with only one access point may be required to provide an alternative access for emergency vehicle use only, install fire prevention sprinklers, or provide other mitigating measures, determined by the City. Response: No cul-de-sac streets are proposed.
D. Development sites shall be provided with access from a public street improved to City standards in accordance with the following:

1. Where a development site abuts an existing public street not improved to City standards, the abutting street shall be improved to City standards along the full frontage of the property concurrent with development.
Response: All single-family homes will gain direct access from a public street improved to city standards with the exception of Lot 4 which will be accessed across an easement on Lot 3.
2. Half-street improvements are considered the minimum required improvement. Three quarter-street or full-street improvements shall be required where traffic volumes generated by the development are such that a half-street improvement would cause safety and/or capacity problems. Such a determination shall be made by the City Engineer.
Response: All new streets are proposed as full street improvements with the exception of improvements along Highway 26.
3. To ensure improved access to a development site consistent with policies on orderly urbanization and extension of public facilities the Planning Commission or Director may require off-site improvements concurrent with development. Off-site improvement requirements upon the site developer shall be reasonably related to the anticipated impacts of the development.
Response: No off-site improvements have been identified or are warranted with construction of this subdivision.
4. Reimbursement agreements for $3 / 4$ street improvements (i.e., curb face to curb face) may be requested by the developer per Chapter 12 of the SMC.
Response: All streets are proposed as full streets. No 3/4 streets are proposed.
5. A $1 / 2$ street improvement includes curb and pavement 2 feet beyond the center line of the right-of-way. A $3 / 4$ street improvement includes curbs on both sides of the side and full pavement between curb faces.
Response: The applicant intends to complete frontage improvements along the Highway 26 frontage as required. No 1/2 streets are proposed.
E. As necessary to provide for orderly development of adjacent properties, public streets installed concurrent with development of a site shall be extended through the site to the edge of the adjacent property(ies) in accordance with the following:
6. Temporary dead-ends created by this requirement to extend street improvements to the edge of adjacent properties may be installed without turn-arounds, subject to the approval of the Fire Marshal.
7. In order to assure the eventual continuation or completion of the street, reserve strips may be required.
Response: The proposed street layout results in one temporary dead-end street (Street B. "New Street") that will be stubbed to the southern property line of the subject property. The applicant is aware the Fire Marshal will need to review the proposal. In addition, the applicant is aware that reserve strips will likely be required at the end of this street.
F. Where required by the Planning Commission or Director, public street improvements may be required through a development site to provide for the logical extension of an existing street network or to connect a site with a nearby neighborhood activity center, such as a school or park. Where this creates a land division incidental to the development, a land partition shall be completed concurrent with the development. Response: The applicant does not anticipate any public street improvements will be required to be extended beyond the site boundaries. No such improvements were identified at the pre-application conference.
G. Except for extensions of existing streets, no street names shall be used that will duplicate or be confused with names of existing streets. Street names and numbers shall conform to the established pattern in the surrounding area and be subject to approval of the Director.
Response: The proposal contains only three street segments: Dubarko Road, an extension of Fawn Street to intersect with Dubarko Road, and Street B ("New Street") from Dubarko Road to the southern property line of the subject property. The City will need to determine if Street $A$ will be named Fawn Street or a different name.
H. Location, grades, alignment, and widths for all public streets shall be considered in relation to existing and planned streets, topographical conditions, public convenience and safety, and proposed land use. Where topographical conditions present special circumstances, exceptions to these standards may be granted by the City Engineer provided the safety and capacity of the street network is not adversely affected. The following standards shall apply:
8. Location of streets in a development shall not preclude development of adjacent properties. Streets shall conform to planned street extensions identified in the Transportation Plan and/or provide for continuation of the existing street network in the surrounding area.
Response: A future street plan is submitted with this application as part of Sheet C1. This plan shows that the proposal does not preclude development on
adjacent properties. Both Dubarko Road and Street B ("New Street") are identified on the TSP and proposed to be constructed with this development.
9. Grades shall not exceed 6 percent on arterial streets, 10 percent on collector streets, and 15 percent on local streets.
Response: Dubarko, a minor arterial is designed to have a grade of $2 \%$ to $6 \%$, Street B ("New Street") a grade of $2 \%$ to $8.65 \%$, and the extension of Fawn Street, a local street will have a grade of $1 \%$ to $6.6 \%$. All streets comply with the standards in this section.
10. As far as practical, arterial streets and collector streets shall be extended in alignment with existing streets by continuation of the street centerline. When staggered street alignments resulting in " $T$ " intersections are unavoidable, they shall leave a minimum of 150 ft . between the nearest edges of the two rights-ofway.
Response: Dubarko Road, a minor arterial will be extended by a continuation of the centerline of this existing street. Street B ("New Road") is not an extension of an existing street except that it will align with the extension of Fawn Street (Street A).
11. Centerline radii of curves shall not be less than 500 ft . on arterial streets, 300 ft . on collector streets, and 100 ft . on local streets.
Response: Dubarko Road, a minor arterial is designed with a centerline radii of 500 feet and the extension of Fawn Street will have a centerline radii of 100 feet. Both of these streets comply with this standard. Street B ("New Street") is proposed to be designed with a centerline radii less than 300 feet as shown on submitted plans. A reduced centerline radii is proposed due to the assumed 25 mph posted speed and the location of this curve near a stop controlled intersection. A greater centerline radius is not needed given these conditions. A tighter radius will encourage drivers to slow down as they approach this stop controlled intersection and slower approach speeds are more pedestrian friendly. This area of the development is expected to have a large number of pedestrians using these facilities due to proposed future densities on lots 5 and 6 and proximity to the proposed park. The applicant believes a reduction of centerline radii and vehicle speeds for this street is warranted.
12. Streets shall be designed to intersect at angles as near as practicable to right angles and shall comply with the following:
a) The intersection of an arterial or collector street with another arterial or collector street shall have a minimum of 100 ft . of straight (tangent) alignment perpendicular to the intersection.
Response: The proposed tangent length from the projected curb line is proposed to be 61 feet on Street B. The applicant requests approval of this design.
b) The intersection of a local street with another street shall have a minimum of 50 ft . of straight (tangent) alignment perpendicular to the intersection.
c) Where right angle intersections are not possible, exceptions can be granted by the City Engineer provided that intersections not at right angles have a minimum corner radius of 20 ft . along the right-of-way lines of the acute angle.
d) Intersections with arterial streets shall have a minimum curb corner radius of 20 ft . All other intersections shall have a minimum curb corner radius of 10 ft . Response: All proposed streets are designed to insect at right angles with the intersecting street and comply with the requirements of this section.
13. Right-of-way and improvement widths shall be as specified by the Transportation System Plan. Exceptions to those specifications may be approved by the City Engineer to deal with specific unique physical constraints of the site.
Response: The proposed right-of-way width of Dubarko Road is 76 feet, Street $B$ ("New Street") is 60 feet, and the extension of Fawn Street is proposed at 50 feet in compliance this standard.
J. Private streets may be considered within a development site provided all the following conditions are met:
Response: No private streets are proposed.

### 17.84.60 - PUBLIC FACILITY EXTENSIONS

A. All development sites shall be provided with public water, sanitary sewer, broadband (fiber), and storm drainage.
Response: The submitted Utility Plan (Sheet C5) shows the location of proposed public water, sanitary sewer, and stormwater drainage facilities. Broadband fiber service will be detailed with construction plans.
$B$. Where necessary to serve property as specified in "A" above, required public facility installations shall be constructed concurrent with development.
Response: All of the utilities identified above will be constructed concurrent with the development.
C. Off-site public facility extensions necessary to fully serve a development site and adjacent properties shall be constructed concurrent with development.
Response: The applicant will extend all utilities as necessary to serve the development as required by this section.
D. As necessary to provide for orderly development of adjacent properties, public facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies).
Response: As shown on the submitted Sheet C5, Master Street and Utility Plan, all public facilities are proposed to be extended through the site to the edge of adjacent properties.
E. Private on-site sanitary sewer and storm drainage facilities may be considered provided all the following conditions exist:

Response: A private sanitary sewer and stormwater drainage connection is proposed to serve Lot 7. All other utilities will be public.

### 17.84.70 - PUBLIC IMPROVEMENT PROCEDURES

Response: The applicant is aware of and intends to comply with the requirements of this section.

### 17.84.80 - FRANCHISE UTILITY INSTALLATIONS

These standards are intended to supplement, not replace or supersede, requirements contained within individual franchise agreements the City has with providers of electrical power, telephone, cable television, and natural gas services (hereinafter referred to as "franchise utilities").
A. Where a land division is proposed, the developer shall provide franchise utilities to the development site. Each lot created within a subdivision shall have an individual service available or financially guaranteed prior to approval of the final plat.
Response: Franchise utilities will be provided to all lots within the proposed subdivision as required. The location of these utilities will be identified on construction plans and installed or guaranteed prior to final plat approval.
B. Where necessary, in the judgment of the Director, to provide for orderly development of adjacent properties, franchise utilities shall be extended through the site to the edge of adjacent property(ies), whether or not the development involves a land division.
Response: The applicant does not anticipate extending franchise utilities beyond the site.
C. The developer shall have the option of choosing whether or not to provide natural gas or cable television service to the development site, providing all of the following conditions exist:

1. Extension of franchise utilities through the site is not necessary for the future orderly development of adjacent property(ies);
2. The development site remains in one ownership and land division does not occur (with the exception of land divisions that may occur under the provisions of 17.84.50 F above); and
3. The development is non-residential.

Response: The applicant anticipates installing natural gas and will determine if the installation of cable television service is required.
D. Where a land division is not proposed, the site shall have franchise utilities required by this section provided in accordance with the provisions of 17.84 .70 prior to occupancy of structures.
Response: A land division is proposed, as such this section is not applicable. With the future review of the proposed multi-family units, this section will be applicable.
E. All franchise utility distribution facilities installed to serve new development shall be placed underground except as provided below. The following facilities may be installed aboveground:

1. Poles for street lights and traffic signals, pedestals for police and fire system communications and alarms, pad mounted transformers, pedestals, pedestal mounted terminal boxes and meter cabinets, concealed ducts, substations, or facilities used to carry voltage higher than 35,000 volts;
2. Overhead utility distribution lines may be permitted upon approval of the City Engineer when unusual terrain, soil, or other conditions make underground installation
impracticable. Location of such overhead utilities shall follow rear or side lot lines wherever feasible.
Response: All franchise utilities will be installed underground with the exception of street lights as allowed by this section.
F. The developer shall be responsible for making necessary arrangements with franchise utility providers for provision of plans, timing of installation, and payment for services installed. Plans for franchise utility installations shall be submitted concurrent with plan submittal for public improvements to facilitate review by the City Engineer.
Response: The developer will make all necessary arrangements with franchise utility providers as required by this section.
G. The developer shall be responsible for installation of underground conduit for street lighting along all public streets improved in conjunction with the development in accordance with the following:
3. The developer shall coordinate with the City Engineer to determine the location of future street light poles. The street light plan shall be designed to provide illumination meeting standards set by the City Engineer.
4. The developer shall make arrangements with the serving electric utility for trenching prior to installation of underground conduit for street lighting.
Response: The developer will install underground conduit for street lighting in accordance with the requirements of this section.

### 17.84.90 - LAND FOR PUBLIC PURPOSES

A. Easements for public sanitary sewer, water, storm drain, pedestrian and bicycle facilities shall be provided whenever these facilities are located outside a public right-of-way in accordance with the following:

1. When located between adjacent lots, easements shall be provided on one side of a lot line.
2. The minimum easement width for a single utility is 15 ft . The minimum easement width for two adjacent utilities is 20 ft . The easement width shall be centered on the utility to the greatest extent practicable. Wider easements may be required for unusually deep facilities.
Response: A 15-foot public storm easement is proposed along the back of Lots 1-4 and a storm easement and sanitary sewer easement are identified in Tract A. The majority of public facilities will be located within public rights-of-way
including the existing waterline that will be contained within the Dubarko Road right-of-way.
B. Public utility easements with a minimum width of 5 feet shall be provided adjacent to all street rights-of-way for franchise utility installations.
Response: Despite the language in this section, eight foot wide public utility easements will be provided along all lots adjacent to street rights-of-way for future franchise utility installations.
C. Where a development site is traversed by a drainageway or water course, a drainage way dedication shall be provided to the City.
Response: The site is not traversed by a drainage way or water course and this section is not applicable.
D. Where a development is traversed by, or adjacent to, a future trail linkage identified within the Transportation System Plan, dedications of suitable width to accommodate the trail linkage shall be provided. This width shall be determined by the City Engineer, considering the type of trail facility involved.
Response: No future trail is identified in the TSP on subject property and none are proposed.
E. Where existing rights-of-way and/or easements within or adjacent to development sites are nonexistent or of insufficient width, dedications may be required. The need for and widths of those dedications shall be determined by the City Engineer.
Response: The only existing right-of-way adjacent to the development is Highway 26. No additional right-of-way dedication along this street has been identified.
F. Where easement or dedications are required in conjunction with land divisions, they shall be recorded on the plat. Where a development does not include a land division, easements and/or dedications shall be recorded on standard document forms provided by the City Engineer.
Response: All easements and dedications will be identified on the plat as required.

### 17.84.100-MAIL DELIVERY FACILITIES

Response: The location and type of mail delivery facilities will be coordinated with the City Engineer and the Post Office as part of the construction plan process.

## CHAPTER 17.86 - PARKLAND and OPEN SPACE

### 17.86.00-INTENT

The availability of parkland and open space is a critical element in maintaining and improving the quality of life in Sandy. Land that features trees, grass and vegetation provides not only an aesthetically pleasing landscape but also buffers incompatible uses, and preserves sensitive environmental features and important resources. Parks and open space, together with support facilities, also help to meet the active and passive recreational needs of the population of Sandy. This chapter implements policies of Goal 8 of the Comprehensive Plan and the Parks Master Plan by outlining provisions for parks and open space in the City of Sandy.

Response: The city's Parks Master Plan and Comprehensive Plan map shows a conceptual neighborhood park located on the subject property although it is not clear if this conceptual requirement has already satisfied with the parkland dedicated as part of the Deer Pointe 2 Subdivision in 2007. As noted above, the current Parks and Trails Master Plan update available on the city's website does not show a park on the subject property. A representative of the Parks Boards stated this is an error. Regardless, the applicant proposes dedicating parkland with this application.

### 17.86.10-MINIMUM PARKLAND DEDICATION REQUIREMENTS

Parkland Dedication: New residential subdivisions, planned developments, multi-family or manufactured home park developments shall be required to provide parkland to serve existing and future residents of those developments.
Response: The proposed residential subdivision is subject to the provisions of this chapter.

1. The required parkland shall be dedicated as a condition of approval for the following:
a. Tentative plat for a subdivision or partition;
b. Planned Development conceptual or detailed development plan;
c. Design review for a multi-family development or manufactured home park; and
d. Replat or amendment of any site plan for multi-family development or manufactured home park where dedication has not previously been made or where the density of the development involved will be increased.
Response: A subdivision to contain single family detached and multi-family dwellings is proposed. The applicant proposes dedicating 1.43 acres of parkland with this application.
2. Calculation of Required Dedication: The required parkland acreage to be dedicated is based on a calculation of the following formula rounded to the nearest $1 / 100(0.00)$ of an acre:

Required parkland dedication (acres) $=($ proposed units) $\times($ persons $/ u n i t) \times 0.0043$ (per person park land dedication factor)
Response: The proposed seven-lot subdivision includes four lots for single-family dwellings and the two lots for multi-family dwellings. One lot is proposed for to be zoned C-3. These lots are currently proposed to contain a maximum of 163 units. As such, the proposal results in the following formulas: 1) single-family lots: 4 (proposed single-family residential units) x 3 (persons/unit) x 0.0043 (per person park land dedication factor) $=0.0516$ acres rounded to 0.05 acres, and 2) 2 multi-family lots to contain up to 158 units: 158 (proposed multi-family units) x 2 (persons/unit) x 0.0043 (per person park land dedication factor) $=1.358$ acres rounded to 1.36 acres. The combined total required parkland dedication is 1.41 acres $(0.05+1.36)$. As shown on submitted plans, the applicant proposes dedicating 1.43 acres of parkland exceeding the minimum parkland dedication required by this section by 0.02 acres.

### 17.86.20 MINIMUM PARKLAND STANDARDS

Land required or proposed for parkland dedication shall be contained within a continuous unit and must be suitable for active use as a neighborhood or mini-park, based on the following criteria:

1. Homes must front on the parkland as shown in the example below:


Response: The diagram in this section shows the preferred relationship of parkland to single family residential dwellings with homes fronting the park. The proposed parkland dedication with this application expands parkland dedicated previously dedicated with the Deer Pointe 2 Subdivision. With this configuration the entire park after dedication with the current application will be bordered on its western border by Meadow Avenue with homes across the street, on the South by an extension of Fawn Street, on the North by Highway 26, and the East by Lot 7 proposed to be zoned C-3, Village Commercial. The details of the development of Lot 7 is not known at this time and will be determined following a pre-application conference and submittal of a design review application at a later date. In order to address the spirit of the requirement in this section, the applicant proposes constructing a widened sidewalk along the eastern park frontage adjacent to Lot 7.
2. The required dedication shall be contained as a contiguous unit and not separated into pieces or divided by roadways.
Response: The proposed 1.43 acre parkland dedication will be contiguous to 1.4 acres of parkland previously dedicated as part of the Deer Point 2 Subdivision.
3. The parkland must be able to accommodate play structures, play fields, picnic areas, or other active park use facilities. The average slope of the active use parkland shall not exceed 15\%.
Response: The majority of the proposed parkland contains slopes less than 15 percent as required. As shown on submitted plans, a small area of the proposed park currently exists exceeding this grade and could either be regraded or left in a natural condition in order to provide visual interest or an additional amenity. The subject property is able to accommodate a variety of amenities including those listed in this section. The city's Master Plan for this park will determine appropriate amenities for this park.
4. Any retaining wall constructed at the perimeter of the park adjacent to a public right-of-way or private street shall not exceed 4 feet in height.
Response: No retaining walls are proposed.
5. Once dedicated, the City will assume maintenance responsibility for the neighborhood or mini parkland.
Response: The applicant understands the City will assume maintenance responsibility once the land is dedicated.

### 17.86.30 DEDICATION PROCEDURES

Prior to approval of the final plat, the developer shall dedicate the land as previously determined by the City in conjunction with approval of the tentative plat. Dedication of land in conjunction with multi-family development shall be required prior to issuance of permits and commencement of construction.
A. Prior to acceptance of required parkland dedications, the applicant/developer shall complete the following items for all proposed dedication areas:

1. The developer shall clear, fill, and/or grade all land to the satisfaction of the City, install sidewalks on the park land adjacent to any street, and seed the park land; and,
Response: The applicant understands he will be required to clear, grade, and seed the proposed parkland as desired by the City. In addition, the applicant is interested in partnering with the city to construct park improvements in exchange for Park SDC credits.
2. The developer shall submit a Phase I Environmental Site Assessment completed by a qualified professional according to American Society of Testing and Materials (ASTM) standards (ASTM E 1527). The results of this study shall indicate a clean environmental record.
Response: The applicant understands submittal of a Phase I Environmental Assessment will be required prior to the City accepting the park dedication.

## B. Additional Requirements

1. In addition to a formal dedication on the plat to be recorded, the subdivider shall convey the required lands to the city by general warranty deed. The developer of a multi-family development or manufactured home park shall deed the lands required to be dedicated by a general warranty deed. In any of the above situations, the land so dedicated and deeded shall not be subject to any reservations of record, encumbrances of any kind or easements which, in the opinion of the Director, will interfere with the use of the land for park, open space or recreational purposes.

The subdivider or developer shall be required to present to the City a title insurance policy on the subject property ensuring the marketable state of the title.
Response: The applicant understands this requirement.
2. Where any reservations, encumbrances or easements exist, the City may require payment in lieu of the dedication of lands unless it chooses to accept the land subject to encumbrances.
Response: The applicant proposes including two utility easements within the proposed parkland dedication. These easements are unavoidable given the location of existing utilities.

### 17.86.40 - CASH IN LIEU OF DEDICATION

At the city's discretion only, the city may accept payment of a fee in lieu of land dedication. The city may require payment in lieu of land when the park land to be
dedicated is less than 3 acres. A payment in lieu of land dedication is separate from Park Systems Development Charges, and is not eligible for a credit of Park Systems Development Charges. The amount of the fee in lieu of land dedication (in dollars per acre) shall be set by City Council Resolution, and it shall be based on the typical market value of developed property (finished lots) in Sandy net of related development costs.
Response: City staff indicated at the pre-application conference parkland dedication would be required and this was also articulated by the Parks and Trails Advisory Board at a meeting on June 10, 2020. As noted above, the current draft Parks and Trails Plan update does not show a proposed park in this location. Despite this problem, the applicant proposes dedicating 1.43 acres of parkland with this application exceeding the required dedication calculated in Section 17.86.10(2) above by 0.02 acres.

## CHAPTER 17.92 - LANDSCAPING AND SCREENING GENERAL STANDARDS - ALL ZONES

Response: This chapter has limited applicability to subdivisions so only those applicable sections are reviewed in this submittal.

### 17.92.10-GENERAL PROVISIONS

A. Where landscaping is required by this Code, detailed planting plans shall be submitted for review with development applications. No development may commence until the Director or Planning Commission has determined the plans comply with the purposes clause and specific standards in this chapter. All required landscaping and related improvements shall be completed or financially guaranteed prior to the issuance of a Certificate of Occupancy.
B. Appropriate care and maintenance of landscaping onsite and landscaping in the adjacent public right-of-way is the right and responsibility of the property owner, unless City ordinances specify otherwise for general public and safety reasons. If street trees or other plant materials do not survive or are removed, materials shall be replaced in kind within 6 months.
C. Significant plant and tree specimens should be preserved to the greatest extent practicable and integrated into the design of a development. Trees of 25 -inches or greater circumference measured at a height of $4-1 / 2 \mathrm{ft}$. above grade are considered significant. Plants to be saved and methods of protection shall be indicated on the detailed planting plan submitted for approval. Existing trees may be considered preserved if no cutting, filling, or compaction of the soil takes place between the trunk of the tree and the area $5-\mathrm{ft}$. outside the tree's drip line. Trees to be retained shall be protected from damage during construction by a construction fence located 5 ft . outside the dripline.
Response: The requirements of this section do not apply to residential subdivisions per the Planning Commission's Code Interpretation as part of the Jacoby Heights Subdivision (File No. 18-025 SUB/VAR/FSH/TREE/INT). Tree retention requirements are contained in Chapter 17.102, Urban Forestry and are reviewed below. The proposed tree plan proposes to retain more than the minimum required by this chapter.

### 17.92.20 - MINIMUM IMPROVEMENTS - LANDSCAPING AND SCREENING

Response: The Single Family Residential zone is not listed in this section requiring minimum landscaping. The details of this section will be considered with submittal of a
design review application for the proposed multi-family units to be zoned R-3, High Density Residential.

## CHAPTER 17.98 - PARKING, LOADING, AND ACCESS REQUIREMENTS 17.98.10-GENERAL PROVISIONS

M. Residential Parking Analysis Plan. A Residential Parking Analysis Plan shall be required for all new residential planned developments, subdivisions, and partitions to include a site plan depicting all of the following:
a. Location and dimension of required parking spaces as specified in Section 17.98.200.
b. Location of areas where parking is not permitted as specified in Sections 17.98.200(A)(3) and (5).
c. Location and design of parking courts (if applicable).

Response: A Residential Parking Analysis Plan identifying the location of parking for the four $R-1$ lots as required by this section is included on sheet $C 7$ of the plan set. The details of this analysis is discussed in Section 17.98.200 below.

### 17.98.20-OFF-STREET PARKING REQUIREMENTS

A. Off Street Parking Requirements. Off street parking shall conform to the following standards:

1. All square footage measurements are gross square feet of total floor area.
2. 18 lineal inches of bench shall be considered 1 seat.
3. Except as otherwise specified, parking for employees shall be provided based on 1 space per 2 employees for the largest shift in addition to required parking specified in Sections A6-A9 below.
4. Where less than 5 parking spaces are required, then only one bicycle space shall be required except as otherwise modified in Sections 5-9 below.
5. In addition to requirements for residential off street parking, new dwellings shall meet the on-street parking requirements in Section 17.98.200.
Response: Each single-family dwelling is required to provide at least two offstreet parking spaces. All lots are designed to ensure compliance with this standard and will be evaluated during building plan review. Parking for the proposed multi-family units will be evaluated as part of a future design review application.

### 17.98.60 - DESIGN, SIZE AND ACCESS

All off-street parking facilities, vehicular maneuvering areas, driveways, loading facilities, accessways, and private streets shall conform to the standards set forth in this section.
Response: The details of this section will be evaluated with submittal of the design review application for the multi-family units.

### 17.98.80 - ACCESS TO ARTERIAL AND COLLECTOR STREETS

Response: No lots are proposed to gain access from an arterial or collector street.

### 17.98.90 - ACCESS TO UNIMPROVED STREETS

Response: All streets proposed in the subdivision will be improved to city standards.

### 17.98.100-DRIVEWAYS

A. A driveway to an off-street parking area shall be improved from the public roadway to the parking area a minimum width of 20 feet for a two-way drive or 12 feet for a oneway drive but in either case not less than the full width of the standard approach for the first 20 feet of the driveway.
Response: Lots 5 and 6 to contain multi-family units will be provided with a 26 foot wide curb cut and driveway approach.
B. A driveway for a single-family dwelling shall have a minimum width of 10 feet. Response: All single family lots will have a 12 -foot wide curb cut and driveway approach. This reduction from the typical standard width is proposed to accommodate additional on-street parking.
C. A driveway for a two-family dwelling shall have a minimum width of 20 feet. A driveway approach must be constructed in accordance with applicable city standards and the entire driveway must be paved with asphalt or concrete.
Response: None of the lots will be developed with two-family dwellings and this section is not applicable.
D. Driveways, aisles, turnaround areas and ramps shall have a minimum vertical clearance of twelve feet for their entire length and width but such clearance may be reduced in parking structures.
Response: All driveways will be designed in compliance with this standard.
E. No driveway shall traverse a slope in excess of 15 percent at any point along the driveway length.
Response: All driveways will be designed in compliance with this standard.
F. The location and design of the driveway shall provide for unobstructed sight per the vision clearance requirements. Requests for exceptions to these requirements will be evaluated by the City Engineer considering the physical limitations of the lot and safety impacts to vehicular, bicycle, and pedestrian traffic.
Response: All driveways will be designed in compliance with this standard.

### 17.98.110 - VISION CLEARANCE

A. Except within the Central Business District, vision clearance areas shall be provided at intersections of all streets and at intersections of driveways and alleys with streets to promote pedestrian, bicycle, and vehicular safety. The extent of vision clearance to be provided shall be determined from standards in Chapter 17.74 and taking into account functional classification of the streets involved, type of traffic control present at the intersection, and designated speed for the streets.
Response: The subject property will contain $R-1, R-3$, and $C-3$ zoning requiring compliance with this section. The requirements of this section will be considered in placing landscaping in these areas with construction of homes and will be evaluated with a future design review application for the multi-family units and development on Lot 7.
B. Traffic control devices, streetlights, and utility installations meeting approval by the City Engineer are permitted within vision clearance areas.
Response: The exceptions contained in this section will be considered in the design and placement of these structures.

### 17.98.200 - RESIDENTIAL ON-STREET PARKING REQUIREMENTS

A. Residential On-Street Parking Requirements. Residential on-street parking shall conform to the following standards:

1. In addition to required off-street parking, all new residential planned developments, subdivisions and partitions shall provide one (1) on-street parking space within 200 feet of each dwelling except as provided in Section 17.98.200(A) (6) below.
2. The location of residential on-street parking shall be reviewed for compliance with this section through submittal of a Residential Parking Analysis Plan as required in Section 17.98.10(M).
3. Residential on-street parking shall not obstruct required clear vision areas and shall not violate any local or state laws.
4. Parallel residential on-street parking spaces shall be 22 feet minimum in length.
5. Residential on-street parking shall be measured along the curb from the outside edge of a driveway wing or curb cut. Parking spaces must be set back a minimum of 15 feet from an intersection and may not be located within 10 feet of a fire hydrant.
Response: This section is only applicable to the portion of the property zoned R-1. A Residential On-Street Parking Analysis designed in compliance with the requirements of this section is included on Sheet C7 of the application package. One on-street parking space at least 22 feet in length has been identified within 200 feet of each of the 4 lots as required. This sheet shows that 20 on-street parking spaces in compliance with this standard have been identified.
6. Portions of residential on-street parking required by this section may be provided in parking courts that are interspersed throughout a development when the following standards are met:
Response: No parking courts are proposed.

## CHAPTER 17.100-LAND DIVISION

17.100.20 - LAND DIVISION CLASSIFICATION - TYPE I, II OR III PROCEDURES
C. Type II Land Division (Major Partition or Subdivision). A major partition or subdivision shall be a Type II procedure when a street is extended, satisfactory street conditions exist and the resulting parcels/lots comply with the standards of the zoning district and this chapter. Satisfactory street conditions exist when the Director determines one of the following:

1. Existing streets are stubbed to the property boundaries and are linked by the land division.
2. An existing street or a new proposed street need not continue beyond the land division in order to complete an appropriate street system or to provide access to adjacent property.
3. The proposed street layout is consistent with a street pattern adopted as part of the Comprehensive Plan or an officially adopted City street plan.
Response: The proposed subdivision preliminary plat complies with all applicable code requirements to be processed as a Type II application. However, because the application also includes Type IV applications for a Specific Area Plan, Comprehensive Plan Map Amendment, and Zoning Map amendment, the entire application will be processed under the Type IV quasi-judicial procedure.

### 17.100.60 - SUBDIVISIONS

Approval of a subdivision is required for a land division of 4 or more parcels in a calendar year. A two-step procedure is required for subdivision approval: (1) tentative plat review and approval; and (2) final plat review and approval.
Response: As defined by this section the seven-lot land division is considered a subdivision.
A. Preapplication Conference. The applicant for a subdivision shall participate in a preapplication conference with city staff to discuss procedures for approval, applicable state and local requirements, objectives and policies of the Sandy Comprehensive Plan, and the availability of services.
Response: Pre-application conferences were held with the City on January 10, 2018, June 12, 2018, and October 10, 2018.
B. Application Requirements for a Tentative Plat. Subdivision applications shall be made on forms provided by the planning department and shall be accompanied by:
Response: All of the items required by this section are included with the submittal.
E. Approval Criteria. The Director or Planning Commission shall review the tentative plat for the subdivision based on the classification procedure (Type II or III) set forth in Section 17.12 and the following approval criteria:

1. The proposed subdivision is consistent with the density, setback and dimensional standards of the base zoning district, unless modified by a Planned Development approval.
Response: As reviewed in the narrative above, the proposed subdivision is designed to be consistent with density, setback, and dimensional standards in the $R-1, R-3$, and $C-3$ zoning districts. The details of the development on Lots 5-7 will be addressed with future design review applications.
2. The proposed subdivision is consistent with the design standards set forth in this chapter.
Response: As detailed in this narrative, the proposal complies with the design standards of this chapter.
3. The proposed street pattern is connected and consistent with the Comprehensive Plan or official street plan for the City of Sandy.
Response: As illustrated on the submitted Future Street Plan (Sheet C1), the proposed street system is consistent with the City's Transportation System Plan and Comprehensive Plan.
4. Adequate public facilities are available or can be provided to serve the proposed subdivision.
Response: The City has indicated that all public facilities have capacity to serve the proposed subdivision.
5. All proposed improvements meet City standards.

Response: As reviewed in this narrative, all improvements in the proposed development are designed in compliance with City standards.
6. The phasing plan, if requested, can be carried out in a manner that meets the objectives of the above criteria and provides necessary public improvements for each phase as it develops.
Response: The applicant proposes developing the subdivision in a single phase. The applicant intends submitting a design review application for development proposed on Lots 5-7 at a later date.

### 17.100.80 - CHARACTER OF THE LAND

Land which the Director or the Planning Commission finds to be unsuitable for development due to flooding, improper drainage, steep slopes, rock formations, adverse earth formations or topography, utility easements, or other features which will reasonably be harmful to the safety, health, and general welfare of the present or future inhabitants of the partition or subdivision and the surrounding areas, shall not be developed unless adequate methods are formulated by the subdivider and approved by the Director or the Planning Commission to solve the problems created by the unsuitable land conditions.
Response: As reviewed in this narrative, the subject property is suitable for development as proposed. The site does not contain any physical constraints or utility concerns that would make it unsuitable for the proposed subdivision. The proposal is expected to result in a slight increase in traffic generated by the development and does not warrant any mitigation.

### 17.100.90 - ACCESS CONTROL GUIDELINES AND COORDINATION

A. Notice and coordination with ODOT required. The city will coordinate and notify ODOT regarding all proposals for new or modified public and private accesses on to Highways 26 and 211.
Response: The subject property abuts Highway 26 and notification of the proposal will be sent to ODOT. The applicant's traffic consultant coordinated with ODOT and the City's traffic consultant prior to the preparation of the traffic impact study (Exhibit E) submitted with this application. The proposal does not include direct access to Highway 26 with the exception of the Dubarko Road intersection, a planned public road.

### 17.100.100-STREETS GENERALLY

A. Transportation Impact Studies. Transportation impact studies may be required by the city engineer to assist the city to evaluate the impact of development proposals, determine reasonable and prudent transportation facility improvements and justify
modifications to the design standards. Such studies will be prepared in accordance with the following:

1. A proposal established with the scope of the transportation impact study shall be coordinated with, and agreed to, by the city engineer. The study requirements shall reflect the magnitude of the project in accordance with accepted transportation planning and engineering practices. A professional civil or traffic engineer registered in the State of Oregon shall prepare such studies.
2. If the study identifies level-of-service conditions less than the minimum standards established in the Sandy Transportation System Plan, improvements and funding strategies mitigating the problem shall be considered as part of the land use decision for the proposal.
Response: A traffic impact study prepared in compliance with city standards is included with the application package (Exhibit E). With the exception of a revised striping plan and frontage improvements on the Highway 26 frontage, this study does not identify any issues requiring mitigation by the applicant.
B. Topography and Arrangement. All streets shall be properly related to special traffic generators such as industries, business districts, schools, and shopping centers and to the pattern of existing and proposed land uses.
Response: None of the special traffic generators listed in this section are located near the subject property. All existing and proposed residential uses have been considered in development of the proposed street pattern. A future street plan is submitted with this application (Sheet C1) showing how streets can be extended beyond the subject property in the future.
C. Street Spacing. Street layout shall generally use a rectangular grid pattern with modifications as appropriate to adapt to topography or natural conditions.
Response: The proposed street layout is predominately controlled by the alignment of Dubarko Road that will be extended through the site from the current terminus to connect with Highway 26 and the location of Street B ("New Street"). Both of these streets are identified in the city's Transportation System Plan as future streets. The only other street in the subdivision is the extension of Fawn Street (Street " $A$ ") on the property. The proposed street layout represents a logical street pattern.
D. Future Street Plan. Future street plans are conceptual plans, street extensions and connections on acreage adjacent to land divisions. They assure access for future development and promote a logical, connected pattern of streets. It is in the interest of the city to promote a logical, connected pattern of streets. All applications for land divisions shall provide a future street plan that shows the pattern of existing and proposed future streets within the boundaries of the proposed land divisions, proposed connections to abutting properties, and extension of streets to adjacent parcels within a 400 foot radius of the study area where development may practically occur.
Response: A future street plan in compliance with the requirements of this section is included as part of the application package (Sheet C1). This plan assures that access for future development will promote a logical and connected pattern of streets.
E. Connections. Except as permitted under Exemptions, all streets, alleys and pedestrian walkways shall connect to other streets within the development and to existing and planned streets outside the development and to undeveloped properties which have no future street plan. Streets shall terminate at other streets or at parks, schools or other public land within a neighborhood.

Where practicable, local roads shall align and connect with other roads when crossing collectors and arterials.

Proposed streets or street extensions shall be located to provide direct access to existing or planned transit stops, and existing or planned neighborhood activity centers, such as schools, shopping areas and parks.
Response: The proposal includes a limited number of streets because of the alignment of Dubarko Road, Street B ("New Street"), and the location of Fawn Street extended into the property. Because the proposed subdivision includes two large lot multi-family development sites proposed on Lots 5 and 6 and future Village Commercial development on Lot 7, the street network is further limited. Given these facts, the proposed street layout represents a logical design.

### 17.100.120 - BLOCKS AND ACCESSWAYS

A. Blocks. Blocks shall have sufficient width to provide for two tiers of lots at appropriate depths. However, exceptions to the block width shall be allowed for blocks that are adjacent to arterial streets or natural features.
Response: All blocks within the proposed subdivision have sufficient width to provide for two tiers of lots.
B. Residential Blocks. Blocks fronting local streets shall not exceed 400 feet in length, unless topographic, natural resource, or other similar physical conditions justify longer blocks. Blocks may exceed 400 feet if approved as part of a Planned Development, Specific Area Plan, adjustment or variance.
Response: No blocks exceed 400 feet in length.
D. Pedestrian and Bicycle Access Way Requirements. In any block in a residential or commercial district over 600 feet in length, a pedestrian and bicycle accessway with a minimum improved surface of 10 feet within a 15 -foot right-of-way or tract shall be provided through the middle of the block. To enhance public convenience and mobility, such accessways may be required to connect to cul-de-sacs, or between streets and other public or semipublic lands or through greenway systems.
Response: None of the blocks within the proposed subdivision exceed 600 feet in length.

### 17.100.130 - EASEMENTS

A minimum eight (8) foot public utility easement shall be required along property lines abutting a right-of-way for all lots within a partition or subdivision. Where a partition or subdivision is traversed by a watercourse, drainage way, channel or stream, the land division shall provide a stormwater easement or drainage right-of-way conforming
substantially with the lines of such watercourse, and such further width as determined needed for water quality and quantity protection.
Response: The preliminary plat includes eight foot wide public utility easements along all property lines abutting a public right-of-way. Because access is limited along Dubarko Drive, a shared private drive and access easement is also proposed across Lot 3 to provide access to Lot 4. In addition, a 10 -foot PUE/Sidewalk easement is proposed along the Highway 26 frontage of Lot 7 and the majority of the frontage of Tract A. A Conservation Easement is proposed to be platted across the northern portion of Lot 7 to protect retained trees in this area. Finally, a public storm easement is proposed along the back of Lots 1, 2, and 4 and public and private utility easements are proposed across Tract A.

### 17.100.140 - PUBLIC ALLEYS

Response: No alleys are proposed with this development.

### 17.100.150 RESIDENTIAL SHARED PRIVATE DRIVES

Response: No residential shared private drives as defined by this section are proposed. The proposal does include an access easement is proposed to provide access to both Lots 3 and 4. This drive serves only two lots as allowed and will be designed in accordance with this section. A shared maintenance agreement will be recorded with the plat to ensure maintenance for this facility into the future.

### 17.100.160 PUBLIC ACCESS LANES

Response: No public access lanes are proposed in this development

### 17.100.170 - FLAG LOTS

Flag lots can be created where it can be shown that no other street access is possible to achieve the requested land division. The flag lot shall have a minimum street frontage of 15 feet for its accessway. The following dimensional requirements shall apply to flag lots: A. Setbacks applicable to the underlying zoning district shall apply to the flag lot. B. The access strip (pole) may not be counted toward the lot size requirements. Response: No flag lots are proposed.

### 17.100.180-INTERSECTIONS

A. Intersections. Streets shall be laid out so as to intersect as nearly as possible at right angles. A proposed intersection of two new streets at an angle of less than 75 degrees shall not be acceptable. No more than two streets shall intersect at any one point unless specifically approved by the City Engineer. The city engineer may require left turn lanes, signals, special crosswalks, curb extensions and other intersection elements justified by a traffic study or necessary to comply with the Development Code.
Response: Both the extension of Fawn Street (Street A) and Street B ("New Street") are designed to intersect at right angles to the Dubarko Road as required. In addition, Dubarko Road will intersect Highway 26 at a right angle.
B. Curve Radius. All local and neighborhood collector streets shall have a minimum curve radius (at intersections of rights-of-way) of 20 feet, unless otherwise approved by the

City Engineer. When a local or neighborhood collector enters on to a collector or arterial street, the curve radius shall be a minimum of 30 feet, unless otherwise approved by the City Engineer.
Response: All streets in the proposed subdivision have a minimum curve radius as required by this section.

### 17.100.190 - STREET SIGNS

The subdivider shall pay the cost of street signs prior to the issuance of a Certificate of Substantial Completion. The City shall install all street signs and upon completion will bill the developer for costs associated with installation. In addition, the subdivider may be required to pay for any traffic safety devices related to the development. The City Engineer shall specify the type and location of the street signs and/or traffic safety devices.
Response: The applicant understands it is his responsibility to pay the cost of street signs and the city will install these signs.

### 17.100.200 - STREET SURFACING

Public streets, including alleys, within the development shall be improved in accordance with the requirements of the City or the standards of the Oregon State Highway Department. An overlay of asphalt concrete, or material approved by the City Engineer, shall be placed on all streets within the development. Where required, speed humps shall be constructed in conformance with the City's standards and specifications.
Response: All streets in the proposed subdivision will be improved in accordance with City standards.

### 17.100.210 - STREET LIGHTING

A complete lighting system (including, but not limited to: conduits, wiring, bases, poles, arms, and fixtures) shall be the financial responsibility of the subdivider on all cul-desacs, local streets, and neighborhood collector streets. The subdivider will be responsible for providing the arterial street lighting system in those cases where the subdivider is required to improve an arterial street. Standards and specifications for street lighting shall be coordinated with the utility and any lighting district, as appropriate.
Response: The applicant is aware of the requirements of this section. A lighting plan will be coordinated with PGE and the city as part of the construction plan process and prior to installation of any fixtures.

### 17.100.220-LOT DESIGN

A. The lot arrangement shall be such that there will be no foreseeable difficulties, for reason of topography or other conditions, in securing building permits to build on all lots in compliance with the Development Code.
Response: All lots in the proposed subdivision have been designed so that no foreseeable difficulties due to topography or other conditions will exist in securing building permits on these lots. A Geotechnical Evaluation is included with the application package (Exhibit I) .
B. The lot dimensions shall comply with the minimum standards of the Development Code. When lots are more than double the minimum lot size required for the zoning
district, the subdivider may be required to arrange such lots to allow further subdivision and the opening of future streets to serve such potential lots.
Response: All lots in the R-1 zone comply with the minimum standards in that zone and no lots are proposed to contain more than double the minimum lot size. The $R-3$ zoning district does not contain a minimum or maximum lot size standard.
C. The lot or parcel width at the front building line shall meet the requirements of the Development Code and shall abut a public street other than an alley for a width of at least 20 feet. A street frontage of not less than 15 feet is acceptable in the case of a flag lot division resulting from the division of an unusually deep land parcel which is of a size to warrant division into not more than two parcels.
Response: All lots in the proposed subdivision contain at least 20 feet of frontage along a public street. As noted above, no flag lots are proposed.
D. Double frontage lots shall be avoided except where necessary to provide separation of residential developments from arterial streets or to overcome specific disadvantages of topography or orientation.
Response: Lots 6 and 7 both contain frontage on Highway 26 and Dubarko Road. In addition, Lot 7 also contains frontage on Street A (Fawn Street). Because no direct access to Highway 26 is allowed the creation of a double frontage lot is unavoidable.
E. Lots shall avoid deriving access from major or minor arterials. When driveway access from major or minor arterials may be necessary for several adjoining lots, the Director or the Planning Commission may require that such lots be served by a common access drive in order to limit possible traffic hazards on such streets. Where possible, driveways should be designed and arranged to avoid requiring vehicles to back into traffic on minor or major arterials.
Response: Lots 6 and 7 are proposed to be provided full access to Dubarko Road, a minor arterial. Lot 6 will also have access on Street B ("New Street"), a collector street but because of the size of lot and the number of units proposed for this lot, the applicant is proposing two access points. Lot 7 will have access on Street A, a local street. Because Lot 7 will be zoned C-3, Village Commercial, the applicant prefers that access on Dubarko Road be a full access.

### 17.100.230 - WATER FACILITIES

Water lines and fire hydrants serving the subdivision or partition, and connecting the development to City mains, shall be installed to provide adequate water pressure to serve present and future consumer demand. The materials, sizes, and locations of water mains, valves, service laterals, meter boxes and other required appurtenances shall be in accordance with the standards of the Fire District, the City, and the State.

If the city requires the subdivider to install water lines in excess of eight inches, the city may participate in the oversizing costs. Any oversizing agreements shall be approved by the city manager based upon council policy and dependent on budget constraints. If required water mains will directly serve property outside the subdivision, the city may enter into an agreement with the subdivider setting forth methods for reimbursement for the proportionate share of the cost.

Response: The applicant intends installing all water lines and fire hydrants in compliance with applicable standards.
17.100.240 - SANITARY SEWERS Sanitary sewers shall be installed to serve the subdivision and to connect the subdivision to existing mains. Design of sanitary sewers shall take into account the capacity and grade to allow for desirable extension beyond the subdivision.

If required sewer facilities will directly serve property outside the subdivision, the city may enter into an agreement with the subdivider setting forth methods for reimbursement by nonparticipating landowners for the proportionate share of the cost of construction.
Response: The applicant intends installing sanitary sewer lines in compliance with applicable standards. All lots except Lot 7 are designed to gravity drain to the sanitary sewer line in Dubarko Road. Because Lot 7 is lower in elevation that this line it will be served by connecting to the existing sanitary sewer line at the North end of Tract $A$.

### 17.100.250 - SURFACE DRAINAGE AND STORM SEWER SYSTEM

A. Drainage facilities shall be provided within the subdivision and to connect with offsite drainage ways or storm sewers. Capacity, grade and materials shall be by a design approved by the city engineer. Design of drainage within the subdivision shall take into account the location, capacity and grade necessary to maintain unrestricted flow from areas draining through the subdivision and to allow extension of the system to serve such areas.
Response: A public stormwater water quality and detention facility is proposed as Tract B to be located north of Lot 1 and south of the Fawn Street extension. This facility has been sized and located to accommodate the water quality and stormwater detention needs of all streets in addition those of Lots 1-4. The water quality and detention needs of Lots 5-7 will be accommodated on each of these lots. Stormwater from Lots 5 and 6 will also be routed to flow through the facility in Tract B. After onsite detention and water quality treatment, stormwater from Lot 7 will be piped and connected to the existing storm line in Tract A. A stormwater report is included with this application as Exhibit C.
B. In addition to normal drainage design and construction, provisions shall be taken to handle any drainage from preexisting subsurface drain tile. It shall be the design engineer's duty to investigate the location of drain tile and its relation to public improvements and building construction.
Response: No subsurface drain tiles are known to exist on the site.
C. The roof and site drainage from each lot shall be discharged to either curb face outlets (if minor quantity), to a public storm drain or to a natural acceptable drainage way if adjacent to the lot.
Response: All roof and site drainage will be discharged to curb face outlets or another approved system as required.

### 17.100.260 - UNDERGROUND UTILITIES

All subdivisions or major partitions shall be required to install underground utilities (including, but not limited to, electrical and telephone wiring). The utilities shall be installed pursuant to the requirements of the utility company.
Response: The applicant intends installing all utilities underground as required.

### 17.100.270-SIDEWALKS

Sidewalks shall be installed on both sides of a public street and in any special pedestrian way within the subdivision.
Response: Sidewalks will be installed on both sides of all streets with the exception of Highway 26 which will only be improved on the frontage adjacent to the subject property.

### 17.100.280 - BICYCLE ROUTES

If appropriate to the extension of a system of bicycle routes, existing or planned, the Director or the Planning Commission may require the installation of bicycle lanes within streets. Separate bicycle access ways may be required to reduce walking or cycling distance when no feasible street connection is available.
Response: No existing, planned, or proposed bicycle routes are proposed with the exception of stripped bike lanes on Dubarko Road. A cross-section showing this improvement is included on Sheet C6.

### 17.100.290 - STREET TREES

Where planting strips are provided in the public right-of-way, a master street tree plan shall be submitted and approved by the Director. The street tree plan shall provide street trees approximately every 30' on center for all lots.
Response: Planter strips will be provided along all frontages as required. Street trees in accordance with City standards will be provided in these areas. A Street Tree Plan is included with the submittal package as Sheet C7.

### 17.100.300-EROSION CONTROL

Grass seed planting shall take place prior to September 30th on all lots upon which a dwelling has not been started but the ground cover has been disturbed. The seeds shall be of an annual rye grass variety and shall be sown at not less than four pounds to each 1000 square feet of land area.
Response: Grass seeding will be completed as required by this section. The submitted preliminary Grading and Erosion Control plan (Sheet C9) provides additional details to address erosion control concerns. A separate Grading and Erosion Control Permit will be required prior to any site grading.

### 17.100.310-REQUIRED IMPROVEMENTS

The following improvements shall be installed at no expense to the city, consistent with the design standards of Chapter 17.84, except as otherwise provided in relation to oversizing.
A. Drainage facilities
B. Lot, street and perimeter monumentation
C. Mailbox delivery units
D. Sanitary sewers
E. Sidewalks
F. Street lights
G. Street name signs
H. Street trees
I. Streets
J. Traffic signs
K. Underground communication lines, including broadband (fiber), telephone, and cable. Franchise agreements will dictate whether telephone and cable lines are required.
L. Underground power lines
M. Water distribution lines and fire hydrants

Response: All of the improvements specified in this section are required to be installed by the developer at no expense to the City of Sandy consistent with the design standards of Chapter 17.84 and applicable standards.

## CHAPTER 17.102-URBAN FORESTRY

### 17.102.20-APPLICABILITY

This chapter applies only to properties within the Sandy Urban Growth Boundary that are greater than one acre including contiguous parcels under the same ownership.
A. General: No person shall cut, harvest, or remove trees 11 inches DBH or greater without first obtaining a permit and demonstrating compliance with this chapter.

1. As a condition of permit issuance, the applicant shall agree to implement required provisions of this chapter and to allow all inspections to be conducted.
2. Tree removal is subject to the provisions of Chapter 15.44, Erosion Control, Chapter 17.56, Hillside Development, and Chapter 17.60 Flood and Slope Hazard.
Response: The subject property contains 15.91 acres and the standards of this chapter are applicable to the proposed subdivision. The applicant intends removing the majority of the trees on the property to accommodate development of this subdivision. The proposed tree removal and protection plan have been designed in accordance with the standards of this chapter. As noted in a review of Chapter 17.92, Landscaping above, the Planning Commission has determined only the requirements of Chapter 17.102 are applicable to residential subdivisions.

### 17.102.50 - TREE RETENTION AND PROTECTION REQUIREMENTS

A. Tree Retention: The landowner is responsible for retention and protection of trees required to be retained as specified below:

1. At least three trees 11 inches DBH or greater are to be retained for every oneacre of contiguous ownership.
2. Retained trees can be located anywhere on the site at the landowner's discretion before the harvest begins. Clusters of trees are encouraged.
3. Trees proposed for retention shall be healthy and likely to grow to maturity, and be located to minimize the potential for blow-down following the harvest.
4. If possible, at least two of the required trees per acre must be of conifer species.
5. Trees within the required protected setback areas may be counted towards the tree retention standard if they meet these requirements.

Response: An Arborist Report completed by a professional Arborist is included as Exhibit F. The Arborist inventoried all trees eleven-inches and greater DBH for the portion of the property proposed to satisfy tree retention requirements (northern portion of Lot 7 and Tract A parkland) as required. This inventory is included on Sheet C4 of the plan set and the proposed retention trees are shown on Sheet C3. The subject property contains 15.91 acres requiring retention of 48 trees, 11 inches and greater DBH (15.91 x $3=$ 47.73 rounded up to 48 trees) and in good condition. Only those trees on the portion of the site proposed to be retained were inventoried because most of the trees on the site except those in the proposed tree retention areas will need to be removed to facilitate development of the project. Sheet C4 lists all trees in the inventory area by number, species, condition, and whether it is proposed to be retained or removed.

The submitted plan identifies 59 trees that will be retained. All of the trees proposed for retention are conifers, at least 11-inches DBH, and in "good" condition as identified by the Arborist. The proposal complies with the requirements of this section.
B. Tree Protection Area: Except as otherwise determined by the Planning Director, all tree protection measures set forth in this section shall be instituted prior to any development activities and removed only after completion of all construction activity. Tree protection measures are required for land disturbing activities including but not limited to tree removal, clearing, grading, excavation, or demolition work.

1. Trees identified for retention shall be marked with yellow flagging tape and protected by protective barrier fencing placed no less than 10 horizontal feet from the outside edge of the trunk.
2. Required fencing shall be a minimum of six feet tall supported with metal posts placed no farther than ten feet apart installed flush with the initial undisturbed grade.
3. No construction activity shall occur within the tree protection zone, including, but not limited to dumping or storage of materials such as building supplies, soil, waste items, equipment, or parked vehicles.
Response: The Arborist Report (Exhibit F) provides recommendations for protection of retained trees including identification of the recommended tree protection zone for these trees. The requirements of this section will be complied with prior to any grading or tree removal on the site.

### 17.102.60 - TREE REPLANTING REQUIREMENTS

1. All areas with exposed soils resulting from tree removal shall be replanted with a ground cover of native species within 30 days of harvest during the active growing season, or by June 1st of the following spring.
2. All areas with exposed soils resulting from tree removal occurring between October 1 and March 31 shall also be covered with straw to minimize erosion.
3. Removal of hazard trees as defined shall be replanted with two native trees of quality nursery stock for every tree removed.
4. Tree Removal allowed within the FSH Overlay District shall be replanted with two native trees of quality nursery stock for every tree removed.
5. Tree Removal not associated with a development plan must be replanted following the provisions of OAR Chapter 629, Division 610, Section 020-060
Response: No trees are proposed to be replanted at this time.
17.102.70 - VARIANCES

Response: The submitted plan is designed in compliance with the standards of this chapter and a variance to these standards is not requested or required.

## CHAPTER 15.30-DARK SKY ORDINANCE

### 15.30.000-PURPOSE

The purpose of the Sandy Dark Sky Ordinance is to regulate outdoor lighting in order to reduce or prevent light pollution. This means to the extent reasonably possible the reduction or prevention of glare and light trespass, the conservation of energy, and promotion of safety and security. (Ord. 2002-11)

### 15.30.030 - EXEMPTIONS AND EXCEPTIONS

D. Full cutoff street lighting, which is part of a federal, state, or municipal installation.

### 15.30.060 - GENERAL STANDARDS

D. All outdoor lighting systems shall be designed and operated so that the area 10 feet beyond the property line of the premises receives no more than .25 (one quarter) of a foot-candle of light from the premises lighting system.
Response: The applicant understands the requirements of this chapter. A detailed lighting plan will be submitted with construction plans following land use approval.

## VI. Conclusion

The applicant requests Specific Area Plan approval to shift the zoning district boundaries for the property, a Comprehensive Plan and Map amendment to designate Tract A, a proposed park, as Parks and Open Space (POS), and to increase density on the site by more than 20 percent. The proposal also includes a Zoning Map amendment to change zoning designations on the property from a mix of C-3 (Village Commercial), R-2 (Medium Density Residential), and R-1 (Low Density Residential) to a mix of C-3 (Village Commercial), R-3 (High Density Residential), R-1 (Low Density Residential), and Parks and Open Space (POS).

The four R-1 zoned lots (Lots 1-4) are proposed to contain single-family detached dwellings and the two $\mathrm{R}-3$ zoned lots (Lot 5 and 6) may contain a maximum of 158 multifamily units. Lot 7 zoned $\mathrm{C}-3$ will be developed according to the standards of that zone. The applicant proposes dedicating 1.43 acres to the city to be used as a public park. As discussed in this narrative, the proposal complies with all relevant approval criteria, code standards, policies, and goals, and the applicant respectfully requests the application be approved as submitted.











# EXHIBIT D <br> Preliminary Storm Drainage Design and Calculations For the Bull Run Terrace Subdivision 

November 20, 2019

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## Appendices:

## Appendix A

-Vicinity Map
-Site Layout
-Pre-Developed Areas
-Developed Areas

## Appendix B

-Standard Formulas
-Coefficients
-SCS Runoff Curve Numbers (CN)
-Hydrograph Analysis Summary
-Detention System Summary
-Stage Storage Summary
-Rectangular, Sharp Crested Weir Calculations
-Contech CDS2015-4-C Detail

## PURPOSE:

The purpose of this analysis is to:

- Describe existing and proposed site conditions.
- Provide detention calculations for the 2-yr, 5-yr, 10-yr, and 25-yr storm events.
- Provide water quality calculations.


## PROJECT LOCATION AND DESCRIPTION:

The project site is located on the south side of the Mount Hood Highway in Sandy, Oregon. The site includes tax lots 900 and 1000. The +/- 15.9-acre site consists of grassy fields, and plentiful tree cover. The land is generally sloped to the north and west with an average slope of about $8 \%$. A Vicinity Map and Site Layout (with proposed storm sewer layout) can be found in Appendix A.

## PROPOSED IMPROVEMENTS

The proposed 7 -lot Bull Run Terrace Subdivision project will consist of four single-family residential lots ranging from $5,748 \mathrm{SF}$ to $7,444 \mathrm{SF}$. The project will also include three multifamily lots ranging in size from 52,667 SF to $292,076 \mathrm{SF}$. The site improvements will include streets, curbs, sidewalks, utilities, etc.

New storm sewer pipes, manholes, and catch basins will be installed to convey storm water to a public detention pond located in Tract B. A new water quality manhole will be installed downstream of the detention pond (See Site Layout - Appendix A).

The pond will be sized to detain the new public streets and the new homes to be built on lots 1 through 4 . Lots 5,6 , and 7 will provide lot-level detention and water quality systems at the time of building construction. Lots 5 and 6 will drain through the detention pond, and the pond will be sized to accommodate these anticipated flows. The future detention system on lot 7 will bypass the pond and flow directly to the public storm system in the park west of the development.

The fill required to bring Dubarko Road up to grade with Highway 26 will impede the flows of an existing drainage way that flows through the site. To remedy this, a new culvert will be installed under Dubarko Road. In the future, when lots 6 and 7 develop, a new bypass system will be designed to intercept the off-site flows draining to the project site and reroute them to the existing storm system to the west.

In addition to the on-site storm, improvements to the storm system in the ODOT right of way will occur as well. A new water quality facility will be constructed along Highway 26. This facility will conform to the requirements of the newest ODOT stormwater management manual at the time of design and construction. An existing 24 " culvert which currently drains to the site will be intercepted, and the flows routed through an existing storm system in the ODOT right of way.

Upstream and downstream analyses will be performed as needed at the time of final engineering.

## HYDROGRAPH PARAMETERS:

## Rainfall

The rainfall distribution numbers below were taken from the City of Sandy Stormwater Website: http://www.ci.sandy.or.us/Stormwater/

2 year, 24 hr. rainfall $=3.5$ "
5 year, 24 hr . rainfall $=4.5^{\prime \prime}$
10 year, 24 hr . rainfall $=4.8^{\prime \prime}$
25 year, 24 hr . rainfall $=5.5$ "

## Soils

The soil data for this site is from Soil Survey of Clackamas County, Oregon published by the United Stated Department of Agriculture (USDA). The post-development soil is assumed to be the same as pre-development.

Soil Type: 15B, Cazadero silty clay loam. Hydrologic Group "C" 15C, Cazadero silty clay loam. Hydrologic Group "C" 24B, Cottrell silty clay loam. Hydrologic Group "C"
(See Appendix B for Runoff Curve Numbers)

## Areas and Curve Numbers

Drainage basin areas were determined using a topographic map drafted in AutoCAD. See the Pre-Developed Area and Developed Area in Appendix A.

The impervious area for these post-developed basins includes the proposed roofs from lots 1 through 4, streets, sidewalks, driveways, and curbs. See the following tables for a specific breakdown of these areas.

\left.|  | Pre-Development |  |  |
| :---: | :---: | :---: | :---: |
| Areas | CN | Land Use Description |  |
| Pervious (10.88 acres)* | 83 | Meadow \& Young Second Growth Forest |  |
| Land |  |  |  |$\right]$ N/A

*Pre-Developed Pervious CN: Weighted CN
Meadow or Pasture 5.19 AC: CN = 85
Wood or Forest Land "Young Second Growth" 5.68 AC: CN = 81
$[(5.19 A C \times 85)+(5.68 A C \times 81)] /(5.19+5.68)=82.91=83.0$
Pre-Developed Impervious CN: See Runoff Curve Numbers Appendix B
**Post-Developed Pervious CN: Weighted CN
Meadow or Pasture 2.75 AC: $\mathrm{CN}=85$
Wood or Forest Land "Young Second Growth" 5.16 AC: CN = 81
Lawns "Good Condition" 0.85 AC: $\mathrm{CN}=86$
$[(2.75 A C \times 85)+(5.16 A C \times 81)+(0.85 A C \times 86)] /(2.75+5.16+0.85)=82.74$ $=83.0$
***Refer to Water Quality Design Section for detailed area breakdown.
Post-Developed Impervious CN: See Runoff Curve Numbers Appendix B

## Time of Concentration

The times of concentrations (Tc), were assumed as follows.

$$
\begin{array}{ll}
\text { Pre-development } \mathrm{T}_{\mathrm{c}}= & 30.0 \text { minutes } \\
\text { Post-development } \mathrm{T}_{\mathrm{c}}= & 5.0 \text { minutes }
\end{array}
$$

## Hydrograph Modeling Results

Hydrographs for the site were determined using a spreadsheet based on the King County, Washington Hydrograph Program, version 4.21B, which uses the Santa Barbara Urban Hydrograph (SBUH) method.

## DETENTION SIZING RESULTS:

The Post-Development flows were routed through a proposed 4 -foot deep detention pond. The 4 -foot deep detention pond has been designed so that the Post-Developed release rates for the entire site do not exceed the Pre-Developed rates for the 2-year, 5 -year, 10year, and 25 -year storm events per the City of Sandy public Works Design Standards. See the Detention System Summary in Appendix B.

## Hydrology Table

| Hydrology Table |  |  |  |
| :---: | :---: | :---: | :---: |
| Recurrence <br> Interval (years) | Pre-developed Flows <br> (cfs) | Developed Flows <br> (cfs) | Proposed Release <br> Rates (cfs) |
| 2 | 3.42 | 6.14 | 3.23 |
| 5 | 5.30 | 8.99 | 4.77 |
| 10 | 5.88 | 9.87 | 5.71 |
| 25 | 7.26 | 11.94 | 7.07 |

The required storage volume is 12,323 -cubic feet. This can be contained in a 4 -foot deep pond with a bottom area of 2,443 square feet.

## Flow Control:

The flow control orifices were designed to release the Post-development Peak-Q's at or below the Pre-developed Peak-Q's.
(See the Detention System Summary - Appendix B)

| Orifice Table |  |  |
| :---: | :---: | :---: |
| Orifice | Dia. (inches) | Height (feet) |
| Bottom | 7.68 | -2.50 |
| Top | 10.03 | 2.80 |

## WATER QUALITY DESIGN:

## CDS Storm Water Treatment Device

A CDS manhole by Contech Stormwater Solutions was designed for water quality for the site - see detail in Appendix B. The impervious area for the site includes AC pavement, sidewalks, and roofs. The impervious area is 2.11-acres.

| Proposed asphalt, walks, etc.: | 1.88 acres |
| :--- | :--- |
| Roof, Patio, Driveway*: | 0.23 acres |
| Total Impervious Area: | 2.11 acres |


| *40'x50' Building footprint: | 2000SF |
| :--- | :--- |
| 20'x20' Driveway: | 400 SF |
| 10'x10' Patio: | 100 SF |
| Total: | $2,500 \mathrm{SF} \times 4$ lots $=10,000 \mathrm{SF}$ |

The flow $(Q)$ from this runoff was calculated using the rational method $(Q=C I A)$
Where $Q=$ flow (cfs)
$\mathrm{C}=$ runoff coefficient $=0.90$ pavement and Roofs
I = Intensity = 0.2 inches per hour (Water Quality Design Storm)
$\mathrm{A}=$ Impervious Area $=2.11$ Acres
$Q=0.90 \times 0.2 \times 2.11$
$\mathbf{Q}=0.38 \mathbf{c f s}$

The Contech Storm Water Treatment Device Model: CDS2015-4-C has a treatment capacity of 0.7 cfs which exceeds the required 0.38 cfs.

## A Storm Water Treatment Device CDS Model CDS2015-4-C can be used to adequately treat the water for the site

## CONCLUSIONS:

- The conveyance system for the proposed Bull Run Terrace Subdivision site has been sized to handle the peak 25-year, 24-hour storm.
- On-site detention has been designed to maintain existing downstream storm water runoff characteristics in accordance with the City of Sandy requirements.
- A CDS Storm Water Treatment Device will be used for water quality.

JOHNSON
Economics

## EXHIBIT E



Public Need Analysis for Rolltide Property

## Residential Lands

City of Sandy

July, 2020

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## InTRODUCTION

Johnson Economics was asked to prepare an assessment of the public need for residential as well as commercial uses in the City of Sandy. This work is in support of a comprehensive plan and zone change application for a 15.91acre site located south of Highway 26 at the future intersection with Dubarko Road.

Location of Subject Site


SOURCE: Clackamas Maps

Current zoning on the site include 2.84 acres of C-3 (Village Commercial), 8.05 acres designated R-1 (Low Density Residential), and 5.01 acres designated R-2 (Medium Density Residential). The proposed change in zoning would increase the C-3 zoned area to 3.61 acres, reduce the R-1 zoned property to 0.59 acres, and rezone 7.91 acres to R-3 (High Density Residential). In addition, 1.43 acres would be set aside as POS (Parks and Open Space), 2.21 would be right of way, and 0.16 would be a public stormwater tract. The change in designation would allow for up to 158 rental apartment units on the R-3 property, while reducing density in the R-1 and R-2 tracts from a current max of 101 units to a max of 5 units. The net impact assuming development at maximum allowed density would increase residential capacity on the site by 62 units, with a shift from low- and medium-density product to rental apartments. The commercial/employment capacity on the site would be increased by roughly 1.5 net acres.

Area Comparison of Existing to Proposed Zoning

|  | Existing (gross acres) | Existing (net acres) | Proposed (net acres) |
| :--- | :---: | :---: | :---: |
| C-3, Village Commercial | 2.84 | 2.13 | 3.61 |
| R-1, Low Density <br> Residential | 8.05 | 6.04 (48 units max.) | 0.59 (5 units max.) |
| R-2, Medium Density <br> Residential | 5.01 | 3.76 (53 units max.) | 0.00 |
| R-3, High Density <br> Residential | 0.00 | 0.00 | 7.91 (158 units max.) |
| POS, Parks and Open <br> Space | 0.00 | 0.00 | 1.43 |
| Rights of Way | 0.00 | 3.98 | 2.21 |
| Public Tracts <br> (stormwater tract) | 0.00 | 0.00 | 0.16 |
| Total Area | 15.91 | 15.91 | 15.91 |

## * - Net acres assumes $25 \%$ reduction for public roads

This analysis addresses the public need for the requested change. In addition, the analysis will discuss whether the proposed change on the property represents an appropriate zoning boundary modification and the degree to which the development represents a sound, stable, and desirable development proposal. Following is a brief summary of the designations from the City of Sandy's Development Code:

Sandy's C3 zone "The Village Commercial (C-3) district is primarily oriented to serve residents of the village and the immediately surrounding residential area. The Village Commercial area is intended to help form the core of the villages. Allowing a mixture of residential uses beside and/or above commercial uses will help create a mixed-use environment which integrates uses harmoniously and increases the intensity of activity in the area. The orientation of the uses should integrate pedestrian access and provide linkages to adjacent residential areas, plazas and/or parks, and amenities."

The "High Density Residential (R-3) district is intended for high density residential development at 10 to 20 dwelling units per net acre. Intended uses are apartments, row houses, and townhouses, duplexes, singlefamily planned developments, and manufactured home parks including existing developed areas and areas suitable for development at this density.

High density residential areas are generally located immediately adjacent to village commercial centers or the Central Business District. Commercial development, including home businesses and limited neighborhood retail, is considered appropriate in high density residential developed in conjunction with villages or immediately north of the Central Business District. High density residential areas are generally located nearby Village Commercial Centers, the Central Business District and/or public facilities such as schools or parks. The HDR Plan designation encompasses one zoning district designation."

The proposed R3 zoning allows a range of multi-family residential uses, including duplexes, townhomes, and residential facilities. The minimum allowed residential density is 10 units per acre with a maximum of 20 units per acre. The predominant use on the site is likely to be common wall multi-family and/or rental apartments.

This analysis relies on employment data provided by the US Census, assessment of developed and vacant land provided by Metro's RLIS, the City of Sandy Urbanization Study (2015), and Portland State University's Population Research Center's population estimates. This analysis supports the following findings:

- The change in use would provide capacity for additional housing options, which may alleviate local housing affordability issues while providing increased demographic support for the proximate commercial concentrations in central Sandy.
- The entitlement change would be expected to bring the property into active urban use and be supportive of the City's planning policies.


## Residential Land Needs

## POPULATION

Portland State University's Population Research Center provides intercensal population estimates for the State of Oregon, which are considered to be more accurate than Census Bureau estimates. The Center estimates that in 2001 Sandy's population was 5,380 and grew to 10,990 by 2018. This represents an increase of $104 \%$ since 2001 and an average growth rate of $4.3 \%$ over this same period. However, much of this growth took place before 2011. From 2011 through 2018 average annual growth was only 1.7\%. Portland State University's population forecast programs most recent forecast for the Sandy UGB projected average annual growth of $2.7 \%$ through 2040.

Historical Population, Sandy (2001-2018) ${ }^{1}$


## Population and Housing

As mentioned earlier, Portland State University's Center estimates that in 2001 Sandy's population was 5,380 and grew to 10,990 by 2018. This represents an increase of $104 \%$ since 2001 and an average growth rate of $4.7 \%$ over this same period. For the purposes of this study, assuming that levels of residential density in Sandy remain constant, the demand for residential land will likely follow the city's forecasted population within the UGB of $2.7 \%$. According to Metro's RLIS, Sandy currently has 865.7 acres of residentially zoned, developed land. Projecting 20

[^0]years forward to 2038, the city will likely need an additional 609.2 acres to meet a total need of $1,474.9$ acres of residential land. Currently, the city has a total of $1,295.6$ acres of land zoned for residential uses. This amount of land is 178.6 acres short of the projected need by 2038 based on historic development patterns.


Summary of Residential Zoned Land Supply, City of Sandy ${ }^{2}$

| Zone | Developed |  | Undeveloped |  | \% Developed |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
|  | Parcels | Acres | Parcels | Acres | Parcels | Acres |
| R1 | 74 | 137.5 | 30 | 39.4 | $71.2 \%$ | $77.7 \%$ |
| R2 | 76 | 194.1 | 31 | 71.4 | $71.0 \%$ | $73.1 \%$ |
| R3 | 58 | 125.8 | 29 | 53.0 | $66.7 \%$ | $70.4 \%$ |
| SRR | 114 | 408.3 | 53 | 266.9 | $68.3 \%$ | $60.5 \%$ |
| Total Residential | 322 | 865.7 | 143 | 430.6 | $69.2 \%$ | $66.8 \%$ |

The City has developed just over $70 \%$ of its land for multifamily and $66.8 \%$ for residential more broadly. While additional capacity is expected to be available through redevelopment, this is inherently more difficult and typically more expensive to deliver. Increasing the City's multifamily residential land inventory would increase local capacity for residential products that can meet a broad range of price points. Affordability of housing has become a major

[^1]concern during the recent expansion cycle and provision of higher density housing options is seen as a major tool in addressing affordability concerns.

## Site Suitability for Proposed Uses

The subject site does not have any significant physical development constraints and enjoys visibility from Highway 26. The proposed use pattern will place a public park and the low density residential uses on the western edge of the property, providing a buffer between more intensive uses on the remainder of the site and the R-3 zoned property to the east and south. The proposed development pattern allows for a relatively efficient utilization of the site, with an efficiency of $84 \%$ (net developable area divided by total area, excluding park dedication). This is significantly higher than would be achievable with the current zoning designation, and supports more efficient land utilization.

Clustering residential density along Highway 26 and at the future intersection with Dubarko will provide excellent access to the residents, including to the commercial development on the site and the extensive commercial options in the city's downtown core (roughly a mile and a half west and three minutes away) as well as larger format retailers to the west of downtown. The intersection of Dubarko and Highway 26 is expected to collect the bulk of traffic from commercial and multi-family development on the site.

## Conclusions Regarding the Proposed Zone Change

The proposed zone change is responsive to the City's projected need for additional residential capacity. Lennar Corporation, who previously controlled the site, spent a decade and significant investment trying to generate a viable development program for the site. The cost of the connection to Highway 26 and the infrastructure investment requirements in the village overlay were too great to be offset by the value of the underlying property. While technically capable of supporting development, these economic constraints make the site effectively undevelopable under the current zoning designation.

A key criteria in the City of Sandy is the degree to which the development represents a sound, stable, and desirable development proposal. Increasing the allowed residential density as proposed will provide the ability of the site to support necessary infrastructure investments to open up development. Under the current zoning the economic constraints outlined preclude a "sound, stable" development program for the site.

Allowing the proposed change in zoning will accelerate the development of the property while better addressing the City of Sandy's land use needs and public policy objectives. Dubarko's connection to Highway 26 can't be completed unless this site is developed, which has a significant impact on the City's broader street system. In addition, development of the site will provide more tax revenue as well as providing needed park space. The proposed use will also provide a "middle housing" product in the market that will address the local need for more low-cost housing choices.

## EXHIBIT F

## AARD 

Bull Run Terrace<br>Traffic Impact Study

SANDY, OREGON



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# 隿 ARP 

# Bull Run Terrace Subdivision Traffic Impact Study 

SANDY, OREGON



## Prepared For:

Alex Reverman

## Prepared By:

Michael Ard, PE
Ard Engineering
DATE:
July 12, 2020

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## ExECUTIVE Summary

1. A property located on the south side of US Highway 26 opposite SE Vista Loop Drive in Sandy, Oregon is proposed for a subdivision which will support up to 158 apartment units and 4 singlefamily homes, along with future commercial uses. The site will take access via an extension of Dubarko Road through the property, connecting the existing stub to Highway 26 opposite SE Vista Loop Drive.
2. Upon completion of residential development within the proposed subdivision, the subject property is projected to generate 76 new site trips during the morning peak hour, 92 trips during the evening peak hour, and 1,194 new daily site trips.
3. Based on the operational analysis, the study intersections currently operate acceptably and are projected to continue to operate acceptably under year 2022 background conditions without residential development of the subject property or connection of Dubarko Road to Highway 26.
4. All study intersections are projected to operate within capacity under year 2022 traffic conditions either with or without the addition of site trips from the proposed development. However, upon completion of the residential development within the proposed subdivision and the connection of Dubarko Road to Highway 26, it is projected that the intersection of Highway 26 at Dubarko Road will operate with very high delays for the northeast-bound Dubarko Road approach. Since vehicles exiting the site to the west can also travel west on Dubarko Road to Langensand Road prior to turning west on Highway 26, it is expected that some vehicles will divert and the actual delays will be lower than those reported. An additional analysis showing operation of the study intersections with the new Dubarko Road at Highway 26 intersection restricted to right-in, rightout only demonstrates that there is sufficient capacity for such diversions even if all northeastbound left-turning vehicles diverted to alternative travel paths.
5. Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. It is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety improvements are recommended for the study area intersections at this time.
6. Based on the warrant analysis, a northwest-bound left-turn lane and a southeast-bound right-turn lane are projected to be warranted at the intersection of Highway 26 at Dubarko Road with completion of the Dubarko Road extension. The northbound left-turn lane would not be needed at the time of project completion if the intersection is limited to right-in, right-out only. No other turn lanes or traffic signals are recommended in conjunction with the proposed subdivision.
7. Intersection sight distance was evaluated for the new intersection of Highway 26 at Dubarko Road. The proposed intersection was found to have adequate sight distance in both directions.
8. A zone change is proposed for the subject property from the existing mix of R-1, R-2 and C-3 zoning to $\mathrm{R}-1, \mathrm{R}-3, \mathrm{C}-3$ and POS zoning. This zone change is projected to result in a negligible change to traffic volumes as measured under the "reasonable worst case" development scenarios and therefore will not have a significant effect on operation of area roadways and intersections at the planning horizon as defined by Oregon's Transportation Planning Rule.

## Project Description \& Location

## INTRODUCTION

A property located on the south side of US Highway 26 opposite SE Vista Loop Drive is proposed for development with up to 158 apartment units and 4 single-family homes. The site will take access via an extension of Dubarko Road which will connect the existing stub (east of Meadow Avenue) to Highway 26 opposite SE Vista Loop Drive.

This report addresses the impacts of the proposed development on the surrounding street system. Based on discussions with the City of Sandy and ODOT staff, an operational and safety analysis was conducted for the proposed site access as well as the intersections of:

- Highway 26 at SE Ten Eyck Road;
- Highway 26 at SE Langensand Road;
- Highway 26 at SE Vista Loop Drive;
- Highway 211 at Dubarko Road; and
- Dubarko Road at SE Langensand Road.

The purpose of this analysis is to determine whether the surrounding transportation system is capable of safely and efficiently supporting the proposed use and to identify any necessary improvements and mitigations.

## Site Location and Study area Description

The project site has an area of approximately 16 acres, which is currently undeveloped. The property is surrounded by a mixture of residential development, agricultural uses and undeveloped forested land.

The proposed development will include an extension of Dubarko Road from its existing eastern terminus through the subject property to Highway 26 opposite SE Vista Loop Drive. The proposed development will take access via this newly extended segment of Dubarko Road.

US Highway 26 (Mt. Hood Highway) is classified by the Oregon Department of Transportation as a Statewide Highway and a Freight Route. It has two through lanes in each direction and added turn lanes at intersections. Between SE Langensand Road and SE Vista Loop Drive it has a center twoway left-turn lane. It has a posted speed limit of 25 mph at SE Ten Eyck Road, 40 mph at SE Langensand Road, and 55 mph at SE Vista Loop Drive. West of SE Ten Eyck Road the highway divides into a couplet, with westbound traffic traveling on Proctor Boulevard and eastbound traffic traveling on Pioneer Boulevard.

SE Ten Eyck Road has one through lane in each direction and is striped to prohibit passing in the site vicinity. It has a basic rule speed limit of 55 mph and is classified by the City of Sandy as a Minor Arterial.


SE Langensand Road is also classified by the City of Sandy as a Minor Arterial. It has a two-lane cross-section with one through lane in each direction and a posted speed limit of 25 mph . Partial sidewalks are in place on both sides of the roadway, and on-street parking is available where sufficient paved width is provided.

SE Vista Loop Drive is a narrow street without centerline striping and with a posted residential speed limit of 25 mph . It is classified by the City of Sandy as a collector roadway.

Oregon Highway 211 (Eagle Creek Sandy Highway) is classified by the Oregon Department of Transportation as a District Highway. It has a two-lane cross-section with one through lane in each direction and added turn lanes at major intersections. It has a posted speed limit of 45 mph in the vicinity of Dubarko Road.

Dubarko Road is classified by the City of Sandy as a Minor Arterial. It generally has a two-lane cross-section with some added turn lanes at major intersections and bike lanes on each side of the roadway. Partial sidewalks are in place on each side of the roadway adjacent to developed properties. It has a posted residential speed limit of 25 mph .

## Existing Conditions

The intersection of US Highway 26 at SE Ten Eyck Road/Wolf Drive is controlled by a traffic signal. The northbound and southbound approaches each have a single, shared lane for all turning movements. The westbound approach has a left-turn lane, two through lanes, and a short right-turn pocket. The eastbound approach has a left-turn lane, a dedicated through lane and a shared through/right lane. The northbound and southbound approaches operate with concurrent signal phasing. Protected phasing is provided for the eastbound and westbound left-turn movements. Bike lanes are provided along Highway 26 to the right of the through lanes.

The intersection of US Highway 26 at SE Langensand Road is a T- intersection controlled by a stop sign on the northbound Langensand Road approach. Through traffic traveling along Highway 26 does not stop. The northbound approach has a left-turn lane and a right-turn lane. The eastbound approach has two through lanes and a right-turn lane. The westbound approach has a left-turn lane and two through lanes. Bike lanes are provided along Highway 26 to the right of the through lanes.

The intersection of US Highway 26 at SE Vista Loop Drive is currently a T- intersection controlled by a stop sign on the southwest-bound Vista Loop Drive approach. Through traffic traveling along Highway 26 does not stop. The southwest-bound approach has a single, shared lane for all turning movements. The southeast-bound approach has a left-turn lane and two through lanes. The northwest-bound approach has a dedicated through lane and a shared through/right lane. Bike lanes are provided along Highway 26 to the right of the through lanes.

The intersection of Oregon Highway 211 at Dubarko Road is a four-way intersection controlled by stop signs on the eastbound and westbound Dubarko Road approaches. The southbound, eastbound and westbound approaches each have a shared through/left lane, a bike lane, and a dedicated rightturn lane. The northbound approach has a single, shared lane for all motorized turning movements and a bike lane.

The intersection of Dubarko Road at SE Langensand Road is a four-way intersection currently controlled by stop signs on the eastbound and westbound Dubarko Road approaches. Through traffic traveling along SE Langensand Road does not stop. The northbound and southbound approaches each have a single, shared lane for all turning movements. The westbound approach has a single, shared lane for all motor vehicle turning movements and a bike lane. The eastbound approach has a left-turn lane, a shared through/right lane and a bike lane.

A vicinity map displaying the project site, vicinity streets, and the study intersections including lane configurations is provided in Figure 1 on page 7.


## Traffic Count Data

Traffic counts were conducted at the study intersections on Tuesday March $19^{\text {th }}, 2019$ from 4:00 to 6:00 PM and on Wednesday March $20^{\text {th }}, 2019$ from 7:00 to 9:00 AM. Data was used from the highest-volume hour during each analysis period.

Since the count data was collected during a non-peak period of the year, the observed traffic volumes were adjusted to account for seasonal traffic variations in order to represent the $30^{\text {th }}$-highest hour design volumes.

US Highway 26 serves local and commuter traffic as well as trips to and from Mt. Hood and beyond. These trip types would be expected to exhibit very different seasonal variations in travel demands over the course of the year, since local and commuter traffic volumes are relatively stable regardless of season, while travel volumes to and from Mt. Hood vary significantly based on the season.

In order to determine the portion of traffic attributable to each of the two primary travel types, data from ODOT's 2017 Highway Volume Tables was utilized. Specifically, the data used was collected at ODOT's Automatic Count Data station 03-006, located 0.30 miles east of Camp Creek Road in Rhododendron, Oregon. This site is located on Highway 26 approximately 21 miles east of SE Vista Loop Drive. Although the distance to the ATR station means the data cannot be used directly, the ATR data provides useful information regarding the variation in traffic volumes traveling to Mt. Hood and beyond during the time of the count data collection as well as during the peak season of the year. Accordingly, this data allows determination of the likely portion of highway traffic that falls into each of the two seasonal variation categories ("commuter" and "recreational summer/winter"), as well as providing information regarding the most appropriate seasonal adjustment factor for the recreational summer/winter traffic.

Based on the data, 6,763 vehicles per day (approximately 676 per hour during the peak hour) travel along Highway 26 to and from Mt. Hood at the Rhododendron permanent count station location during the month of March. This volume represents 45.3 percent of the through traffic volumes measured on Highway 26 east of SE Vista Loop Drive. Accordingly, it is expected that no more than 45.3 percent of the trips traveling along Highway 26 in the project vicinity are traveling to and from destinations beyond the Rhododendron count station. Since the remaining 54.7 percent of through traffic volumes on the Highway 26 at the study intersections never reach Mt. Hood, it was assumed that these traffic volumes represent more typical commuter and local trips.

The ODOT data also showed that 11,738 vehicles were measured per day (approximately 1174 per hour during the peak hour) during the peak-season month of August at the ATR station near Rhododendron. This indicates that the seasonal recreational traffic volumes along the Highway 26 corridor increased by no more than 4,975 vehicles per day ( 11,738 vehicles per day in August 6,763 vehicles per day in March). This equates to roughly 498 additional vehicles per hour during the peak hour of the peak recreational season. It is expected that the increased recreational traffic flows will be somewhat directional, with approximately $55 \%$ traveling westbound during the evening peak hour.

In order to seasonally adjust the local and commuter traffic volumes, the through traffic volumes were reduced by the amount of the assumed seasonal traffic ( 676 vehicles per hour during the

evening peak hour, and a seasonal adjustment of 1.08 was applied to the remaining local and commuter traffic volumes. Following this adjustment, the 676 March recreational trips and the 498 peak-season through trips were added to determine the total peak-season traffic volumes. These calculated through traffic volumes represent the anticipated traffic levels for the intersections along Highway 26 during the $30^{\text {th }}$-highest hour in August. The morning peak hour traffic volumes along the highway were then increased by the same overall percentage as the evening peak hour volumes.

The observed traffic volumes along Highway 211 also had a seasonal adjustment of 1.08 applied to represent peak-season traffic volumes.

Following application of the seasonal adjustments, one year of growth was added to the year 2019 traffic count data in order to represent the expected year 2020 seasonal peak traffic conditions absent the impacts of the current COVID-19 pandemic. Based on data from ODOT's Future Volume Tables, the growth rate for traffic volumes on Highway 26 in the site vicinity was calculated to be 1.93 percent per year. The growth rate for traffic volumes on Highway 211 was calculated to be 3.16 percent per year. These growth rates were applied to the through traffic volumes on the highways. All other turning movements had a growth factor of 2 percent per year applied. The respective growth rates were applied over a period of one year to generate the year 2020 seasonal peak traffic volumes.

Figure 2 on page 10 shows the existing year $202030^{\text {th }}$-highest hour traffic volumes for the morning and evening peak hours at the study intersections.
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## OPERATIONAL ANALYSIS

An operational analysis was conducted for the study intersections using Synchro 10 software, with outputs calculated based on the HIGHWAY CAPACITY MANUAL, $6^{\text {th }}$ Edition. The analysis was conducted for the weekday morning and evening peak hours.

The purpose of the existing conditions analysis is to establish how the study area intersections operate currently and allow for calibration of the operational analysis if required.

The results of the operational analysis are reported based on delay, Level of Service (LOS), and volume-to-capacity ratio (v/c). Delays are reported in seconds. Level of service is reported as a letter grade and can range from $A$ to $F$, with level of service A representing nearly free-flow conditions and level of service $F$ representing high delays and severe congestion. A report of level of service $D$ generally indicates moderately high but tolerable delays, and typically occurs prior to reaching intersection capacity. For unsignalized intersections, the $\mathrm{v} / \mathrm{c}$ represents the portion of the available intersection capacity that is being utilized on the worst intersection approach. For signalized intersections, it indicates the portion of the overall intersection's capacity that is being used. A v/c ratio of 1.0 would indicate that the intersection is operating at capacity.

The Oregon Department of Transportation requires that the signalized intersection of Highway 26 at SE Ten Eyck Road operate with a v/c ratio of 0.85 or less during the peak hours. The intersections of Highway 26 at SE Langensand Road and Highway 26 at SE Vista Loop Drive are required to operate with a $\mathrm{v} / \mathrm{c}$ ratio of 0.80 or less on the major-street approaches and a $\mathrm{v} / \mathrm{c}$ ratio of 0.90 or less on the minor-street approaches. The intersection of Highway 211 at Dubarko Road is required to operate with a v/c ratio of 0.90 or less on all approaches.

Intersections operating under the jurisdiction of the City of Sandy are required to operate at level of service D or better. This operational standard applies to the intersection of Dubarko Road at Langensand Road.

A summary of the existing conditions operational analysis is provided in Table 1 on the following page. For the unsignalized intersections the reported delays and levels-of-service represent the approach lane which experiences the highest delays. The reported $\mathrm{v} / \mathrm{c}$ ratios represent the highest ratio for the major-street and minor-street movements. For the signalized intersection of Highway 26 at SE Ten Eyck Road, the reported delays, levels-of-service and v/c ratios represent the operation of the overall intersection.

Based on the analysis, the study intersections are currently operating acceptably per the respective ODOT and City of Sandy standards. Detailed capacity analysis worksheets are provided in the technical appendix.

Table 1 - Operational Analysis Summary: Year 2020 30th-Highest Hour Conditions

| Intersection | AM Peak Hour |  |  | PM Peak Hour |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Delay | LOS | v/c* | Delay | LOS | v/c* |
| Highway 26 at Ten Eyck Road | 23.4 | C | 0.62 | 26.2 | C | 0.70 |
| Highway 26 at Langensand Road | 54.8 | F | $0.28 / 0.50$ | 88.9 | F | $0.35 / 0.47$ |
| Highway 26 at Vista Loop Drive | 12.7 | B | $0.28 / 0.08$ | 13.0 | B | $0.32 / 0.06$ |
| Highway 211 at Dubarko Road | 18.3 | C | $0.22 / 0.27$ | 25.7 | D | $0.24 / 0.32$ |
| Dubarko Road at Langensand Road | 9.3 | A | 0.05 | 9.8 | A | 0.04 |

*(major street $\mathrm{v} / \mathrm{c}$ ) / (minor-street $\mathrm{v} / \mathrm{c}$ ) is shown for unsignalized ODOT intersections.

## Site Trips

## Proposed Development

The proposed subdivision will support development of up to 158 apartment units and 4 single-family homes. Although some commercial development is expected to occur in the longer-range future, a separate application and analysis will be prepared for the future commercial development. To estimate the number of trips that will be generated by residential development within the proposed subdivision, trip rates from the TRIP GENERATION MANUAL, $10^{\text {th }}$ EDITION were used. Data from land-use code 210, Single-Family Detached Housing, and 220, Multi-Family Housing, were used. The trip estimates are based on the number of dwelling units.

A summary of the trip generation calculations is provided in Table 2 below. Detailed trip generation worksheets are also included in the technical appendix.

Table 2 - Proposed Development Trip Generation Summary

|  | AM Peak Hour |  |  |  | PM Peak Hour |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Daily |  |  |  |  |  |  |  |
|  | In | Out | Total | In | Out | Total | Total |
| 158 Apartment Units | 17 | 56 | 73 | 55 | 33 | 88 | 1156 |
| 4 Single-Family Homes | 1 | 2 | 3 | 3 | 1 | 4 | 38 |
| Total Site Trips | 18 | 58 | 76 | 58 | 34 | 92 | 1,194 |

## Zone Change

In addition to evaluation of the increase in site trips expected upon completion of residential development within the proposed subdivision, trip generation calculations were prepared to examine the potential change in site trips based on the "reasonable worst-case development scenario" for the existing and proposed zoning. This second analysis was conducted to determine whether the proposed zone change would significantly affect any transportation facilities as defined by Oregon's Transportation Planning Rule.

The subject property is currently zoned with a mix of 8.05 acres of R-1, 5.01 acres of R-2 and 2.84 acres of C-3 zoning. Under the proposed subdivision plan, 2.21 acres will be dedicated as public right-of-way, 0.75 acres will be zoned $\mathrm{R}-1,7.91$ acres will be zoned $\mathrm{R}-3,3.61$ acres will be zoned C 3 (with just 3.12 acres available for development due to 0.49 acres being placed into a tree conservation easement), and 1.43 acres will be zoned POS (Parks \& Open Space).

A summary of the trip generation calculations for the reasonable worst-case development scenarios based on allowable development levels under the existing and proposed City of Sandy zoning is provided in Table 3 on the following page. Detailed trip generation calculations are also included in the technical appendix.

Table 3 - Zone Change Trip Generation Summary

|  | AM Peak Hour |  |  | PM Peak Hour |  |  | Daily <br> Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total |  |
| Existing R1, R2 and C3 Zoning |  |  |  |  |  |  |  |
| 8.05 Acres R-1 (52 Homes) | 10 | 28 | 38 | 32 | 19 | 51 | 490 |
| 5.01 Acres R-2 (56 Homes) | 10 | 31 | 41 | 35 | 20 | 55 | 528 |
| 2.84 Acres C-3 (30,900 sf Retail) | 18 | 11 | 29 | 57 | 61 | 118 | 1166 |
| -Pass-by Trips (34\%) | -5 | -5 | -10 | -20 | -20 | -40 | -396 |
| Net Trips (Existing Zoning) | 33 | 65 | 98 | 104 | 80 | 184 | 1788 |
| Proposed Zoning |  |  |  |  |  |  |  |
| 0.75 Acres R-1 (6 Homes) | 1 | 3 | 4 | 4 | 2 | 6 | 56 |
| 7.91 Acres R-3 (158 Apartments) | 17 | 56 | 73 | 55 | 33 | 88 | 1156 |
| 3.12 Acres C-3 (34,000 sf Retail) | 20 | 12 | 32 | 62 | 68 | 130 | 1284 |
| -Pass-by Trips (34\%) | -5 | -5 | -10 | -22 | -22 | -44 | -436 |
| 1.43 Acres POS (Public Park) | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Net Trips (Proposed Zoning) | 33 | 66 | 99 | 99 | 81 | 180 | 2062 |
| Net Change In Site Trips | 0 | 1 | 1 | -5 | 1 | -4 | 274 |

Based on the zone change analysis, the proposed zone change would result in no significant change in site trips at the planning horizon. Specifically, during the morning peak hour, a net increase of one trip is projected and during the evening peak hour a decrease of 4 trips is projected. Although there is a projected increase of 274 daily trips, these trips would primarily occur in the off-peak hours and since the daily increase is fewer than 400 trips the proposed zone change qualifies as a "small increase in traffic" and per Oregon Highway Plan Policy 1F5 will not degrade the performance of existing or planned transportation facilities. Accordingly, the proposed change in zoning will conform to the requirements of Oregon's Transportation Planning Rule. A detailed analysis based on the requirements of Oregon's Transportation Planning Rule is provided on page 26 of this report.

## TRIP DIStRIBUTION

The directional distribution of site trips to and from the project site was estimated based the existing travel patterns in the site vicinity, as well as the locations of likely trip destinations and major transportation routes. Overall, 65 percent of the anticipated site trips are projected to travel to and from the northwest on Highway 26, 20 percent are projected to travel to and from the southeast on Highway 26, and the remaining 15 percent of site trips are projected to travel to and from the west on Dubarko Road.

The trip distribution percentages and trip assignment for residential development within the proposed subdivision are shown in Figure 3 on page 15.
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## Future Conditions Analysis

## BACKGROUND VOLUMES

In order to determine the expected impact of site trips on the study area intersections, it is necessary to compare traffic conditions both with and without the addition of the projected traffic from the proposed development. This comparison is made for future traffic conditions at the time of project completion. It is anticipated that the proposed use will be completed and occupied within two years. Accordingly, the analysis was conducted for year 2022 traffic conditions.

Prior to adding the projected site trips to the study intersections, the existing traffic volumes were adjusted to account for background traffic growth over time. Based on data from ODOT's Future Volume Tables, the growth rate for traffic volumes on Highway 26 in the site vicinity was calculated to be 1.93 percent per year (linear). The growth rate for traffic volumes on Highway 211 was calculated to be 3.16 percent per year (linear). These growth rates were applied to the through traffic volumes on the highways. All other turning movements had a growth factor of 2 percent per year (exponential) applied.

In addition to the background growth, anticipated site trips from the "The Views" residential development were added to the background traffic volumes. The projected site trips for this residential development are shown in Figure 8 in the attached technical appendix.

Figure 4 on page 17 shows the projected year 2022 background traffic volumes at the study intersections during the morning and evening peak hours.

## BaCkground Volumes plus Site Trips

Peak hour trips calculated to be generated by the proposed development were added to the projected year 2022 background traffic volumes to obtain the year 2022 total traffic volumes following completion of the proposed residential development.

In addition to the addition of anticipated site trips, some existing traffic is expected to divert upon completion of the Dubarko Road connection to Highway 26. Drivers traveling between locations east of the city on Highway 26 and locations south of the city on Highway 211 will have an alternative travel route available that will serve as a shorter travel route and bypass some congestion within the City of Sandy. The new road connection will also serve as an alternative travel route for residents living in areas to the west of the subject property traveling to and from destinations to the east on Highway 26. A diagram showing the projected trip diversions associated with completion of the Dubarko Road connection to Highway 26 is provided as Figure 7 in the attached technical appendix.

Figure 5 on page 18 shows the projected year 2022 peak hour volumes including background growth, site trips from the proposed development, and diverted trips associated with the proposed connection of Dubarko Road to Highway 26 for the morning and evening peak hours. Figure 6 on page 19 shows the year 2022 turning movement volumes for the morning and evening peak hour with full site development if the Dubarko Road connection to Highway 26 is limited to right-in, right-out only.
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## OPERATIONAL ANALYSIS

The operational analysis for future traffic conditions was again conducted using Synchro analysis software, with outputs based on the analysis methodologies contained in the HIGHWAY CAPACITY $M A N U A L$. The analysis was prepared for the intersections' morning and evening peak hours.

The results of the operational analysis are summarized in Table 4 below. Detailed analysis worksheets are also included in the technical appendix.

Table 4 - Operational Analysis Summary: Year 2022 Future Conditions

| Intersection | AM Peak Hour |  |  | PM Peak Hour |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Delay | LOS | v/c* | Delay | LOS | v/c* |
| Highway 26 at Ten Eyck Road |  |  |  |  |  |  |
| 2022 Background Conditions | 24.4 | C | 0.67 | 28.0 | C | 0.75 |
| 2022 Background plus Site | 24.1 | C | 0.66 | 28.1 | C | 0.72 |
| 2022 Background plus Site RIRO | 25.3 | C | 0.69 | 28.6 | C | 0.75 |
| Highway 26 at Langensand Road |  |  |  |  |  |  |
| 2022 Background Conditions | 77.4 | F | 0.31 / 0.62 | 137.4 | F | 0.39 / 0.62 |
| 2022 Background plus Site | 56.8 | F | 0.30 / 0.52 | 129.9 | F | 0.36/0.71 |
| 2022 Background plus Site RIRO | 107.2 | F | 0.31 / 0.85 | 168.9 | F | 0.36 / 0.83 |
| Highway 26 at Vista Loop Drive |  |  |  |  |  |  |
| 2022 Background Conditions | 11.4 | B | 0.30 / 0.05 | 13.9 | B | 0.34/0.09 |
| 2022 Background plus Site | 157.0 | F | $0.28 / 0.75$ | 412.7 | F | 0.32 / 0.75 |
| 2022 Background plus Site RIRO | 14.0 | B | 0.30 / 0.16 | 15.2 | C | 0.32 / 0.25 |
| Highway 211 at Dubarko Road |  |  |  |  |  |  |
| 2022 Background Conditions | 19.6 | C | 0.23 / 0.30 | 28.8 | D | 0.26 / 0.36 |
| 2022 Background plus Site | 21.0 | C | 0.23 / 0.47 | 54.3 | F | 0.26 / 0.79 |
| 2022 Background plus Site RIRO | 20.0 | C | 0.23 / 0.35 | 28.6 | D | 0.27 / 0.37 |
| Dubarko Road at Langensand Road |  |  |  |  |  |  |
| 2022 Background Conditions | 9.4 | A | 0.05 | 9.8 | A | 0.04 |
| 2022 Background plus Site | 10.3 | B | 0.17 | 11.1 | B | 0.22 |
| 2022 Background plus Site RIRO | 10.3 | B | 0.15 | 11.1 | B | 0.22 |

*(major street $\mathrm{v} / \mathrm{c}$ ) / (minor-street $\mathrm{v} / \mathrm{c}$ ) is shown for unsignalized ODOT intersections.

Based on the results of the operational analysis, the study intersections are projected to operate acceptably through year 2021 either with or without the addition of site trips from the proposed development and the diversion of through trips between Highway 26 and Highway 211 onto Dubarko Road.

Although the intersection of Highway 26 at SE Vista Loop Drive is shown to operate acceptably during the morning and evening peak hours, the average delays for the northeast-bound left/through lane are projected to be 157 seconds during the morning peak hour and 413 seconds during the evening peak hour. These long delays indicate that the northeast-bound left/through lane is unlikely

to accommodate any meaningful traffic volumes as vehicles are likely to divert to alternative (lowerdelay) travel routes. As shown by the right-in, right-out analysis, even if all site trips diverted to avoid these delays the remaining study intersections would continue to operate acceptably.

## Queuing Analysis

In addition to the operational analysis, a queuing analysis was conducted to determine an appropriate storage length for a northwest-bound left-turn lane on Highway 26 at Dubarko Road.

The storage length provided for the northwest-bound left-turn lane on Highway 26 should be sufficient to accommodate the $95^{\text {th }}$ percentile queue length for this movement. The $95^{\text {th }}$ percentile queue is the length which is exceeded during five percent or less of the peak hour. Queue lengths in excess of the $95^{\text {th }}$ percentile occur do not occur with sufficient frequency to allow for cost-effective design.

The queuing analysis was conducted for year 2022 background plus site trips conditions during the morning and evening peak hours. Based on the analysis, the projected $95^{\text {th }}$ percentile queue lengths were 38 feet during the morning peak hour and 80 feet during the evening peak hour. Accordingly, it is recommended that if a new turn lane is provided it should have a storage length of at least 100 feet.

The queuing analysis also showed a projected northeast-bound $95^{\text {th }}$-percentile queue length on Dubarko Road approaching Highway 26 of up to 277 feet.

## Site Circulation Considerations

The proposed subdivision includes a new four-leg intersection on Dubarko Road. "Street A" will connect to Fawn Street to the north, providing for local-street connectivity within the development and extending connectivity for the existing residential homes west of the site. "Street B" will extend south from Dubarko Road stubbing at the property line to provide future connectivity to the south in conformance with the city's Transportation System Plan.

It is anticipated that there may also be private access driveways on Dubarko Road within the subject property. Future access driveways should be located outside the standing queue for the intersection of Highway 26 at Dubarko Road or be restricted to right-in, right-out access only in order to ensure that they can operate safely and efficiently.

## Safety Analysis

## CRASH DATA ANALYSIS

Using data obtained from the Oregon Department of Transportation, a review of the five most recent years of available crash history (from January 2013 through December 2017) was performed for the study intersections. The crash data was evaluated based on the number, type, and severity of collisions, as well as the intersection crash rate. Crash rates allow comparison of relative safety risks at intersections with different lane configurations, volumes, and traffic control devices by accounting for both the number of crashes that occur during the study period and the number of vehicles that traveled through the intersection during that period. Crash rates are calculated using the standard assumption that evening peak hour volumes are approximately 10 percent of the average daily traffic volume at an intersection. The crash rates were compared to statewide crash rates for similar intersection types in order to identify any locations with crash rates in excess of the $90^{\text {th }}$ percentile.

The intersection of Highway 26 at SE Ten Eyck Road had seven reported collisions during the fiveyear analysis period. These included six rear-end collisions and one turning-movement collision. The crashes resulted in no serious injuries or fatalities and four reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.18 crashes per million entering vehicles. This is well below the $90^{\text {th }}$ percentile crash rate of 0.86 crashes per million entering vehicles for signalized, four-way urban intersections in Oregon.

The intersection of Highway 26 at SE Langensand Road had six reported collisions during the fiveyear analysis period. These included three turning-movement collisions, one angle collision, one backing collision and one pedestrian collision. The pedestrian collision occurred when a pedestrian walking along the south side of Highway 26 crossing Langensand Road was struck by a driver making an eastbound right turn from the highway onto Langensand Road. The collision resulted in a report of a "possible injury/complaint of pain" by the pedestrian. Overall, the crashes resulted in one non-incapacitating injury and five reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.20 crashes per million entering vehicles. This is well below the $90^{\text {th }}$ percentile crash rate of 0.29 crashes per million entering vehicles for stop-controlled, threeway urban intersections in Oregon.

The intersection of Highway 26 at SE Vista Loop Drive had no reported crashes during the five-year analysis period.

The intersection of Highway 211 at Dubarko Road had 27 reported crashes during the five-year analysis period. These included 15 angle collisions, 5 turning-movement collisions, 5 rear-end collisions, 1 backing collision, and 1 sideswipe-overtaking collision. The crashes resulted in no incapacitating injuries or fatalities. There were six "non-incapacitating" injuries reported and 18 reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 1.72 crashes per million entering vehicles. This is above the $90^{\text {th }}$ percentile crash rate of 1.08 crashes per million entering vehicles for rural unsignalized four-way intersections in the state of Oregon. The Oregon Department of Transportation recently undertook safety improvements at this intersection, including re-alignment of the minor-street approaches to intersect at a 90 -degree angle and the addition of some striping along the major-street to increase driver awareness of speed. However, the crash data for subsequent years showed no significant improvement in the crash
frequency at this intersection. An examination of the current intersection configuration revealed no significant apparent hazards and adequate sight distance from the minor-street approaches, allowing drivers approaching the highway to select safe gaps when turning onto or crossing the highway. As described in the Warrant Analysis section of this report below, the intersection currently meets allway stop control warrants based on crash history and is projected to meet all-way stop control warrants based on vehicular volume under year 2022 conditions with completion of the Dubarko Road connection to Highway 26. Accordingly, it is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety mitigations are recommended at this time.

The intersection of Dubarko Road at SE Langensand Road had one reported collision during the five-year analysis period. It was an angle collision that resulted in property damage only. The crash rate for the intersection was calculated to be 0.35 crashes per million entering vehicles. This is well below the $90^{\text {th }}$ percentile crash rate of 0.408 crashes per million entering vehicles for stop-controlled, four-way urban intersections in Oregon.

Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. It is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety improvements are recommended for the study area intersections at this time.

## Traffic Signal Warrant Analysis

Traffic signal warrants were examined for the unsignalized study intersections.
Based on the projected traffic volumes, traffic signal warrants are projected to be marginally met at for the intersection of Highway 211 at Dubarko Road under year $202230^{\text {th }}$-highest hour conditions with completion of the proposed development, the nearby "The Views" development, and completion of a full-movement connection between Highway 26 and Dubarko Road. Traffic signal warrants are not projected to be met for any of the other unsignalized study intersections for any of the analysis scenarios.

An additional traffic signal warrant analysis was prepared for the intersection of Highway 211 at Dubarko Road assuming that traffic is restricted to right-in, right-out only for the intersection of Highway 26 at Dubarko Road. Under this scenario, the side-street volumes are significantly reduced for the Dubarko Road approach to Highway 211 and traffic signal warrants are not projected to be met. This analysis also demonstrates that the triggering event that causes signal warrants to be marginally met at this intersection upon project completion is not the Bull Run Terrace Development. Rather, it is the completion of the city's planned connection of Dubarko Road to Highway 26. Accordingly, a request to construct a traffic signal at this intersection would be disproportionate to the actual impacts of the proposed development.

Since traffic volumes for Highway 211 at Dubarko Road are only projected to marginally meet signal warrants for $30^{\text {th }}$-highest hour conditions if all proposed developments are constructed, allway stop-control warrants were also examined for the intersection. Based on the analysis, all-way
stop control warrants are currently met for Criterion B (crash history) and are projected to be met upon completion of the proposed development for Criterion C (minimum volumes). Accordingly, all-way stop control can be installed at this intersection. Upon installation of all-way stop control, the intersection would be projected to operate at level of service C during the morning and evening peak hours, with an average delay of 24 seconds or less for the highest-delay (northbound) approach and a maximum $\mathrm{v} / \mathrm{c}$ ratio of 0.74 .

Alternatively, consideration was given to installing a roundabout at the intersection of Highway 211 and Dubarko Road. Based on the operational analysis, installation of a roundabout would result in operation well within capacity and at level of service A. However, according to Roundabouts: An Informational Guide, published by the Federal Highway Administration, "It is generally not desirable to locate roundabouts in locations where grades through the intersection are greater than four percent. The installation of roundabouts on roadways with grades lower than three percent is generally not problematic." In this instance, Highway 211 has a constant grade of approximately 6 percent through its intersection with Dubarko Road. Accordingly, installation of a roundabout would not be recommended absent significant re-grading of the approach roadways. The potential for snow and ice at the intersection compound this concern.

## TURN LaNe Warrant Analysis

Turn lane warrants were also examined for the major-street approaches to the unsignalized study intersections. Left-turn lane warrants are intended to evaluate whether a meaningful safety benefit may be expected if the turning vehicles are provided with turn lane within the street, allowing leftturning drivers to move out of the through travel lane so that following vehicles may pass without conflicts.

The intersection of Highway 26 at Langensand Road already has left and right turn lanes in place.
The intersection of Highway 26 at Dubarko Road is projected to meet warrants for a northwestbound left-turn lane and a southeast-bound right turn lane upon completion of the proposed development.

The intersection of Highway 211 at Dubarko Road currently meets warrants for a northbound leftturn lane and a northbound right-turn lane. However, the need for these turn lanes is not related to the proposed development. Further, the turn lane warrants would not be applicable and added lanes may not be needed if all-way stop control is installed at the intersection as recommended based on the safety analysis, or if a traffic signal is installed at the intersection.

The intersection of Dubarko Road at Langensand Road is not projected to meet turn lane warrants under any analysis scenarios. However, it was noted that the existing two-way stop control is currently oriented in a way that favors through traffic on Langensand Road. Upon completion of the Dubarko Road connection to Highway 26 the major street is projected to be Dubarko Road. Accordingly, consideration should be given to revising the traffic control at this intersection to remove the stop signs on the eastbound and westbound Dubarko Road approaches and install stop signs on the northbound and southbound Langensand Road approaches.

## Intersection Sight Distance Analysis

Intersection sight distance was evaluated for the proposed new Dubarko Road approach to Highway 26. The posted speed limit along Highway 26 is 55 mph . Using a design speed of 65 mph and designing for combination trucks, the minimum required intersection sight distance was calculated to be 1,195 feet in each direction.

The available intersection sight distances were measured from a position 14.5 feet behind the edge of the traveled way with a driver's eye height 3.5 feet above the driveway surface to an oncoming driver's eye height of 3.5 feet above the surface of the oncoming travel lane.

From the location of the proposed Dubarko Road approach to Highway 26, the available intersection sight distance was measured to be in excess of 1,200 feet in each direction. Since the available intersection sight distance is in excess of the minimum required, intersection sight distance was determined to be acceptable at this intersection. No sight distance mitigations are necessary or recommended.

## Transportation Planning Rule Analysis

In order to allow the proposed zone change on the subject property, the City of Sandy must find that the requirements of Oregon's Transportation Planning Rule (OAR 660-012-0060) are met. This rule provides guidance regarding whether and how the potential transportation impacts of a plan amendment must be mitigated. The relevant portions of the Transportation Planning Rule are quoted below, along with responses specific to the proposed comprehensive plan amendment and zone change.

## 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);

No changes are proposed to the functional classification of existing or planned transportation facilities.
(b) Change standards implementing a functional classification system; or

No changes are proposed to the standards implementing the functional classification system.
(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.

Under the reasonable worst case development scenario, the proposed zone change would result in a net increase of one trip during the morning peak hour, a decrease of 4 trips during the evening peak hour, and an increase of 274 daily trips. The projected change in peak-hour trips represents a negligible change in traffic and will therefore not degrade the performance of any existing or planned transportation facilities during the peak hours. Additionally, according to Oregon Highway Plan policy 1F5:
"If an amendment subject to OAR 660-012-0060 increases the volume to capacity ratio further, or degrades the performance of a facility so that it does not meet an adopted mobility target at the planning horizon, it will significantly affect the facility unless it falls within the thresholds listed below for a small increase in traffic."

It further defines that:
"In applying "avoid further degradation" for state highway facilities already operating above the mobility targets in Table 6 or Table 7 or those otherwise approved by the Oregon Transportation Commission, or facilities projected to be above the mobility targets at the planning horizon, a small increase in traffic does not cause 'further degradation' of the facility."

Finally, it states that:
The threshold for a small increase in traffic between the existing plan and the proposed amendment is defined in terms of the increase in total average daily trip volumes as follows:

- Any proposed amendment that does not increase the average daily trips by more than 400.

Since the proposed zone change would result in a net increase of fewer than 400 average daily trips, it is defined as a "small increase in traffic" and therefore as not degrading the performance of existing or planned transportation facilities.

Since the proposed land use action does not include changes to the functional classification system, change the standards of the functional classification system, result in types or levels of travel or access inconsistent with the functional classification of the surrounding street network or degrade the performance of existing or planned transportation facilities, the proposed annexation and zone change will not result in a significant effect as defined under Oregon's Transportation Planning Rule. Accordingly, no mitigation is necessary or recommended in conjunction with the proposed land use action.

## Conclusions

All study intersections are projected to operate within capacity under year 2022 traffic conditions either with or without the addition of site trips from the proposed development. However, upon completion of the residential development within the proposed subdivision and the connection of Dubarko Road to Highway 26, it is projected that the intersection of Highway 26 at Dubarko Road will operate with very high delays for the northeast-bound Dubarko Road approach. Since vehicles exiting the site to the west can also travel west on Dubarko Road to Langensand Road prior to turning west on Highway 26, it is expected that some vehicles will divert and the actual delays will be lower than those reported. An additional analysis showing operation of the study intersections with the new Dubarko Road at Highway 26 intersection restricted to right-in, right-out only demonstrates that there is sufficient capacity for such diversions even if all northeast-bound leftturning vehicles diverted to alternative travel paths.

Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. It is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety improvements are recommended for the study area intersections at this time.

Based on the warrant analysis, a northwest-bound left-turn lane and a southeast-bound right-turn lane are projected to be warranted at the intersection of Highway 26 at Dubarko Road with completion of the Dubarko Road extension. The northbound left-turn lane would not be needed at the time of project completion if the intersection is limited to right-in, right-out only. No other turn lanes or traffic signals are recommended in conjunction with the proposed subdivision.

Intersection sight distance was evaluated for the new intersection of Highway 26 at Dubarko Road. The proposed intersection was found to have adequate sight distance in both directions.

A zone change is proposed for the subject property from the existing mix of R-1, R-2 and C-3 zoning to $\mathrm{R}-1, \mathrm{R}-3, \mathrm{C}-3$ and POS zoning. This zone change is projected to result in a negligible change to traffic volumes as measured under the "reasonable worst case" development scenarios and therefore will not have a significant effect on operation of area roadways and intersections at the planning horizon as defined by Oregon's Transportation Planning Rule.

APPENDIX

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5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 16 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 5 | 26 | 2 | 0 | 0 | 74 | 0 | 0 | 140 |
| 7:05 AM | 10 | 0 | 1 | 0 | 1 | 0 | 10 | 0 | 2 | 18 | 3 | 0 | 1 | 65 | 2 | 0 | 113 |
| 7:10 AM | 17 | 1 | 0 | 0 | 2 | 0 | 11 | 0 | 7 | 36 | 2 | 0 | 2 | 74 | 1 | 0 | 153 |
| 7:15 AM | 12 | 0 | 0 | 0 | 1 | 2 | 9 | 0 | 9 | 40 | 2 | 0 | 1 | 84 | 1 | 0 | 161 |
| 7:20 AM | 15 | 0 | 0 | 0 | 3 | 0 | 11 | 0 | 3 | 40 | 1 | 0 | 0 | 68 | 0 | 0 | 141 |
| 7:25 AM | 14 | 1 | 0 | 0 | 1 | 1 | 16 | 0 | 2 | 40 | 4 | 0 | 0 | 70 | 1 | 0 | 150 |
| 7:30 AM | 7 | 1 | 1 | 0 | 0 | 0 | 16 | 0 | 8 | 43 | 2 | 0 | 0 | 67 | 0 | 0 | 145 |
| 7:35 AM | 12 | 2 | 0 | 0 | 3 | 0 | 12 | 0 | 0 | 56 | 5 | 0 | 0 | 57 | 1 | 0 | 148 |
| 7:40 AM | 8 | 2 | 0 | 0 | 0 | 0 | 11 | 0 | 4 | 59 | 3 | 0 | 0 | 53 | 0 | 0 | 140 |
| 7:45 AM | 12 | 1 | 1 | 0 | 2 | 0 | 11 | 0 | 4 | 53 | 3 | 0 | 0 | 45 | 2 | 0 | 134 |
| 7:50 AM | 4 | 2 | 0 | 0 | 1 | 0 | 10 | 0 | 9 | 47 | 4 | 0 | 0 | 62 | 0 | 0 | 139 |
| 7:55 AM | 4 | 1 | 0 | 0 | 1 | 1 | 8 | 0 | 3 | 62 | 5 | 0 | 0 | 42 | 2 | 0 | 129 |
| 8:00 AM | 5 | 0 | 1 | 0 | 2 | 1 | 13 | 0 | 2 | 46 | 2 | 0 | 0 | 41 | 0 | 0 | 113 |
| 8:05 AM | 6 | 0 | 0 | 0 | 1 | 1 | 5 | 0 | 8 | 50 | 2 | 0 | 0 | 42 | 2 | 0 | 117 |
| 8:10 AM | 3 | 0 | 0 | 0 | 2 | 1 | 10 | 0 | 5 | 45 | 4 | 0 | 0 | 53 | 1 | 0 | 124 |
| 8:15 AM | 12 | 0 | 0 | 0 | 2 | 0 | 7 | 0 | 3 | 38 | 1 | 0 | 0 | 34 | 1 | 0 | 98 |
| 8:20 AM | 6 | 2 | 0 | 0 | 2 | 0 | 9 | 0 | 5 | 38 | 1 | 0 | 1 | 49 | 0 | 0 | 113 |
| 8:25 AM | 8 | 0 | 0 | 0 | 1 | 0 | 11 | 0 | 4 | 44 | 3 | 0 | 0 | 39 | 2 | 0 | 112 |
| 8:30 AM | 5 | 0 | 0 | 0 | 2 | 1 | 10 | 0 | 4 | 66 | 2 | 0 | 0 | 47 | 0 | 0 | 137 |
| 8:35 AM | 10 | 0 | 0 | 0 | 3 | 0 | 13 | 0 | 6 | 59 | 5 | 0 | 0 | 45 | 1 | 0 | 142 |
| 8:40 AM | 7 | 0 | 0 | 0 | 5 | 1 | 15 | 0 | 10 | 62 | 3 | 0 | 1 | 43 | 1 | 0 | 148 |
| 8:45 AM | 5 | 0 | 0 | 0 | 1 | 0 | 12 | 0 | 5 | 69 | 5 | 0 | 0 | 63 | 0 | 0 | 160 |
| 8:50 AM | 9 | 2 | 0 | 0 | 3 | 0 | 12 | 0 | 7 | 56 | 8 | 0 | 1 | 46 | 1 | 0 | 145 |
| 8:55 AM | 8 | 1 | 0 | 0 | 2 | 0 | 13 | 0 | 6 | 51 | 8 | 0 | 2 | 44 | 1 | 0 | 136 |
| Total Survey | 215 | 16 | 4 | 0 | 41 | 9 | 272 | 0 | 121 | 1,144 | 80 | 0 | 9 | 1,307 | 20 | 0 | 3,238 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 2 |

15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 43 | 1 | 1 | 0 | 3 | 0 | 38 | 0 | 14 | 80 | 7 | 0 | 3 | 213 | 3 | 0 | 406 |
| 7:15 AM | 41 | 1 | 0 | 0 | 5 | 3 | 36 | 0 | 14 | 120 | 7 | 0 | 1 | 222 | 2 | 0 | 452 |
| 7:30 AM | 27 | 5 | 1 | 0 | 3 | 0 | 39 | 0 | 12 | 158 | 10 | 0 | 0 | 177 | 1 | 0 | 433 |
| 7:45 AM | 20 | 4 | 1 | 0 | 4 | 1 | 29 | 0 | 16 | 162 | 12 | 0 | 0 | 149 | 4 | 0 | 402 |
| 8:00 AM | 14 | 0 | 1 | 0 | 5 | 3 | 28 | 0 | 15 | 141 | 8 | 0 | 0 | 136 | 3 | 0 | 354 |
| 8:15 AM | 26 | 2 | 0 | 0 | 5 | 0 | 27 | 0 | 12 | 120 | 5 | 0 | 1 | 122 | 3 | 0 | 323 |
| 8:30 AM | 22 | 0 | 0 | 0 | 10 | 2 | 38 | 0 | 20 | 187 | 10 | 0 | 1 | 135 | 2 | 0 | 427 |
| 8:45 AM | 22 | 3 | 0 | 0 | 6 | 0 | 37 | 0 | 18 | 176 | 21 | 0 | 3 | 153 | 2 | 0 | 441 |
| Total Survey | 215 | 16 | 4 | 0 | 41 | 9 | 272 | 0 | 121 | 1,144 | 80 | 0 | 9 | 1,307 | 20 | 0 | 3,238 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 2 |

Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 145 | 44 | 189 | 0 | 161 | 77 | 238 | 0 | 612 | 1,034 | 1,646 | 0 | 775 | 538 | 1,313 | 0 | 1,693 |
| \%HV | 6.2\% |  |  |  | 3.1\% |  |  |  | 12.1\% |  |  |  | 6.1\% |  |  |  | 8.0\% |
| PHF | 0.81 |  |  |  | 0.82 |  |  |  | 0.81 |  |  |  | 0.84 |  |  |  | 0.93 |
| By <br> Movement | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 131 | 11 | 3 | 145 | 15 | 4 | 142 | 161 | 56 | 520 | 36 | 612 | 4 | 761 | 10 | 775 | 1,693 |
| \%HV | 6.9\% | 0.0\% | 0.0\% | 6.2\% | 13.3\% | 25.0\% | 1.4\% | 3.1\% | 8.9\% | 12.7\% | 8.3\% | 12.1\% | 75.0\% | 5.5\% | 20.0\% | 6.1\% | 8.0\% |
| PHF | 0.74 | 0.55 | 0.75 | 0.81 | 0.63 | 0.33 | 0.81 | 0.82 | 0.74 | 0.77 | 0.75 | 0.81 | 0.25 | 0.84 | 0.63 | 0.84 | 0.93 |



## Rolling Hour Summary

7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval <br> Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 131 | 11 | 3 | 0 | 15 | 4 | 142 | 0 | 56 | 520 | 36 | 0 | 4 | 761 | 10 | 0 | 1,693 | 0 | 0 | 0 | 0 |
| 7:15 AM | 102 | 10 | 3 | 0 | 17 | 7 | 132 | 0 | 57 | 581 | 37 | 0 | 1 | 684 | 10 | 0 | 1,641 | 0 | 0 | 0 | 1 |
| 7:30 AM | 87 | 11 | 3 | 0 | 17 | 4 | 123 | 0 | 55 | 581 | 35 | 0 | 1 | 584 | 11 | 0 | 1,512 | 0 | 0 | 0 | 2 |
| 7:45 AM | 82 | 6 | 2 | 0 | 24 | 6 | 122 | 0 | 63 | 610 | 35 | 0 | 2 | 542 | 12 | 0 | 1,506 | 1 | 0 | 0 | 2 |
| 8:00 AM | 84 | 5 | 1 | 0 | 26 | 5 | 130 | 0 | 65 | 624 | 44 | 0 | 5 | 546 | 10 | 0 | 1,545 | 1 | 0 | 0 | 2 |

## SE Ten Eyck Rd \& Hwy 26

Wednesday, March 20, 2019
7:00 AM to 9:00 AM


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 6 | 1 | 8 | 0 | 6 | - | 6 | 15 |
| 7:05 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 5 | 10 |
| 7:10 AM | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 2 | 2 | 1 | 5 | 11 |
| 7:15 AM | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 6 | 0 | 8 | 1 | 1 | 0 | 2 | 12 |
| 7:20 AM | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 5 | 0 | 5 | 0 | 1 | 0 | 1 | 9 |
| 7:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 7 | 0 | 1 | 0 | 1 | 8 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 | 0 | 7 | 0 | 7 | 14 |
| 7:35 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 7 | 0 | 7 | 0 | 6 | 0 | 6 | 14 |
| 7:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 9 | 0 | 1 | 0 | 1 | 10 |
| 7:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 6 | 0 | 6 | 0 | 4 | 0 | 4 | 11 |
| 7:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 3 | 0 | 7 | 0 | 7 | 11 |
| 7:55 AM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 6 | 0 | 1 | 1 | 2 | 10 |
| 8:00 AM | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 10 | 1 | 11 | 0 | 2 | 0 | 2 | 15 |
| 8:05 AM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 9 | 0 | 9 | 0 | 7 | 1 | 8 | 19 |
| 8:10 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 6 | 0 | 6 | 8 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 3 | 0 | 3 | 7 |
| 8:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 0 | 5 | 1 | 2 | 0 | 3 | 9 |
| 8:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 7 | 0 | 3 | 0 | 3 | 10 |
| 8:30 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 6 | 0 | 8 | 0 | 3 | 0 | 3 | 12 |
| 8:35 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 6 | 0 | 8 | 0 | 8 | 14 |
| 8:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 0 | 5 | 0 | 1 | 0 | 1 | 7 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 9 | 0 | 3 | 0 | 3 | 12 |
| 8:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 5 | 1 | 8 | 0 | 9 | 14 |
| 8:55 AM | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 2 | 2 | 0 | 3 | 0 | 3 | 8 |
| Total Survey | 10 | 0 | 0 | 10 | 4 | 1 | 9 | 14 | 9 | 131 | 7 | 147 | 5 | 91 | 3 | 99 | 270 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 14 | 1 | 16 | 2 | 13 | 1 | 16 | 36 |
| 7:15 AM | 3 | 0 | 0 | 3 | 1 | 1 | 0 | 2 | 2 | 17 | 1 | 20 | 1 | 3 | 0 | 4 | 29 |
| 7:30 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 22 | 0 | 23 | 0 | 14 | 0 | 14 | 38 |
| 7:45 AM | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 2 | 1 | 13 | 1 | 15 | 0 | 12 | 1 | 13 | 32 |
| 8:00 AM | 1 | 0 | 0 | 1 | 1 | 0 | 2 | 3 | 0 | 21 | 1 | 22 | 0 | 15 | 1 | 16 | 42 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 15 | 1 | 16 | 1 | 8 | 0 | 9 | 26 |
| 8:30 AM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 3 | 16 | 0 | 19 | 0 | 12 | 0 | 12 | 33 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 | 13 | 2 | 16 | 1 | 14 | 0 | 15 | 34 |
| Total Survey | 10 | 0 | 0 | 10 | 4 | 1 | 9 | 14 | 9 | 131 | 7 | 147 | 5 | 91 | 3 | 99 | 270 |

Heavy Vehicle Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | NorthboundSE Ten Eyck Rd |  |  | SouthboundSE Ten Eyck Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 9 | 7 | 16 | 5 | 7 | 12 | 74 | 53 | 127 | 47 | 68 | 115 | 135 |
| PHF | 0.38 |  |  | 0.63 |  |  | 0.80 |  |  | 0.73 |  |  | 0.89 |


| By Movement | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 9 | 0 | 0 | 9 | 2 | 1 | 2 | 5 | 5 | 66 | 3 | 74 | 3 | 42 | 2 | 47 | 135 |
| PHF | 0.38 | 0.00 | 0.00 | 0.38 | 0.50 | 0.25 | 0.25 | 0.63 | 0.63 | 0.75 | 0.75 | 0.80 | 0.25 | 0.75 | 0.50 | 0.73 | 0.89 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval <br> Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 9 | 0 | 0 | 9 | 2 | 1 | 2 | 5 | 5 | 66 | 3 | 74 | 3 | 42 | 2 | 47 | 135 |
| 7:15 AM | 6 | 0 | 0 | 6 | 3 | 1 | 4 | 8 | 4 | 73 | 3 | 80 | 1 | 44 | 2 | 47 | 141 |
| 7:30 AM | 3 | 0 | 0 | 3 | 2 | 0 | 5 | 7 | 2 | 71 | 3 | 76 | 1 | 49 | 2 | 52 | 138 |
| 7:45 AM | 3 | 0 | 0 | 3 | 2 | 0 | 6 | 8 | 4 | 65 | 3 | 72 | 1 | 47 | 2 | 50 | 133 |
| 8:00 AM | 1 | 0 | 0 | 1 | 2 | 0 | 7 | 9 | 4 | 65 | 4 | 73 | 2 | 49 | 1 | 52 | 135 |



## SE Ten Eyck Rd \& Hwy 26

Tuesday, March 19, 2019
4:00 PM to 6:00 PM


5-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | NorthboundSE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 4 | 0 | 2 | 0 | 4 | 3 | 11 | 0 | 8 | 58 | 12 | 0 | 1 | 49 | 2 | 0 | 154 | 0 | 1 | 0 | 0 |
| 4:05 PM | 10 | 1 | 0 | 0 | 7 | 1 | 5 | 0 | 12 | 63 | 8 | 0 | 1 | 53 | 3 | 0 | 164 | 0 | 0 | 0 | 0 |
| 4:10 PM | 7 | 2 | 3 | 0 | 1 | 0 | 17 | 0 | 12 | 76 | 11 | 0 | 0 | 65 | 1 | 0 | 195 | 0 | 0 | 0 | 0 |
| 4:15 PM | 14 | 0 | 1 | 0 | 7 | 1 | 9 | 0 | 18 | 71 | 15 | 0 | 0 | 62 | 1 | 0 | 199 | 0 | 0 | 0 | 0 |
| 4:20 PM | 9 | 0 | 1 | 0 | 4 | 1 | 11 | 0 | 9 | 75 | 10 | 0 | 0 | 62 | 7 | 0 | 189 | 0 | 0 | 0 | 0 |
| 4:25 PM | 12 | 2 | 0 | 0 | 5 | 0 | 10 | 0 | 12 | 61 | 14 | 0 | 0 | 52 | 0 | 0 | 168 | 0 | 0 | 0 | 0 |
| 4:30 PM | 11 | 1 | 4 | 0 | 3 | 2 | 12 | 0 | 17 | 87 | 16 | 1 | 1 | 58 | 1 | 0 | 213 | 0 | 0 | 0 | 0 |
| 4:35 PM | 15 | 0 | 0 | 0 | 2 | 2 | 6 | 0 | 6 | 59 | 14 | 0 | 0 | 65 | 3 | 0 | 172 | 0 | 0 | 0 | 0 |
| 4:40 PM | 7 | 1 | 1 | 0 | 3 | 0 | 7 | 0 | 7 | 54 | 9 | 0 | 1 | 57 | 0 | 0 | 147 | 1 | 0 | 0 | 0 |
| 4:45 PM | 8 | 1 | 0 | 0 | 4 | 1 | 3 | 0 | 13 | 71 | 15 | 1 | 3 | 51 | 3 | 0 | 173 | 0 | 0 | 0 | 0 |
| 4:50 PM | 13 | 2 | 1 | 0 | 1 | 1 | 6 | 0 | 19 | 74 | 8 | 0 | 0 | 56 | 0 | 0 | 181 | 0 | 0 | 0 | 0 |
| 4:55 PM | 7 | 1 | 0 | 0 | 1 | 0 | 12 | 0 | 10 | 67 | 14 | 0 | 3 | 57 | 1 | 0 | 173 |  | 0 | 0 | 0 |
| 5:00 PM | 13 | 3 | 1 | 0 | 2 | 2 | 14 | 0 | 12 | 81 | 12 | 0 | 0 | 49 | 1 | 0 | 190 | 2 | 0 | 0 | 0 |
| 5:05 PM | 12 | 2 | 1 | 0 | 4 | 3 | 4 | 0 | 14 | 66 | 11 | 0 | 0 | 68 | 3 | 1 | 188 | 0 | 0 | 0 | 0 |
| 5:10 PM | 8 | 0 | 0 | 0 | 6 | 2 | 10 | 0 | 13 | 60 | 12 | 0 | 0 | 68 | 2 | 0 | 181 | 2 | 0 | 0 | 0 |
| 5:15 PM | 8 | 2 | 1 | 0 | 6 | 2 | 8 | 0 | 9 | 70 | 11 | 0 | 0 | 57 | 1 | 0 | 175 | 0 | 0 | 0 | 0 |
| 5:20 PM | 8 | 1 | 1 | 1 | 1 | 4 | 10 | 0 | 15 | 73 | 10 | 0 | 0 | 43 | 1 | 0 | 167 | 0 | 1 | 0 | 0 |
| 5:25 PM | 9 | 1 | 0 | 0 | 4 | 2 | 8 | 0 | 14 | 74 | 11 | 0 | 0 | 43 | 0 | 0 | 166 | 0 | 0 | 0 | 0 |
| 5:30 PM | 5 | 0 | 1 | 0 | 4 | 0 | 5 | 0 | 15 | 64 | 10 | 0 | 0 | 44 | 0 | 0 | 148 | 1 | 0 | 0 | 0 |
| 5:35 PM | 5 | 1 | 0 | 0 | 7 | 0 | 9 | 0 | 17 | 50 | 4 | 1 | 0 | 39 | 0 | 0 | 132 | 0 | 0 | 0 | 0 |
| 5:40 PM | 4 | 0 | 0 | 0 | 2 | 1 | 5 | 0 | 11 | 56 | 7 | 0 | 0 | 30 | 1 | 0 | 117 | 2 | 0 | 0 | 2 |
| 5:45 PM | 4 | 1 | 0 | 0 | 3 | 2 | 8 | 0 | 14 | 76 | 6 | 0 | 3 | 41 | 1 | 0 | 159 | 0 | 0 | 0 | 0 |
| 5:50 PM | 7 | , | 0 | 0 | 0 | 1 | 6 | 0 | 14 | 69 | 8 | 0 | 0 | 42 | 0 | 0 | 148 | 0 | 0 | 0 | 0 |
| 5:55 PM | 10 | 1 | 0 | 0 | 0 | 2 | 3 | 0 | 16 | 65 | 10 | 0 | 0 | 51 | 1 | 0 | 159 | 0 | 0 | 0 | 0 |
| Total Survey | 210 | 24 | 18 | 1 | 81 | 33 | 199 | 0 | 307 | 1,620 | 258 | 3 | 13 | 1,262 | 33 | 1 | 4,058 | 9 | 2 | 0 | 2 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | $\begin{gathered} \text { Interval } \\ \text { Total } \\ \hline \end{gathered}$ | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 21 | 3 | 5 | 0 | 12 | 4 | 33 | 0 | 32 | 197 | 31 | 0 | 2 | 167 | 6 | 0 | 513 | 0 | 1 | 0 | 0 |
| 4:15 PM | 35 | 2 | 2 | 0 | 16 | 2 | 30 | 0 | 39 | 207 | 39 | 0 | 0 | 176 | 8 | 0 | 556 | 0 | 0 | 0 | 0 |
| 4:30 PM | 33 | 2 | 5 | 0 | 8 | 4 | 25 | 0 | 30 | 200 | 39 | 1 | 2 | 180 | 4 | 0 | 532 | 1 | 0 | 0 | 0 |
| 4:45 PM | 28 | 4 | 1 | 0 | 6 | 2 | 21 | 0 | 42 | 212 | 37 | 1 | 6 | 164 | 4 | 0 | 527 | 1 | 0 | 0 | 0 |
| 5:00 PM | 33 | 5 | 2 | 0 | 12 | 7 | 28 | 0 | 39 | 207 | 35 | 0 | 0 | 185 | 6 | 1 | 559 | 4 | 0 | 0 | 0 |
| 5:15 PM | 25 | 4 | 2 | 1 | 11 | 8 | 26 | 0 | 38 | 217 | 32 | 0 | 0 | 143 | 2 | 0 | 508 | 0 | 1 | 0 | 0 |
| 5:30 PM | 14 | 1 | 1 | 0 | 13 | 1 | 19 | 0 | 43 | 170 | 21 | 1 | 0 | 113 | 1 | 0 | 397 | 3 | 0 | 0 | 2 |
| 5:45 PM | 21 | 3 | 0 | 0 | 3 | 5 | 17 | 0 | 44 | 210 | 24 | 0 | 3 | 134 | 2 | 0 | 466 | 0 | 0 | 0 | 0 |
| Total Survey | 210 | 24 | 18 | 1 | 81 | 33 | 199 | 0 | 307 | 1,620 | 258 | 3 | 13 | 1,262 | 33 | 1 | 4,058 | 9 | 2 | 0 | 2 |

Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Ten Eyck Rd |  |  |  | SouthboundSE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 156 | 170 | 326 | 0 | 161 | 185 | 346 | 0 | 1,140 | 941 | 2,081 | 2 | 731 | 892 | 1,623 | 1 | 2,188 |
| \%HV | 1.3\% |  |  |  | 5.6\% |  |  |  | 3.0\% |  |  |  | 6.6\% |  |  |  | 4.3\% |
| PHF | 0.87 |  |  |  | 0.79 |  |  |  | 0.95 |  |  |  | 0.92 |  |  |  | 0.94 |
| By <br> Movement |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 128 | 15 | 13 | 156 | 37 | 13 | 111 | 161 | 149 | 842 | 149 | 1,140 | 8 | 702 | 21 | 731 | 2,188 |
| \%HV | 1.6\% | 0.0\% | 0.0\% | 1.3\% | 0.0\% | 0.0\% | 8.1\% | 5.6\% | 4.0\% | 3.0\% | 2.0\% | 3.0\% | 0.0\% | 6.7\% | 4.8\% | 6.6\% | 4.3\% |
| PHF | 0.84 | 0.63 | 0.65 | 0.87 | 0.58 | 0.65 | 0.75 | 0.79 | 0.89 | 0.94 | 0.85 | 0.95 | 0.33 | 0.93 | 0.58 | 0.92 | 0.94 |



Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | WestboundHwy 26 |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 117 | 11 | 13 | 0 | 42 | 12 | 109 | 0 | 143 | 816 | 146 | 2 | 10 | 687 | 22 | 0 | 2,128 | 2 | 1 | 0 | 0 |
| 4:15 PM | 129 | 13 | 10 | 0 | 42 | 15 | 104 | 0 | 150 | 826 | 150 | 2 | 8 | 705 | 22 | 1 | 2,174 | 6 | 0 | 0 | 0 |
| 4:30 PM | 119 | 15 | 10 | 1 | 37 | 21 | 100 | 0 | 149 | 836 | 143 | 2 | 8 | 672 | 16 | 1 | 2,126 | 6 | 1 | 0 | 0 |
| 4:45 PM | 100 | 14 | 6 | 1 | 42 | 18 | 94 | 0 | 162 | 806 | 125 | 2 | 6 | 605 | 13 | 1 | 1,991 | 8 | 1 | 0 | 2 |
| 5:00 PM | 93 | 13 | 5 | 1 | 39 | 21 | 90 | 0 | 164 | 804 | 112 | 1 | , | 575 | 11 | 1 | 1,930 | 7 | 1 | 0 | 2 |

## SE Ten Eyck Rd \& Hwy 26

Tuesday, March 19, 2019
4:00 PM to 6:00 PM


Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | SouthboundSE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 10 | 1 | 11 | 15 |
| 4:05 PM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 6 | 0 | 6 | 0 | 3 | 1 | 4 | 11 |
| 4:10 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 8 | 0 | 8 | 10 |
| 4:15 PM | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 2 | 2 | 3 | 0 | 5 | 0 | 3 | 0 | 3 | 12 |
| 4:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 3 | 0 | 4 | 0 | 5 | 1 | 6 | 12 |
| 4:25 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 1 | 6 | 0 | 4 | 0 | 4 | 11 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 3 | 6 |
| 4:35 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 5 |
| 4:40 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 3 | 0 | 2 | 0 | 2 | 6 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 4 | 0 | 4 | 6 |
| 4:50 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 | 7 |
| 4:55 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 4 | 0 | 0 | 0 | 0 | 5 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 5 | 0 | 1 | 0 | 1 | 6 |
| 5:05 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 5 | 0 | 5 | 7 |
| 5:10 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 4 | 0 | 4 | 0 | 4 | 8 |
| 5:15 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 2 | 0 | 2 | 4 |
| 5:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 5 | 0 | 5 | 6 |
| 5:25 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 3 |
| 5:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 4 | 0 | 3 | 0 | 3 | 7 |
| 5:35 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 4 | 0 | 4 | 6 |
| 5:40 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 2 |
| 5:45 PM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 3 | 6 |
| 5:50 PM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 4 | 0 | 4 | 7 |
| 5:55 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 3 | 0 | 5 | 0 | 5 | 8 |
| Total Survey | 4 | 0 | 0 | 4 | 1 | 0 | 9 | 10 | 10 | 53 | 5 | 68 | 0 | 91 | 3 | 94 | 176 |

Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 12 | 0 | 12 | 0 | 21 | 2 | 23 | 36 |
| 4:15 PM | 2 | 0 | 0 | 2 | 0 | 0 | 5 | 5 | 3 | 11 | 1 | 15 | 0 | 12 | 1 | 13 | 35 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 | 3 | 0 | 4 | 0 | 10 | 0 | 10 | 17 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 1 | 6 | 0 | 11 | 0 | 11 | 18 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 1 | 11 | 0 | 10 | 0 | 10 | 21 |
| 5:15 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 5 | 0 | 8 | 0 | 8 | 13 |
| 5:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 1 | 8 | 0 | 7 | 0 | 7 | 15 |
| 5:45 PM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 5 | 1 | 7 | 0 | 12 | 0 | 12 | 21 |
| Total Surver | 4 | 0 | 0 | 4 | 1 | 0 | 9 | 10 | 10 | 53 | 5 | 68 | 0 | 91 | 3 | 94 | 176 |

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Ten Eyck Rd |  |  | SouthboundSE Ten Eyck Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 3 | 5 | 9 | 7 | 16 | 34 | 58 | 92 | 48 | 25 | 73 | 93 |
| PHF | 0.25 |  |  | 0.45 |  |  | 0.57 |  |  | 0.71 |  |  | 0.66 |


| By Movement | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 2 | 0 | 0 | 2 | 0 | 0 | 9 | 9 | 6 | 25 | 3 | 34 | 0 | 47 | 1 | 48 | 93 |
| PHF | 0.25 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.45 | 0.45 | 0.50 | 0.57 | 0.38 | 0.57 | 0.00 | 0.73 | 0.25 | 0.71 | 0.66 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \end{gathered}$ | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 2 | 0 | 0 | 2 | 1 | 0 | 9 | 10 | 6 | 29 | 2 | 37 | 0 | 54 | 3 | 57 | 106 |
| 4:15 PM | 2 | 0 | 0 | 2 | 0 | 0 | 9 | 9 | 7 | 26 | 3 | 36 | 0 | 43 | 1 | 44 | 91 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 5 | 19 | 2 | 26 | 0 | 39 | 0 | 39 | 69 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 5 | 22 | 3 | 30 | 0 | 36 | 0 | 36 | 67 |
| 5:00 PM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 24 | 3 | 31 | 0 | 37 | 0 | 37 | 70 |




5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  |
| 7:00 AM | 4 | 0 | 0 |  | 0 | 25 | 1 | 0 | 2 | 62 | 0 | 94 |
| 7:05 AM | 9 | 0 | 0 |  | 0 | 24 | 2 | 0 | 2 | 65 | 0 | 102 |
| 7:10 AM | 3 | 0 | 0 |  | 0 | 22 | 2 | 0 | 0 | 74 | 0 | 101 |
| 7:15 AM | 4 | 2 | 0 |  | 0 | 33 | 3 | 0 | 1 | 71 | 0 | 114 |
| 7:20 AM | 9 | 2 | 0 |  | 0 | 52 | 1 | 0 | 0 | 71 | 0 | 135 |
| 7:25 AM | 4 | 1 | 0 |  | 0 | 31 | 3 | 0 | 4 | 67 | 0 | 110 |
| 7:30 AM | 5 | 2 | 0 |  | 0 | 39 | 5 | 0 | 0 | 60 | 0 | 111 |
| 7:35 AM | 4 | 1 | 0 |  | 0 | 52 | 1 | 0 | 2 | 54 | 0 | 114 |
| 7:40 AM | 8 | 0 | 0 |  | 0 | 56 | 3 | 0 | 2 | 41 | 0 | 110 |
| 7:45 AM | 1 | 2 | 0 |  | 0 | 49 | 8 | 0 | 3 | 42 | 0 | 105 |
| 7:50 AM | 4 | 2 | 0 |  | 0 | 56 | 2 | 0 | 1 | 52 | 0 | 117 |
| 7:55 AM | 7 | 1 | 0 |  | 0 | 59 | 2 | 0 | 0 | 45 | 0 | 114 |
| 8:00 AM | 5 | 2 | 0 |  | 0 | 54 | 2 | 0 | 0 | 38 | 0 | 101 |
| 8:05 AM | 2 | 2 | 0 |  | 0 | 44 | 3 | 0 | 1 | 41 | 0 | 93 |
| 8:10 AM | 2 | 2 | 0 |  | 0 | 41 | 1 | 0 | 0 | 49 | 0 | 95 |
| 8:15 AM | 4 | 1 | 0 |  | 0 | 46 | , | 0 | 2 | 34 | 0 | 87 |
| 8:20 AM | 2 | 1 | 0 |  | 0 | 40 | 3 | 0 | 0 | 42 | 0 | 88 |
| 8:25 AM | 4 | 2 | 0 |  | 0 | 39 | 2 | 0 | 1 | 43 | 0 | 91 |
| 8:30 AM | 5 | 4 | 0 |  | 0 | 53 | 1 | 0 | 2 | 37 | 0 | 102 |
| 8:35 AM | 2 | 3 | 0 |  | 0 | 56 | 1 | 0 | 0 | 53 | 0 | 115 |
| 8:40 AM | 1 | 2 | 0 |  | 0 | 53 | 8 | 0 | 1 | 47 | 0 | 112 |
| 8:45 AM | 6 | 2 | 0 |  | 0 | 77 | 5 | 0 | 0 | 53 | 0 | 143 |
| 8:50 AM | 4 | 4 | 0 |  | 0 | 52 | 2 | 0 | 5 | 60 | 0 | 127 |
| 8:55 AM | 5 | 0 | 0 |  | 0 | 60 | 0 | 0 | 1 | 42 | 0 | 108 |
| Total Survey | 104 | 38 | 0 |  | 0 | 1,113 | 61 | 0 | 30 | 1,243 | 0 | 2,589 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 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 |
| 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 |

15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  |
| 7:00 AM | 16 | 0 | 0 |  | 0 | 71 | 5 | 0 | 4 | 201 | 0 | 297 |
| 7:15 AM | 17 | 5 | 0 |  | 0 | 116 | 7 | 0 | 5 | 209 | 0 | 359 |
| 7:30 AM | 17 | 3 | 0 |  | 0 | 147 | 9 | 0 | 4 | 155 | 0 | 335 |
| 7:45 AM | 12 | 5 | 0 |  | 0 | 164 | 12 | 0 | 4 | 139 | 0 | 336 |
| 8:00 AM | 9 | 6 | 0 |  | 0 | 139 | 6 | 0 | 1 | 128 | 0 | 289 |
| 8:15 AM | 10 | 4 | 0 |  | 0 | 125 | 5 | 0 | 3 | 119 | 0 | 266 |
| 8:30 AM | 8 | 9 | 0 |  | 0 | 162 | 10 | 0 | 3 | 137 | 0 | 329 |
| 8:45 AM | 15 | 6 | 0 |  | 0 | 189 | 7 | 0 | 6 | 155 | 0 | 378 |
| Total Survey | 104 | 38 | 0 |  | 0 | 1,113 | 61 | 0 | 30 | 1,243 | 0 | 2,589 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | NorthboundSE Langensand Rd |  |  |  | Southbound <br> SE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 78 | 49 | 127 | 0 | 0 | 0 | 0 | 0 | 561 | 743 | 1,304 | 0 | 695 | 542 | 1,237 | 0 | 1,334 |
| \%HV | 3.8\% |  |  |  | 0.0\% |  |  |  | 13.0\% |  |  |  | 6.8\% |  |  |  | 9.2\% |
| PHF | 0.85 |  |  |  | 0.00 |  |  |  | 0.80 |  |  |  | 0.80 |  |  |  | 0.93 |
| By <br> Movement | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L |  | R | Total |  |  |  | Total |  | T | R | Total | L | T |  | Total |  |
| Volume | 63 |  | 15 | 78 |  |  |  | 0 |  | 527 | 34 | 561 | 15 | 680 |  | 695 | 1,334 |
| \%HV | 3.2\% | NA | 6.7\% | 3.8\% | NA | NA | NA | 0.0\% | NA | 13.1\% | 11.8\% | 13.0\% | 20.0\% | 6.5\% | NA | 6.8\% | 9.2\% |
| PHF | 0.88 |  | 0.75 | 0.85 |  |  |  | 0.00 |  | 0.78 | 0.65 | 0.80 | 0.54 | 0.79 |  | 0.80 | 0.93 |



## Rolling Hour Summary

7:00 AM to 9:00 AM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | NorthboundSE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | $\begin{gathered} \text { Interval } \\ \text { Total } \end{gathered}$ | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  | North | South | East | West |
| 7:00 AM | 62 | 13 | 0 |  | 0 | 498 | 33 | 0 | 17 | 704 | 0 | 1,327 | 0 | 0 | 0 | 0 |
| 7:15 AM | 55 | 19 | 0 |  | 0 | 566 | 34 | 0 | 14 | 631 | 0 | 1,319 | 0 | 0 | 0 | 0 |
| 7:30 AM | 48 | 18 | 0 |  | 0 | 575 | 32 | 0 | 12 | 541 | 0 | 1,226 | 0 | 0 | 0 | 0 |
| 7:45 AM | 39 | 24 | 0 |  | 0 | 590 | 33 | 0 | 11 | 523 | 0 | 1,220 | 0 | 0 | 0 | 0 |
| 8:00 AM | 42 | 25 | 0 |  | 0 | 615 | 28 | 0 | 13 | 539 | 0 | 1,262 | 0 | 0 | 0 | 0 |

Heavy Vehicle Summary

## All Traffic Data <br> Clay Carney <br> (503) 833-2740

Out 46
In 73


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | R | Total |  | Total | T | R | Total | L | T | Total | Total |
| 7:00 AM | 0 | 0 | 0 |  | 0 | 6 | 1 | 7 | 0 | 6 | 6 | 13 |
| 7:05 AM | 0 | 0 | 0 |  | 0 | 4 | 1 | 5 | 0 | 6 | 6 | 11 |
| 7:10 AM | 0 | 0 | 0 |  | 0 | 2 | 0 | 2 | 0 | 3 | 3 | 5 |
| 7:15 AM | 0 | 0 | 0 |  | 0 | 6 | 0 | 6 | 0 | 3 | 3 | 9 |
| 7:20 AM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 7 |
| 7:25 AM | 0 | 0 | 0 |  | 0 | 5 | 1 | 6 | 1 | 2 | 3 | 9 |
| 7:30 AM | 0 | 0 | 0 |  | 0 | 6 | 0 | 6 | 0 | 6 | 6 | 12 |
| 7:35 AM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 1 | 7 | 8 | 13 |
| 7:40 AM | 1 | 0 | 1 |  | 0 | 7 | 0 | 7 | 0 | 2 | 2 | 10 |
| 7:45 AM | 0 | 0 | 0 |  | 0 | 11 | 1 | 12 | 1 | 3 | 4 | 16 |
| 7:50 AM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 5 | 5 | 11 |
| 7:55 AM | 1 | 0 | 1 |  | 0 | 3 | 0 | 3 | 0 | 5 | 5 | 9 |
| 8:00 AM | 0 | 0 | 0 |  | 0 | 9 | 0 | 9 | 0 | 2 | 2 | 11 |
| 8:05 AM | 1 | 0 | 1 |  | 0 | 11 | 1 | 12 | 0 | 7 | 7 | 20 |
| 8:10 AM | 0 | 0 | 0 |  | 0 | 2 | 0 | 2 | 0 | 5 | 5 | 7 |
| 8:15 AM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 4 | 4 | 7 |
| 8:20 AM | 0 | 0 | 0 |  | 0 | 4 | 1 | 5 | 0 | 2 | 2 | 7 |
| 8:25 AM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 3 | 3 | 9 |
| 8:30 AM | 0 | 2 | 2 |  | 0 | 9 | 0 | 9 | 1 | 3 | 4 | 15 |
| 8:35 AM | 1 | 1 | 2 |  | 0 | 5 | 0 | 5 | 0 | 6 | 6 | 13 |
| 8:40 AM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 0 | 3 | 3 | 8 |
| 8:45 AM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 | 1 | 1 | 8 |
| 8:50 AM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 9 | 9 | 12 |
| 8:55 AM | 0 | 0 | 0 |  | 0 | 4 | 0 | 4 | 0 | 4 | 4 | 8 |
| Total Survey | 4 | 5 | 9 |  | 0 | 132 | 8 | 140 | 4 | 97 | 101 | 250 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 7:00 AM | 0 | , | 0 |  | 0 | 12 | 2 | 14 | 0 | 15 | 15 | 29 |
| 7:15 AM | 0 | 0 | 0 |  | 0 | 18 | 1 | 19 | 1 | 5 | 6 | 25 |
| 7:30 AM | 1 | 0 | 1 |  | 0 | 18 | 0 | 18 | 1 | 15 | 16 | 35 |
| 7:45 AM | 1 | 1 | 2 |  | 0 | 18 | 2 | 20 | 1 | 13 | 14 | 36 |
| 8:00 AM | 1 | 0 | 1 |  | 0 | 22 | 1 | 23 | 0 | 14 | 14 | 38 |
| 8:15 AM | 0 | 1 | 1 |  | 0 | 11 | 2 | 13 | 0 | 9 | 9 | 23 |
| 8:30 AM | 1 | 3 | 4 |  | 0 | 19 | 0 | 19 | 1 | 12 | 13 | 36 |
| 8:45 AM | 0 | 0 | 0 |  | 0 | 14 | 0 | 14 | 0 | 14 | 14 | 28 |
| Total Survey | 4 | 5 | 9 |  | 0 | 132 | 8 | 140 | 4 | 97 | 101 | 250 |

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 3 | 7 | 10 | 0 | 0 | 0 | 73 | 46 | 119 | 47 | 70 | 117 | 123 |
| PHF | 0.38 |  |  | 0.00 |  |  | 0.76 |  |  | 0.69 |  |  | 0.79 |


| By <br> Movement | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| Volume | 2 | 1 | 3 |  | 0 | 69 | 4 | 73 | 3 | 44 | 47 | 123 |
| PHF | 0.50 | 0.25 | 0.38 |  | 0.00 | 0.75 | 0.50 | 0.76 | 0.38 | 0.73 | 0.69 | 0.79 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | R | Total |  | Total | T | R | Total | L | T | Total | Total |
| 7:00 AM | 2 | 1 | 3 |  | 0 | 66 | 5 | 71 | 3 | 48 | 51 | 125 |
| 7:15 AM | 3 | 1 | 4 |  | 0 | 76 | 4 | 80 | 3 | 47 | 50 | 134 |
| 7:30 AM | 3 | 2 | 5 |  | 0 | 69 | 5 | 74 | 2 | 51 | 53 | 132 |
| 7:45 AM | 3 | 5 | 8 |  | 0 | 70 | 5 | 75 | 2 | 48 | 50 | 133 |
| 8:00 AM | 2 | 4 | 6 |  | 0 | 66 | 3 | 69 | 1 | 49 | 50 | 125 |

## Peak Hour Summary

All Traffic Data
All Traffic Data

Clay Carney
(503) 833-2740

## SE Langensand Rd \& Hwy 26

7:05 AM to 8:05 AM
Wednesday, March 20, 2019

## Bikes

0


| Approach | PHF | HV\% | Volume |
| :---: | :---: | :---: | :---: |
| EB | 0.80 | $13.0 \%$ | 561 |
| WB | 0.80 | $6.8 \%$ | 695 |
| NB | 0.85 | $3.8 \%$ | 78 |
| SB | 0.00 | $0.0 \%$ | 0 |
| Intersection | 0.93 | $9.2 \%$ | 1,334 |

Count Period: 7:00 AM to 9:00 AM


5-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | NorthboundSE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes | Bikes | T | R | Bikes | L | T | Bikes |  | North | South | East | West |
| 4:00 PM | 2 | 4 | 0 | 0 | 62 | 9 | 0 | 5 | 50 | 0 | 132 | 0 | 0 | 0 | 0 |
| 4:05 PM | 1 | 2 | 0 | 0 | 69 | 6 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:10 PM | 1 | 3 | 0 | 0 | 61 | 3 | 0 | 1 | 74 | 0 | 143 | 0 | 0 | 0 | 0 |
| 4:15 PM | 6 | 1 | 0 | 0 | 76 | 5 | 0 | 1 | 50 | 0 | 139 | 0 | 0 | 0 | 0 |
| 4:20 PM | 5 | 5 | 0 | 0 | 79 | 9 | 0 | 1 | 70 | 0 | 169 | 0 | 0 | 0 | 0 |
| 4:25 PM | 6 | 0 | 1 | 0 | 58 | 8 | 0 | 1 | 49 | 0 | 122 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 3 | 0 | 0 | 75 | 12 | 0 | 1 | 56 | 0 | 147 | 0 | 0 | 0 | 0 |
| 4:35 PM | 2 | 5 | 0 | 0 | 61 | 7 | 0 | 1 | 64 | 0 | 140 | 0 | 0 | 0 | 0 |
| 4:40 PM | 0 | 1 | 0 | 0 | 59 | 1 | 0 | 1 | 55 | 0 | 117 | 0 | 0 | 0 | 0 |
| 4:45 PM | 1 | 1 | 0 | 0 | 64 | 3 | 0 | 2 | 63 | 0 | 134 | 0 | 0 | 0 | 0 |
| 4:50 PM | 6 | 5 | 0 | 0 | 62 | 6 | 0 | 0 | 54 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:55 PM | 3 | 0 | 0 | 0 | 72 | 5 | 0 | 2 | 56 | 0 | 138 | 0 | 0 | 0 | 0 |
| 5:00 PM | 1 | 5 | 0 | 0 | 62 | 10 | 0 | 1 | 55 | 0 | 134 | 0 | 0 | 0 | 0 |
| 5:05 PM | 2 | 3 | 0 | 0 | 72 | 11 | 0 | 4 | 76 | 0 | 168 | 0 | 0 | 0 | 0 |
| 5:10 PM | 2 | 3 | 0 | 0 | 58 | 14 | 0 | 1 | 65 | 0 | 143 | 0 | 0 | 0 | 0 |
| 5:15 PM | 1 | 2 | 0 | 0 | 51 | 8 | 0 | 2 | 59 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:20 PM | 2 | 4 | 0 | 0 | 78 | 7 | 0 | 2 | 43 | 0 | 136 | 0 | 0 | 0 | 0 |
| 5:25 PM | 3 | 1 | 0 | 0 | 71 | 5 | 0 | 1 | 42 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:30 PM | 2 | 2 | 0 | 0 | 67 | 7 | 0 | 3 | 38 | 0 | 119 | 0 | 0 | 0 | 0 |
| 5:35 PM | 1 | 1 | 0 | 0 | 60 | 5 | 0 | 1 | 38 | 0 | 106 | 0 | 0 | 0 | 0 |
| 5:40 PM | 0 | 4 | 0 | 0 | 49 | 7 | 0 | 0 | 34 | 0 | 94 | 0 | 0 | 0 | 0 |
| 5:45 PM | 2 | 1 | 0 | 0 | 69 | 7 | 0 | 1 | 45 | 0 | 125 | 0 | 0 | 0 | 0 |
| 5:50 PM | 0 | 3 | 0 | 0 | 60 | 4 | 0 | 0 | 43 | 0 | 110 | 0 | 0 | 0 | 0 |
| 5:55 PM | 4 | 1 | 0 | 0 | 65 | 8 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| Total Survey | 53 | 60 | 1 | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 | 0 | 0 | 0 | 0 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  |
| 4:00 PM | 4 | 9 | 0 |  | 0 | 192 | 18 | 0 | 9 | 176 | 0 | 408 |
| 4:15 PM | 17 | 6 | 1 |  | 0 | 213 | 22 | 0 | 3 | 169 | 0 | 430 |
| 4:30 PM | 2 | 9 | 0 |  | 0 | 195 | 20 | 0 | 3 | 175 | 0 | 404 |
| 4:45 PM | 10 | 6 | 0 |  | 0 | 198 | 14 | 0 | 4 | 173 | 0 | 405 |
| 5:00 PM | 5 | 11 | 0 |  | 0 | 192 | 35 | 0 | 6 | 196 | 0 | 445 |
| 5:15 PM | 6 | 7 | 0 |  | 0 | 200 | 20 | 0 | 5 | 144 | 0 | 382 |
| 5:30 PM | 3 | 7 | 0 |  | 0 | 176 | 19 | 0 | 4 | 110 | 0 | 319 |
| 5:45 PM | 6 | 5 | 0 |  | 0 | 194 | 19 | 0 | 4 | 140 | 0 | 368 |
| Total Surver | 53 | 60 | 1 |  | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 65 | 96 | 161 | 1 | 0 | 0 | 0 | 0 | 881 | 755 | 1,636 | 0 | 738 | 833 | 1,571 | 0 | 1,684 |
| \%HV | 3.1\% |  |  |  | 0.0\% |  |  |  | 3.3\% |  |  |  | 6.6\% |  |  |  | 4.8\% |
| PHF | 0.71 |  |  |  | 0.00 |  |  |  | 0.91 |  |  |  | 0.94 |  |  |  | 0.93 |
| By <br> Movement | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L |  | R | Total |  |  |  | Total |  | T | R | Total | L | T |  | Total |  |
| Volume | 33 |  | 32 | 65 |  |  |  | 0 |  | 801 | 80 | 881 | 16 | 722 |  | 738 | 1,684 |
| \%HV | 3.0\% | NA | 3.1\% | 3.1\% | NA | NA | NA | 0.0\% | NA | 3.4\% | 2.5\% | 3.3\% | 0.0\% | 6.8\% | NA | 6.6\% | 4.8\% |
| PHF | 0.49 |  | 0.80 | 0.71 |  |  |  | 0.00 |  | 0.93 | 0.69 | 0.91 | 0.57 | 0.93 |  | 0.94 | 0.93 |



Rolling Hour Summary
4:00 PM to 6:00 PM


SE Langensand Rd \& Hwy 26
Tuesday, March 19, 2019
4:00 PM to 6:00 PM
Out 50
In 29


Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total | Total | T | R | Total | L | T | Total |  |
| 4:00 PM | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 11 | 11 | 14 |
| 4:05 PM | 0 | 0 | 0 | 0 | 8 | 0 | 8 | 0 | 5 | 5 | 13 |
| 4:10 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 7 | 7 | 9 |
| 4:15 PM | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 4 | 4 | 9 |
| 4:20 PM | 1 | 0 | 1 | 0 | 4 | 1 | 5 | 0 | 4 | 4 | 10 |
| 4:25 PM | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 5 | 5 | 8 |
| 4:30 PM | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 3 | 3 | 6 |
| 4:35 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 4 | 4 | 5 |
| 4:40 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 3 | 5 |
| 4:45 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 4 | 4 | 5 |
| 4:50 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 6 | 6 | 8 |
| 4:55 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 2 | 3 |
| 5:00 PM | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 1 | 1 | 4 |
| 5:05 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 6 | 6 | 8 |
| 5:10 PM | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | 4 | 5 |
| 5:15 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 3 | 5 |
| 5:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 5 |
| 5:25 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 2 |
| 5:30 PM | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 2 | 2 | 6 |
| 5:35 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 3 |
| 5:40 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 3 | 3 | 4 |
| 5:45 PM | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 3 | 3 | 7 |
| 5:50 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 2 | 3 |
| 5:55 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 7 | 7 | 9 |
| Total Survey | 1 | 1 | 2 | 0 | 53 | 3 | 56 | 1 | 97 | 98 | 156 |

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | NorthboundSE Langensand Rd |  |  | Southbound <br> SE Langensand Rd |  | $\begin{gathered} \hline \text { Eastbound } \\ \text { Hwy } 26 \\ \hline \end{gathered}$ |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 4:00 PM | 0 | 0 | 0 |  | 0 | 13 | 0 | 13 | 0 | 23 | 23 | 36 |
| 4:15 PM | 1 | 0 | 1 |  | 0 | 12 | 1 | 13 | 0 | 13 | 13 | 27 |
| 4:30 PM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 10 | 10 | 16 |
| 4:45 PM | 0 | 0 | 0 |  | 0 | 4 | 0 | 4 | 0 | 12 | 12 | 16 |
| 5:00 PM | 0 | 0 | 0 |  | 0 | 5 | 1 | 6 | 0 | 11 | 11 | 17 |
| 5:15 PM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 9 | 9 | 12 |
| 5:30 PM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 1 | 7 | 8 | 13 |
| 5:45 PM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 | 12 | 12 | 19 |
| Total Surver | 1 | 1 | 2 |  | 0 | 53 | 3 | 56 | 1 | 97 | 98 | 156 |

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 2 | 4 | 0 | 0 | 0 | 29 | 50 | 79 | 49 | 28 | 77 | 80 |
| PHF | 0.25 |  |  | 0.00 |  |  | 0.56 |  |  | 0.82 |  |  | 0.71 |


| By <br> Movement | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| Volume | 1 | 1 | 2 |  | 0 | 27 | 2 | 29 | 0 | 49 | 49 | 80 |
| PHF | 0.25 | 0.25 | 0.25 |  | 0.00 | 0.56 | 0.25 | 0.56 | 0.00 | 0.82 | 0.82 | 0.71 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | R | Total |  | Total | T | R | Total | L | T | Total | Total |
| 4:00 PM | 1 | 1 | 2 |  | 0 | 33 | 2 | 35 | 0 | 58 | 58 | 95 |
| 4:15 PM | 1 | 1 | 2 |  | 0 | 25 | 3 | 28 | 0 | 46 | 46 | 76 |
| 4:30 PM | 0 | 1 | 1 |  | 0 | 16 | 2 | 18 | 0 | 42 | 42 | 61 |
| 4:45 PM | 0 | 0 | 0 |  | 0 | 17 | 1 | 18 | 1 | 39 | 40 | 58 |
| 5:00 PM | 0 | 0 | 0 |  | 0 | 20 | 1 | 21 | 1 | 39 | 40 | 61 |

## Peak Hour Summary

All Traffic Data

## - EnYn1010110

All Traffic Data

Clay Carney
(503) 833-2740

## SE Langensand Rd \& Hwy 26

## 4:10 PM to 5:10 PM

Tuesday, March 19, 2019


| Approach | PHF | HV\% | Volume |
| :---: | :---: | :---: | :---: |
| EB | 0.91 | $3.3 \%$ | 881 |
| WB | 0.94 | $6.6 \%$ | 738 |
| NB | 0.71 | $3.1 \%$ | 65 |
| SB | 0.00 | $0.0 \%$ | 0 |
| Intersection | 0.93 | $4.8 \%$ | 1,684 |

Count Period: 4:00 PM to 6:00 PM


7:00 AM to 9:00 AM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Bikes | L | R | Bikes | L | T | Bikes | T | R | Bikes |  |
| 7:00 AM |  | 0 | 0 | 6 | 0 | 1 | 25 | 0 | 68 | 0 | 0 | 100 |
| 7:05 AM |  | 0 | 0 | 2 | 0 | 0 | 25 | 0 | 54 | 0 | 0 | 81 |
| 7:10 AM |  | 0 | 0 | 4 | 0 | 1 | 24 | 0 | 80 | 0 | 0 | 109 |
| 7:15 AM |  | 0 | 0 | 2 | 0 | 2 | 32 | 0 | 71 | 0 | 0 | 107 |
| 7:20 AM |  | 0 | 0 | 2 | 0 | 2 | 51 | 0 | 63 | 0 | 0 | 118 |
| 7:25 AM |  | 0 | 0 | 4 | 0 | 1 | 31 | 0 | 62 | 0 | 0 | 98 |
| 7:30 AM |  | 0 | 0 | 1 | 0 | 2 | 46 | 0 | 62 | 1 | 0 | 112 |
| 7:35 AM |  | 0 | 0 | 4 | 0 | 0 | 43 | 0 | 49 | 0 | 0 | 96 |
| 7:40 AM |  | 0 | 0 | 4 | 0 | 3 | 54 | 0 | 45 | 0 | 0 | 106 |
| 7:45 AM |  | 0 | 0 | 4 | 0 | 0 | 54 | 0 | 44 | 0 | 0 | 102 |
| 7:50 AM |  | 0 | 0 | 0 | 0 | 2 | 53 | 0 | 57 | 0 | 0 | 112 |
| 7:55 AM |  | 0 | 0 | 2 | 0 | 2 | 58 | 0 | 36 | 0 | 0 | 98 |
| 8:00 AM |  | 0 | 0 | 3 | 0 | 1 | 52 | 0 | 31 | 0 | 0 | 87 |
| 8:05 AM |  | 0 | 0 | 2 | 0 | 3 | 44 | 0 | 40 | 0 | 0 | 89 |
| 8:10 AM |  | 0 | 1 | 1 | 0 | 0 | 42 | 0 | 50 | 0 | 0 | 94 |
| 8:15 AM |  | 0 | 0 | 0 | 0 | 1 | 46 | 0 | 32 | 0 | 0 | 79 |
| 8:20 AM |  | 0 | 0 | 1 | 0 | 2 | 38 | 0 | 46 | 0 | 0 | 87 |
| 8:25 AM |  | 0 | 0 | 0 | 0 | 3 | 39 | 0 | 42 | 0 | 0 | 84 |
| 8:30 AM |  | 0 | 0 | 2 | 0 | 0 | 61 | 0 | 42 | 0 | 0 | 105 |
| 8:35 AM |  | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 44 | 0 | 0 | 100 |
| 8:40 AM |  | 0 | 1 | 2 | 0 | 0 | 64 | 0 | 52 | 0 | 0 | 119 |
| 8:45 AM |  | 0 | 0 | 1 | 0 | 0 | 66 | 0 | 56 | 0 | 0 | 123 |
| 8:50 AM |  | 0 | 0 | 0 | 0 | 2 | 56 | 0 | 49 | 0 | 0 | 107 |
| 8:55 AM |  | 0 | 0 | 2 | 0 | 2 | 61 | 0 | 42 | 0 | 0 | 107 |
| Total Survey |  | 0 | 2 | 49 | 0 | 30 | 1,121 | 0 | 1,217 | 1 | 0 | 2,420 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 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 |
| 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 |

## 15-Minute Interval Summary

7:00 AM to 9:00 AM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | $\begin{aligned} & \text { Northbound } \\ & \text { SE Vista Loop Dr } \end{aligned}$ |  | Southbound SE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Bikes | L | R | Bikes | L | T | Bikes | T | R | Bikes |  |
| 7:00 AM |  | 0 | 0 | 12 | 0 | 2 | 74 | 0 | 202 | 0 | 0 | 290 |
| 7:15 AM |  | 0 | 0 | 8 | 0 | 5 | 114 | 0 | 196 | 0 | 0 | 323 |
| 7:30 AM |  | 0 | 0 | 9 | 0 | 5 | 143 | 0 | 156 | 1 | 0 | 314 |
| 7:45 AM |  | 0 | 0 | 6 | 0 | 4 | 165 | 0 | 137 | 0 | 0 | 312 |
| 8:00 AM |  | 0 | 1 | 6 | 0 | 4 | 138 | 0 | 121 | 0 | 0 | 270 |
| 8:15 AM |  | 0 | 0 | 1 | 0 | 6 | 123 | 0 | 120 | 0 | 0 | 250 |
| 8:30 AM |  | 0 | 1 | 4 | 0 | 0 | 181 | 0 | 138 | 0 | 0 | 324 |
| 8:45 AM |  | 0 | 0 | 3 | 0 | 4 | 183 | 0 | 147 | 0 | 0 | 337 |
| Total Survex |  | 0 | 2 | 49 | 0 | 30 | 1,121 | 0 | 1,217 | 1 | 0 | 2,420 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | Northbound SE Vista Loop Dr |  |  |  | Southbound SE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 0 | 0 | 0 | 0 | 35 | 17 | 52 | 0 | 512 | 726 | 1,238 | 0 | 692 | 496 | 1,188 | 0 | 1,239 |
| \%HV | 0.0\% |  |  |  | 8.6\% |  |  |  | 12.5\% |  |  |  | 6.4\% |  |  |  | 9.0\% |
| PHF | 0.00 |  |  |  | 0.73 |  |  |  | 0.76 |  |  |  | 0.81 |  |  |  | 0.93 |
| By <br> Movement | NorthboundSE Vista Loop Dr |  |  |  | Southbound SE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  |  |  |  | Total | L |  | R | Total | L | T |  | Total |  | T | R | Total |  |
| Volume |  |  |  | 0 | 0 |  | 35 | 35 | 16 | 496 |  | 512 |  | 691 | 1 | 692 | 1,239 |
| \%HV | NA | NA | NA | 0.0\% | 0.0\% | NA | 8.6\% | 8.6\% | 6.3\% | 12.7\% | NA | 12.5\% | NA | 6.4\% | 0.0\% | 6.4\% | 9.0\% |
| PHF |  |  |  | 0.00 | 0.00 |  | 0.73 | 0.73 | 0.80 | 0.75 |  | 0.76 |  | 0.81 | 0.25 | 0.81 | 0.93 |



Rolling Hour Summary

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | $\begin{gathered} \hline \text { Northbound } \\ \text { SE Vista Loop Dr } \end{gathered}$ |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Bikes | L | R | Bikes | L | T | Bikes | T | R | Bikes |  | North | South | East | West |
| 7:00 AM |  | 0 | 0 | 35 | 0 | 16 | 496 | 0 | 691 | 1 | 0 | 1,239 | 0 | 0 | 0 | 0 |
| 7:15 AM |  | 0 | 1 | 29 | 0 | 18 | 560 | 0 | 610 | 1 | 0 | 1,219 | 0 | 0 | 0 | 0 |
| 7:30 AM |  | 0 | 1 | 22 | 0 | 19 | 569 | 0 | 534 | 1 | 0 | 1,146 | 0 | 0 | 0 | 0 |
| 7:45 AM |  | 0 | 2 | 17 | 0 | 14 | 607 | 0 | 516 | 0 | 0 | 1,156 | 0 | 0 | 0 | 0 |
| 8:00 AM |  | 0 | 2 | 14 | 0 | 14 | 625 | 0 | 526 | 0 | 0 | 1,181 | 0 | 0 | 0 | 0 |

Out 47
In 64

## SE Vista Loop Dr \& Hwy 26



Wednesday, March 20, 2019
7:00 AM to 9:00 AM


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time |  | Total | L |  | R | Total | L | T | Total |  | T | R | Total | Total |
| 7:00 AM |  | 0 | 0 |  | 0 | 0 | 0 | 6 | 6 |  | 4 | 0 | 4 | 10 |
| 7:05 AM |  | 0 | 0 |  | 0 | 0 | 0 | 4 | 4 |  | 5 | 0 | 5 | 9 |
| 7:10 AM |  | 0 | 0 |  | 1 | 1 | 0 | 2 | 2 |  | 3 | 0 | 3 | 6 |
| 7:15 AM |  | 0 | 0 |  | 0 | 0 | 0 | 3 | 3 |  | 2 | 0 | 2 | 5 |
| 7:20 AM |  | 0 | 0 |  | 0 | 0 | 0 | 7 | 7 |  | 1 | 0 | 1 | 8 |
| 7:25 AM |  | 0 | 0 |  | 0 | 0 | 0 | 5 | 5 |  | 3 | 0 | 3 | 8 |
| 7:30 AM |  | 0 | 0 |  | 0 | 0 | 0 | 8 | 8 |  | 6 | 0 | 6 | 14 |
| 7:35 AM |  | 0 | 0 |  | 1 | 1 | 0 | 4 | 4 |  | 5 | 0 | 5 | 10 |
| 7:40 AM |  | 0 | 0 |  | 1 | 1 | 1 | 9 | 10 |  | 3 | 0 | 3 | 14 |
| 7:45 AM |  | 0 | 0 |  | 0 | 0 | 0 | 7 | 7 |  | 3 | 0 | 3 | 10 |
| 7:50 AM |  | 0 | 0 |  | 0 | 0 | 0 | 5 | 5 |  | 8 | 0 | 8 | 13 |
| 7:55 AM |  | 0 | 0 |  | 0 | 0 | 0 | 3 | 3 |  | 1 | 0 | 1 | 4 |
| 8:00 AM |  | 0 | 0 |  | 0 | 0 | 1 | 8 | 9 |  | 3 | 0 | 3 | 12 |
| 8:05 AM |  | 0 | 0 |  | 1 | 1 | 1 | 10 | 11 |  | 5 | 0 | 5 | 17 |
| 8:10 AM |  | 0 | 0 |  | 1 | 1 | 0 | 3 | 3 |  | 6 | 0 | 6 | 10 |
| 8:15 AM |  | 0 | 0 |  | 0 | 0 | 0 | 4 | 4 |  | 3 | 0 | 3 | 7 |
| 8:20 AM |  | 0 | 0 |  | 0 | 0 | 1 | 4 | 5 |  | 2 | 0 | 2 | 7 |
| 8:25 AM |  | 0 | 0 |  | 0 | 0 | 1 | 5 | 6 |  | 3 | 0 | 3 | 9 |
| 8:30 AM |  | 0 | 0 |  | 0 | 0 | 0 | 11 | 11 |  | 4 | 0 | 4 | 15 |
| 8:35 AM |  | 0 | 0 |  | 0 | 0 | 0 | 5 | 5 |  | 8 | 0 | 8 | 13 |
| 8:40 AM |  | 0 | 1 |  | 0 | 1 | 0 | 7 | 7 |  | 3 | 0 | 3 | 11 |
| 8:45 AM |  | 0 | 0 |  | 0 | 0 | 0 | 8 | 8 |  | 4 | 0 | 4 | 12 |
| 8:50 AM |  | 0 | 0 |  | 0 | 0 | 1 | 5 | 6 |  | 6 | 0 | 6 | 12 |
| 8:55 AM |  | 0 | 0 |  | 0 | 0 | 0 | 1 | 1 |  | 3 | 0 | 3 | 4 |
| Total Survey |  | 0 | 1 |  | 5 | 6 | 6 | 134 | 140 |  | 94 | 0 | 94 | 240 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start | Northbound SE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| 7:00 AM |  | 0 | 0 | 1 | 1 | 0 | 12 | 12 | 12 | 0 | 12 | 25 |
| 7:15 AM |  | 0 | 0 | 0 | 0 | 0 | 15 | 15 | 6 | 0 | 6 | 21 |
| 7:30 AM |  | 0 | 0 | 2 | 2 | 1 | 21 | 22 | 14 | 0 | 14 | 38 |
| 7:45 AM |  | 0 | 0 | 0 | 0 | 0 | 15 | 15 | 12 | 0 | 12 | 27 |
| 8:00 AM |  | 0 | 0 | 2 | 2 | 2 | 21 | 23 | 14 | 0 | 14 | 39 |
| 8:15 AM |  | 0 | 0 | 0 | 0 | 2 | 13 | 15 | 8 | 0 | 8 | 23 |
| 8:30 AM |  | 0 | 1 | 0 | 1 | 0 | 23 | 23 | 15 | 0 | 15 | 39 |
| 8:45 AM |  | 0 | 0 | 0 | 0 | 1 | 14 | 15 | 13 | 0 | 13 | 28 |
| Total Survey |  | 0 | 1 | 5 | 6 | 6 | 134 | 140 | 94 | 0 | 94 | 240 |

Heavy Vehicle Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | NorthboundSE Vista Loop Dr |  |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 0 | 0 | 0 | 3 | 1 | 4 | 64 | 47 | 111 | 44 | 63 | 107 | 111 |
| PHF | 0.00 |  |  | 0.38 |  |  | 0.73 |  |  | 0.79 |  |  | 0.73 |


| By <br> Movement | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| Volume |  | 0 | 0 | 3 | 3 | 1 | 63 | 64 | 44 | 0 | 44 | 111 |
| PHF |  | 0.00 | 0.00 | 0.38 | 0.38 | 0.25 | 0.75 | 0.73 | 0.79 | 0.00 | 0.79 | 0.73 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| 7:00 AM |  | 0 | 0 | 3 | 3 | 1 | 63 | 64 | 44 | 0 | 44 | 111 |
| 7:15 AM |  | 0 | 0 | 4 | 4 | 3 | 72 | 75 | 46 | 0 | 46 | 125 |
| 7:30 AM |  | 0 | 0 | 4 | 4 | 5 | 70 | 75 | 48 | 0 | 48 | 127 |
| 7:45 AM |  | 0 | 1 | 2 | 3 | 4 | 72 | 76 | 49 | 0 | 49 | 128 |
| 8:00 AM |  | 0 | 1 | 2 | 3 | 5 | 71 | 76 | 50 | 0 | 50 | 129 |



Total Vehicle Summary


5-Minute Interval Summary
4:00 PM to 6:00 PM


15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start | Northbound SE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time |  | Bikes | L | R | Bikes | L | T | Bikes | T | R | Bikes |  |
| 4:00 PM |  | 0 | 1 | 5 | 0 | 8 | 179 | 0 | 177 | 0 | 0 | 370 |
| 4:15 PM |  | 0 | 0 | 6 | 0 | 10 | 204 | 0 | 165 | 0 | 0 | 385 |
| 4:30 PM |  | 0 | 0 | 3 | 0 | 9 | 196 | 2 | 185 | 0 | 0 | 393 |
| 4:45 PM |  | 0 | 0 | 2 | 1 | 7 | 193 | 0 | 176 | 0 | 0 | 378 |
| 5:00 PM |  | 0 | 0 | 4 | 0 | 10 | 194 | 0 | 181 | 0 | 0 | 389 |
| 5:15 PM |  | 0 | 0 | 4 | 0 | 3 | 191 | 0 | 124 | 0 | 0 | 322 |
| 5:30 PM |  | 0 | 0 | 5 | 0 | 5 | 194 | 0 | 107 | 0 | 0 | 311 |
| 5:45 PM |  | 0 | 0 | 3 | 0 | 4 | 209 | 0 | 133 | 0 | 0 | 349 |
| Total Survey |  | 0 | 1 | 32 | 1 | 56 | 1,560 | 2 | 1,248 | 0 | 0 | 2,897 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |

Peak Hour Summary
4:15 PM to 5:15 PM

| By <br> Approach | Northbound SE Vista Loop Dr |  |  |  | SouthboundSE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 0 | 0 | 0 | 0 | 15 | 36 | 51 | 1 | 823 | 722 | 1,545 | 2 | 707 | 787 | 1,494 | 0 | 1,545 |
| \%HV | 0.0\% |  |  |  | 13.3\% |  |  |  | 3.2\% |  |  |  | 6.6\% |  |  |  | 4.9\% |
| PHF | 0.00 |  |  |  | 0.54 |  |  |  | 0.94 |  |  |  | 0.95 |  |  |  | 0.97 |
| By <br> Movement | NorthboundSE Vista Loop Dr |  |  |  | SouthboundSE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  |  |  |  | Total | L |  | R | Total | L | T |  | Total |  | T | R | Total |  |
| Volume |  |  |  | 0 | 0 |  | 15 | 15 | 36 | 787 |  | 823 |  | 707 | 0 | 707 | 1,545 |
| \%HV | NA | NA | NA | 0.0\% | 0.0\% | NA | 13.3\% | 13.3\% | 0.0\% | 3.3\% | NA | 3.2\% | NA | 6.6\% | 0.0\% | 6.6\% | 4.9\% |
| PHF |  |  |  | 0.00 | 0.00 |  | 0.54 | 0.54 | 0.90 | 0.93 |  | 0.94 |  | 0.95 | 0.00 | 0.95 | 0.97 |



Rolling Hour Summary
4:00 PM to 6:00 PM


Out 49
In 26

## SE Vista Loop Dr \& Hwy 26



Tuesday, March 19, 2019
4:00 PM to 6:00 PM


Heavy Vehicle 5-Minute Interval Summary 4:00 PM to 6:00 PM


Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM

| Interval Start Time | $\begin{aligned} & \text { Northbound } \\ & \text { SE Vista Loop Dr } \end{aligned}$ |  | Southbound SE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| 4:00 PM |  | 0 | 1 | 2 | 3 | 2 | 10 | 12 | 19 | 0 | 19 | 34 |
| 4:15 PM |  | 0 | 0 | 2 | 2 | 0 | 12 | 12 | 10 | 0 | 10 | 24 |
| 4:30 PM |  | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 9 | 0 | 9 | 13 |
| 4:45 PM |  | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 12 | 0 | 12 | 16 |
| 5:00 PM |  | 0 | 0 | 0 | 0 | 0 | 6 | 6 | 16 | 0 | 16 | 22 |
| 5:15 PM |  | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 7 | 0 | 7 | 9 |
| 5:30 PM |  | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 8 | 0 | 8 | 12 |
| 5:45 PM |  | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 6 | 0 | 6 | 10 |
| Total Survey |  | 0 | 1 | 4 | 5 | 2 | 46 | 48 | 87 | 0 | 87 | 140 |

Heavy Vehicle Peak Hour Summary
4:15 PM to 5:15 PM

| By <br> Approach | NorthboundSE Vista Loop Dr |  |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 0 | 0 | 0 | 2 | 0 | 2 | 26 | 49 | 75 | 47 | 26 | 73 | 75 |
| PHF | 0.00 |  |  | 0.25 |  |  | 0.54 |  |  | 0.73 |  |  | 0.78 |


| By <br> Movement | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| Volume |  | 0 | 0 | 2 | 2 | 0 | 26 | 26 | 47 | 0 | 47 | 75 |
| PHF |  | 0.00 | 0.00 | 0.25 | 0.25 | 0.00 | 0.54 | 0.54 | 0.73 | 0.00 | 0.73 | 0.78 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start | Northbound SE Vista Loop Dr | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | Total | L | R | Total | L | T | Total | T | R | Total |  |
| 4:00 PM | 0 | 1 | 4 | 5 | 2 | 30 | 32 | 50 | 0 | 50 | 87 |
| 4:15 PM | 0 | 0 | 2 | 2 | 0 | 26 | 26 | 47 | 0 | 47 | 75 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 16 | 16 | 44 | 0 | 44 | 60 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 16 | 16 | 43 | 0 | 43 | 59 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 16 | 16 | 37 | 0 | 37 | 53 |




5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 2 | 18 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 5 | 0 | 0 | 38 |
| 7:05 AM | 3 | 20 | 1 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 5 | 0 | 45 |
| 7:10 AM | 5 | 23 | 0 | 0 | 0 | 12 | 0 | 0 | 2 | 2 | 4 | 0 | 4 | 3 | 9 | 0 | 64 |
| 7:15 AM | 5 | 32 | 0 | 0 | 0 | 9 | 0 | 0 | 1 | 0 | 2 | 0 | 4 | 2 | 2 | 0 | 57 |
| 7:20 AM | 8 | 13 | 0 | 0 | 2 | 13 | 1 | 0 | 0 | 0 | 2 | 0 | 5 | 3 | 5 | 0 | 52 |
| 7:25 AM | 1 | 23 | 2 | 0 | 0 | 13 | 0 | 0 | 1 | 1 | 5 | 0 | 4 | 3 | 3 | 0 | 56 |
| 7:30 AM | 3 | 17 | 0 | 0 | 1 | 12 | 0 | 0 | 0 | 0 | 3 | 0 | 4 | 9 | 1 | 0 | 50 |
| 7:35 AM | 2 | 23 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 7 | 0 | 6 | 5 | 1 | 0 | 61 |
| 7:40 AM | 2 | 23 | 1 | 0 | 0 | 6 | 1 | 0 | 1 | 2 | 4 | 0 | 6 | 4 | 1 | 0 | 51 |
| 7:45 AM | 4 | 20 | 3 | 0 | 0 | 14 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 0 | 0 | 46 |
| 7:50 AM | 5 | 15 | 3 | 0 | 0 | 10 | 0 | 0 | 1 | 1 | 1 | 0 | 5 | 4 | 2 | 0 | 47 |
| 7:55 AM | 1 | 21 | 2 | 0 | 1 | 15 | 0 | 0 | 1 | 0 | 3 | 0 | 3 | 1 | 1 | 0 | 49 |
| 8:00 AM | 3 | 16 | 1 | 0 | 0 | 12 | 0 | 0 | 1 | 1 | 1 | 0 | 5 | 1 | 2 | 0 | 43 |
| 8:05 AM | 2 | 15 | 0 | 0 | 0 | 7 | 0 | 0 | 1 | 1 | 2 | 0 | 4 | 0 | 3 | 0 | 35 |
| 8:10 AM | 2 | 19 | 1 | 0 | 1 | 8 | 0 | 0 | 3 | 1 | 2 | 0 | 3 | 4 | 1 | 0 | 45 |
| 8:15 AM | 3 | 27 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 2 | 0 | 46 |
| 8:20 AM | 0 | 19 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | 34 |
| 8:25 AM | 6 | 8 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 29 |
| 8:30 AM | 3 | 27 | 2 | 0 | 0 | 10 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 2 | 5 | 0 | 53 |
| 8:35 AM | 1 | 14 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 36 |
| 8:40 AM | 0 | 19 | 1 | 0 | 0 | 15 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 3 | 1 | 0 | 42 |
| 8:45 AM | 1 | 21 | 1 | 0 | 0 | 15 | 1 | 0 | 0 | 2 | 3 | 0 | 1 | 2 | 4 | 0 | 51 |
| 8:50 AM | 0 | 21 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 3 | 2 | 0 | 40 |
| 8:55 AM | 4 | 20 | 1 | 0 | 1 | 10 | 0 | 0 | 1 | 3 | 2 | 0 | 3 | 3 | 3 | 0 | 51 |
| Total Survey | 66 | 474 | 22 | 0 | 6 | 269 | 3 | 0 | 13 | 22 | 45 | 0 | 78 | 68 | 55 | 0 | 1,121 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 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 | 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 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 3 | 1 | 0 | 0 |

15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 10 | 61 | 2 | 0 | 0 | 32 | 0 | 0 | 2 | 2 | 4 | 0 | 11 | 9 | 14 | 0 | 147 | 0 | 1 | 0 | 0 |
| 7:15 AM | 14 | 68 | 2 | 0 | 2 | 35 | 1 | 0 | 2 | 1 | 9 | 0 | 13 | 8 | 10 | 0 | 165 | 1 | 0 | 0 | 0 |
| 7:30 AM | 7 | 63 | 1 | 0 | 1 | 35 | 1 | 0 | 1 | 2 | 14 | 0 | 16 | 18 | 3 | 0 | 162 | 1 | 0 | 0 | 0 |
| 7:45 AM | 10 | 56 | 8 | 0 | 1 | 39 | 0 | 0 | 2 | 2 | 4 | 0 | 11 | 6 | 3 | 0 | 142 | 0 | 0 | 0 | 0 |
| 8:00 AM | 7 | 50 | 2 | 0 | 1 | 27 | 0 | 0 | 5 | 3 | 5 | 0 | 12 | 5 | 6 | 0 | 123 | 1 | 0 | 0 | 0 |
| 8:15 AM | 9 | 54 | 2 | 0 | 0 | 26 | 0 | 0 | 0 | 2 | 2 | 0 | 3 | 7 | 4 | 0 | 109 | 0 | 0 | 0 | 0 |
| 8:30 AM | 4 | 60 | 3 | 0 | 0 | 41 | 0 | 0 | 0 | 3 | 2 | 0 | 5 | 7 | 6 | 0 | 131 | 0 | 0 | 0 | 0 |
| 8:45 AM | 5 | 62 | 2 | 0 | 1 | 34 | 1 | 0 | 1 | 7 | 5 | 0 | 7 | 8 | 9 | 0 | 142 | 0 | 0 | 0 | 0 |
| Total Survey | 66 | 474 | 22 | 0 | 6 | 269 | 3 | 0 | 13 | 22 | 45 | 0 | 78 | 68 | 55 | 0 | 1,121 | 3 | 1 | 0 | 0 |

Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  | North | South | East | West |
| Volume | 301 | 229 | 530 | 0 | 151 | 286 | 437 | 0 | 48 | 81 | 129 | 0 | 121 | 25 | 146 | 0 | 621 | 2 | 0 | 0 | 0 |
| \%HV | 5.3\% |  |  |  | 9.9\% |  |  |  | 6.3\% |  |  |  | 4.1\% |  |  |  | 6.3\% |  |  |  |  |
| PHF | 0.85 |  |  |  | 0.88 |  |  |  | 0.71 |  |  |  | 0.82 |  |  |  | 0.90 |  |  |  |  |
|  |  |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  |  |  |  |  |  |  |  |  |  |
| By <br> Movement | Northbound Hwy 211 |  |  |  |  |  |  |  | Westbound Dubarko Rd | Total |  |  |  |  |  |
|  | L | T | R | Total | L | T | R | Total |  |  |  |  |  | L | T | R | Total | L | T | R | Total |  |  |  |  |
| Volume | 42 | 246 | 13 | 301 | 4 | 145 | 2 | 151 | 8 | 8 | 32 | 48 | 52 | 37 | 32 | 121 | 621 |  |  |  |  |
| \%HV | 2.4\% | 5.7\% | 7.7\% | 5.3\% | 25.0\% | 9.7\% | 0.0\% | 9.9\% | 12.5\% | 0.0\% | 6.3\% | 6.3\% | 1.9\% | 0.0\% | 12.5\% | 4.1\% | 6.3\% |  |  |  |  |
| PHF | 0.58 | 0.82 | 0.41 | 0.85 | 0.33 | 0.86 | 0.50 | 0.88 | 0.67 | 0.50 | 0.53 | 0.71 | 0.81 | 0.51 | 0.50 | 0.82 | 0.90 |  |  |  |  |

## Rolling Hour Summary

7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 41 | 248 | 13 | 0 | 4 | 141 | 2 | 0 | 7 | 7 | 31 | 0 | 51 | 41 | 30 | 0 | 616 | 2 | 1 | 0 | 0 |
| 7:15 AM | 38 | 237 | 13 | 0 | 5 | 136 | 2 | 0 | 10 | 8 | 32 | 0 | 52 | 37 | 22 | 0 | 592 | 3 | 0 | 0 | 0 |
| 7:30 AM | 33 | 223 | 13 | 0 | 3 | 127 | 1 | 0 | 8 | 9 | 25 | 0 | 42 | 36 | 16 | 0 | 536 | 2 | 0 | 0 | 0 |
| 7:45 AM | 30 | 220 | 15 | 0 | 2 | 133 | 0 | 0 | 7 | 10 | 13 | 0 | 31 | 25 | 19 | 0 | 505 | 1 | 0 | 0 | 0 |
| 8:00 AM | 25 | 226 | 9 | 0 | 2 | 128 | 1 | 0 | 6 | 15 | 14 | 0 | 27 | 27 | 25 | 0 | 505 | 1 | 0 | 0 | 0 |

Out 1
In 3

Hwy 211 \& Dubarko Rd
Wednesday, March 20, 2019
7:00 AM to 9:00 AM


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 7:05 AM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 7:10 AM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 3 |
| 7:15 AM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
| 7:20 AM | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 3 |
| 7:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 3 |
| 7:30 AM | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 7:35 AM | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 7:40 AM | 0 | 3 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 5 |
| 7:45 AM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 7:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:55 AM | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 8:00 AM | 0 | 6 | 0 | 6 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 8:05 AM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 4 |
| 8:10 AM | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 4 |
| 8:15 AM | 1 | 2 | 0 | 3 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 8:20 AM | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| 8:25 AM | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 8:30 AM | 0 | 3 | 0 | 3 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 8:35 AM | 0 | 3 | 0 | 3 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8:40 AM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 8:45 AM | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 8:50 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8:55 AM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 |
| Total Survey | 2 | 31 | 1 | 34 | 1 | 31 | 0 | 32 | 1 | 1 | 2 | 4 | 3 | 3 | 4 | 10 | 80 |

Heavy Vehicle 15-Minute Interval Summary 7:00 AM to 9:00 AM

| Interval <br> Start <br> Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 6 |
| 7:15 AM | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 2 | 3 | 8 |
| 7:30 AM | 0 | 5 | 1 | 6 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 11 |
| 7:45 AM | 1 | 0 | 0 | 1 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8:00 AM | 0 | 8 | 0 | 8 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 16 |
| 8:15 AM | 1 | 6 | 0 | 7 | 0 | 4 | 0 | 4 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 12 |
| 8:30 AM | 0 | 7 | 0 | 7 | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 8:45 AM | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 6 |
| Total Survey | 2 | 31 | 1 | 34 | 1 | 31 | 0 | 32 | 1 | 1 | 2 | 4 | 3 | 3 | 4 | 10 | 80 |

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | Northbound Hwy 211 |  |  | Southbound Hwy 211 |  |  | Eastbound Dubarko Rd |  |  | Westbound Dubarko Rd |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 16 | 17 | 33 | 15 | 19 | 34 | 3 | 1 | 4 | 5 | 2 | 7 | 39 |
| PHF | 0.57 |  |  | 0.63 |  |  | 0.38 |  |  | 0.42 |  |  | 0.81 |


| By <br> Movement | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 1 | 14 | 1 | 16 | 1 | 14 | 0 | 15 | 1 | 0 | 2 | 3 | 1 | 0 | 4 | 5 | 39 |
| PHF | 0.25 | 0.58 | 0.25 | 0.57 | 0.25 | 0.58 | 0.00 | 0.63 | 0.25 | 0.00 | 0.25 | 0.38 | 0.25 | 0.00 | 0.50 | 0.42 | 0.81 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval <br> Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 1 | 8 | 1 | 10 | 1 | 12 | 0 | 13 | 1 | 0 | 2 | 3 | 1 | 1 | 4 | 6 | 32 |
| 7:15 AM | 1 | 14 | 1 | 16 | 1 | 16 | 0 | 17 | 1 | 0 | 1 | 2 | 3 | 1 | 3 | 7 | 42 |
| 7:30 AM | 2 | 19 | 1 | 22 | 0 | 19 | 0 | 19 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | 4 | 46 |
| 7:45 AM | 2 | 21 | 0 | 23 | 0 | 22 | 0 | 22 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 3 | 49 |
| 8:00 AM | 1 | 23 | 0 | 24 | 0 | 19 | 0 | 19 | 0 | 1 | 0 | 1 | 2 | 2 | 0 | 4 | 48 |




5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 4 | 14 | 0 | 0 | 2 | 25 | 1 | 0 | 0 | 3 | 3 | 0 | 2 | 3 | 3 | 0 | 60 | 0 | 0 | 1 | 0 |
| 4:05 PM | 4 | 28 | 3 | 0 | 1 | 31 | 0 | 0 | 1 | 7 | 6 | 0 | 2 | 6 | 2 | 0 | 91 | 0 | 0 | 0 | 0 |
| 4:10 PM | 10 | 17 | 2 | 0 | 1 | 19 | 0 | 0 | 0 | 4 | 3 | 0 | 3 | 4 | 3 | 0 | 66 | 0 | 0 | 0 | 0 |
| 4:15 PM | 4 | 20 | 6 | 0 | 2 | 20 | 1 | 0 | 2 | 7 | 3 | 1 | 1 | 5 | 1 | 0 | 72 | 0 | 0 | 0 | 0 |
| 4:20 PM | 6 | 12 | 1 | 0 | 1 | 14 | 1 | 0 | 2 | 3 | 4 | 0 | 5 | 7 | 4 | 0 | 60 | 1 | 0 | 0 | 0 |
| 4:25 PM | 5 | 16 | 4 | 0 | 1 | 21 | 1 | 0 | 3 | 3 | 4 | 0 | 2 | 4 | 1 | 0 | 65 | 0 | 0 | 0 | 0 |
| 4:30 PM | 4 | 22 | 3 | 0 | 0 | 19 | 3 | 0 | 1 | 2 | 2 | 0 | 5 | 5 | 1 | 0 | 67 | 1 | 0 | 0 | 0 |
| 4:35 PM | 2 | 23 | 7 | 0 | 0 | 29 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 3 | 0 | 70 | 0 | 0 | 0 | 0 |
| 4:40 PM | 2 | 17 | 4 | 0 | 0 | 22 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 3 | 3 | 0 | 55 | 0 | 0 | 0 | 0 |
| 4:45 PM | 10 | 23 | 7 | 0 | 2 | 29 | 1 | 0 | 0 | 6 | 8 | 0 | 3 | 2 | 0 | 0 | 91 | 0 | 0 | 0 | 0 |
| 4:50 PM | 3 | 22 | 6 | 0 | 1 | 19 | 1 | 0 | 1 | 0 | 4 | 0 | 1 | 1 | 2 | 0 | 61 | 0 | 0 | 0 | 0 |
| 4:55 PM | 4 | 20 | 3 | 0 | 0 | 20 | 2 | 0 | 0 | 6 | 2 | 0 | 1 | 6 | 1 | 0 | 65 | 0 | 0 | 0 | 0 |
| 5:00 PM | 4 | 17 | 6 | 0 | 1 | 42 | 0 | 0 | 0 | 3 | 14 | 0 | 1 | 4 | 4 | 0 | 96 | 0 | 0 | 0 | 0 |
| 5:05 PM | 2 | 24 | 5 | 0 | 0 | 20 | 0 | 0 | 0 | 4 | 5 | 0 | 1 | 2 | 3 | 0 | 66 | 0 | 0 | 0 | 0 |
| 5:10 PM | 8 | 24 | 4 | 0 | 1 | 13 | 1 | 0 | 1 | 8 | 2 | 0 | 2 | 1 | 3 | 0 | 68 | 0 | 0 | 0 | 0 |
| 5:15 PM | 4 | 13 | 4 | 0 | 1 | 19 | 1 | 0 | 0 | 4 | 3 | 0 | 5 | 3 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 5:20 PM | 1 | 19 | 6 | 0 | 1 | 29 | 1 | 0 | 1 | 2 | 2 | 0 | 1 | 4 | 0 | 0 | 67 | 0 | 0 | 0 | 0 |
| 5:25 PM | 5 | 14 | 6 | 0 | 0 | 17 | 1 | 0 | 1 | 3 | 9 | 0 | 2 | 4 | 3 | 0 | 65 | 0 | 0 | 0 | 0 |
| 5:30 PM | 5 | 19 | 6 | 0 | 0 | 19 | 1 | 0 | 1 | 5 | 5 | 0 | 0 | 2 | 3 | 0 | 66 | 0 | 0 | 0 | 0 |
| 5:35 PM | 5 | 15 | 1 | 0 | 2 | 24 | 0 | 0 | 1 | 5 | 6 | 0 | 1 | 2 | 1 | 0 | 63 | 0 | 0 | 0 | 0 |
| 5:40 PM | 5 | 19 | 7 | 0 | 0 | 29 | 1 | 0 | 0 | 8 | 3 | 0 | 1 | 2 | 0 | 1 | 75 | 0 | 0 | 0 | 0 |
| 5:45 PM | 4 | 15 | 8 | 0 | 0 | 16 | 1 | 0 | 0 | 7 | 3 | 0 | 3 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 5:50 PM | 4 | 13 | 2 | 0 | 0 | 20 | 3 | 0 | 2 | 5 | 3 | 0 | 0 | 5 | 3 | 0 | 60 | 0 | 0 | 0 | 0 |
| 5:55 PM | 5 | 13 | 2 | 0 | 1 | 18 | 0 | 0 | 0 | 2 | 3 | 0 | 2 | 1 | 1 | 0 | 48 | 0 | 0 | 0 | 0 |
| Total Survey | 110 | 439 | 103 | 0 | 18 | 534 | 22 | 0 | 18 | 101 | 99 | 1 | 45 | 77 | 45 | 1 | 1,611 | 2 | 0 | 1 | 0 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interva Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval <br> Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 18 | 59 | 5 | 0 | 4 | 75 | 1 | 0 | 1 | 14 | 12 | 0 | 7 | 13 | 8 | 0 | 217 | 0 | 0 | 1 | 0 |
| 4:15 PM | 15 | 48 | 11 | 0 | 4 | 55 | 3 | 0 | 7 | 13 | 11 | 1 | 8 | 16 | 6 | 0 | 197 | 1 | 0 | 0 | 0 |
| 4:30 PM | 8 | 62 | 14 | 0 | 0 | 70 | 4 | 0 | 2 | 6 | 4 | 0 | 6 | 9 | 7 | 0 | 192 | 1 | 0 | 0 | 0 |
| 4:45 PM | 17 | 65 | 16 | 0 | 3 | 68 | 4 | 0 | 1 | 12 | 14 | 0 | 5 | 9 | 3 | 0 | 217 | 0 | 0 | 0 | 0 |
| 5:00 PM | 14 | 65 | 15 | 0 | 2 | 75 | 1 | 0 | 1 | 15 | 21 | 0 | 4 | 7 | 10 | 0 | 230 | 0 | 0 | 0 | 0 |
| 5:15 PM | 10 | 46 | 16 | 0 | 2 | 65 | 3 | 0 | 2 | 9 | 14 | 0 | 8 | 11 | 3 | 0 | 189 | 0 | 0 | 0 | 0 |
| 5:30 PM | 15 | 53 | 14 | 0 | 2 | 72 | 2 | 0 | 2 | 18 | 14 | 0 | 2 | 6 | 4 | 1 | 204 | 0 | 0 | 0 | 0 |
| 5:45 PM | 13 | 41 | 12 | 0 | 1 | 54 | 4 | 0 | 2 | 14 | 9 | 0 | 5 | 6 | 4 | 0 | 165 | 0 | 0 | 0 | 0 |
| Total Survey | 110 | 439 | 103 | 0 | 18 | 534 | 22 | 0 | 18 | 101 | 99 | 1 | 45 | 77 | 45 | 1 | 1,611 | 2 | 0 | 1 | 0 |

Peak Hour Summary
4:05 PM to 5:05 PM

| By <br> Approach | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 347 | 362 | 709 | 0 | 306 | 273 | 579 | 0 | 108 | 117 | 225 | 1 | 98 | 107 | 205 | 0 | 859 |
| \%HV | 2.0\% |  |  |  | 4.6\% |  |  |  | 0.9\% |  |  |  | 5.1\% |  |  |  | 3.1\% |
| PHF | 0.89 |  |  |  | 0.89 |  |  |  | 0.82 |  |  |  | 0.72 |  |  |  | 0.94 |
| By <br> Movement | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound <br> Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 58 | 237 | 52 | 347 | 10 | 285 | 11 | 306 | 11 | 45 | 52 | 108 | 25 | 48 | 25 | 98 | 859 |
| \%HV | 3.4\% | 1.7\% | 1.9\% | 2.0\% | 0.0\% | 4.9\% | 0.0\% | 4.6\% | 0.0\% | 0.0\% | 1.9\% | 0.9\% | 4.0\% | 2.1\% | 12.0\% | 5.1\% | 3.1\% |
| PHF | 0.73 | 0.91 | 0.72 | 0.89 | 0.63 | 0.88 | 0.55 | 0.89 | 0.39 | 0.63 | 0.65 | 0.82 | 0.52 | 0.75 | 0.78 | 0.72 | 0.94 |



Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 58 | 234 | 46 | 0 | 11 | 268 | 12 | 0 | 11 | 45 | 41 | 1 | 26 | 47 | 24 | 0 | 823 | 2 | 0 | 1 | 0 |
| 4:15 PM | 54 | 240 | 56 | 0 | 9 | 268 | 12 | 0 | 11 | 46 | 50 | 1 | 23 | 41 | 26 | 0 | 836 | 2 | 0 | 0 | 0 |
| 4:30 PM | 49 | 238 | 61 | 0 | 7 | 278 | 12 | 0 | 6 | 42 | 53 | 0 | 23 | 36 | 23 | 0 | 828 | 1 | 0 | 0 | 0 |
| 4:45 PM | 56 | 229 | 61 | 0 | 9 | 280 | 10 | 0 | 6 | 54 | 63 | 0 | 19 | 33 | 20 | 1 | 840 | 0 | 0 | 0 | 0 |
| 5:00 PM | 52 | 205 | 57 | 0 | 7 | 266 | 10 | 0 | 7 | 56 | 58 | 0 | 19 | 30 | 21 | 1 | 788 | 0 | 0 | 0 | 0 |

Out 3
In 1

Hwy 211 \& Dubarko Rd
Tuesday, March 19, 2019


Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 7 |
| 4:05 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 4:10 PM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 4:15 PM | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 4:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 2 |
| 4:25 PM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 4:35 PM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 4:40 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 4:50 PM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 4:55 PM | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5:00 PM | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 5:05 PM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:10 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:15 PM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:20 PM | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:25 PM | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5:35 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:40 PM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5:50 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:55 PM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 4 |
| Total Survey | 3 | 9 | 2 | 14 | 0 | 23 | 0 | 23 | 0 | 0 | 3 | 3 | 3 | 1 | 3 | 7 | 47 |

Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM

| Interval <br> Start <br> Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 2 | 1 | 0 | 3 | 0 | 5 | 0 | 5 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 11 |
| 4:15 PM | 0 | 1 | 0 | 1 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 9 |
| 4:30 PM | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 7 |
| 4:45 PM | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 4 |
| 5:00 PM | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 5:15 PM | 1 | 2 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5:30 PM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5:45 PM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 |
| Total Survey | 3 | 9 | 2 | 14 | 0 | 23 | 0 | 23 | 0 | 0 | 3 | 3 | 3 | 1 | 3 | 7 | 47 |

Heavy Vehicle Peak Hour Summary
4:05 PM to 5:05 PM

| By <br> Approach | Northbound Hwy 211 |  |  | Southbound Hwy 211 |  |  | Eastbound Dubarko Rd |  |  | Westbound Dubarko Rd |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 7 | 16 | 23 | 14 | 7 | 21 | 1 | 3 | 4 | 5 | 1 | 6 | 27 |
| PHF | 0.58 |  |  | 0.58 |  |  | 0.25 |  |  | 0.42 |  |  | 0.68 |


| By Movement | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 2 | 4 | 1 | 7 | 0 | 14 | 0 | 14 | 0 | 0 | 1 | 1 | 1 | 1 | 3 | 5 | 27 |
| PHF | 0.25 | 0.50 | 0.25 | 0.58 | 0.00 | 0.58 | 0.00 | 0.58 | 0.00 | 0.00 | 0.25 | 0.25 | 0.25 | 0.25 | 0.38 | 0.42 | 0.68 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval <br> Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 2 | 4 | 1 | 7 | 0 | 16 | 0 | 16 | 0 | 0 | 2 | 2 | 2 | 1 | 3 | 6 | 31 |
| 4:15 PM | 0 | 5 | 1 | 6 | 0 | 14 | 0 | 14 | 0 | 0 |  | 1 | 1 | 1 | 2 | 4 | 25 |
| 4:30 PM | 1 | 6 | 2 | 9 | 0 | 8 | 0 | 8 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 | 20 |
| 4:45 PM | 1 | 6 | 2 | 9 | 0 | 5 | 0 | 5 | 0 | 0 |  | 1 | 0 | 0 | 0 | 0 | 15 |
| 5:00 PM | 1 | 5 | 1 | 7 | 0 | 7 | 0 | 7 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 16 |



SE Langensand Rd \& Dubarko Rd<br>Wednesday, March 20, 2019<br>7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 6 |
| 7:05 AM | 2 | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 3 | 0 | 14 |
| 7:10 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 5 |
| 7:15 AM | 0 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 8 |
| 7:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 3 | 2 | 0 | 9 |
| 7:25 AM | 0 | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 11 |
| 7:30 AM | 0 | 6 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 11 |
| 7:35 AM | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 6 |
| 7:40 AM | 0 | 0 | 1 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 11 |
| 7:45 AM | 0 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 9 |
| 7:50 AM | 1 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 12 |
| 7:55 AM | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 9 |
| 8:00 AM | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 9 |
| 8:05 AM | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 10 |
| 8:10 AM | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 8:15 AM | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 8 |
| 8:20 AM | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 8:25 AM | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 8 |
| 8:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 2 | 1 | 0 | 8 |
| 8:35 AM | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 0 | 0 | 8 |
| 8:40 AM | 1 | 1 | 0 | 0 | 0 | 3 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 9 |
| 8:45 AM | 1 | 3 | 0 | 0 | 0 | 1 | 2 | 0 | 3 | 0 | 2 | 0 | 1 | 2 | 1 | 0 | 16 |
| 8:50 AM | 1 | 4 | 1 | 0 | 0 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 15 |
| 8:55 AM | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 9 |
| Total Survey | 12 | 35 | 4 | 0 | 11 | 14 | 29 | 0 | 38 | 5 | 5 | 0 | 4 | 31 | 31 | 0 | 219 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 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 | 1 | 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 |
| 1 | 0 | 1 | 0 |

15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | $\begin{gathered} \text { Interval } \\ \text { Total } \\ \hline \end{gathered}$ | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 3 | 2 | 0 | 0 | 2 | 1 | 4 | 0 | 2 | 1 | 0 | 0 | 0 | 5 | 5 | 0 | 25 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 2 | 1 | 0 | 2 | , | 4 | 0 | 6 | 0 | 0 | 0 | 1 | 4 | 5 | 0 | 28 | 0 | 0 | 0 | 0 |
| 7:30 AM | 1 | 8 | 1 | 0 | 2 | 1 | 6 | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 3 | 0 | 28 | 0 | 0 | 0 | 0 |
| 7:45 AM | 1 | 6 | 0 | 0 | 3 | 0 | 3 | 0 | 8 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 30 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 5 | 0 | 0 | 1 | 2 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 22 | 1 | 0 | 0 | 0 |
| 8:15 AM | 2 | 2 | 0 | 0 | 0 | 2 | 3 | 0 | 7 | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 21 | 0 | 0 | 1 | 0 |
| 8:30 AM | 2 | 1 | 0 | 0 | 1 | 3 | , | 0 | 4 | 3 | 1 | 0 | 2 | 5 | 1 | 0 | 25 | 0 | 0 | 0 | 0 |
| 8:45 AM | 3 | 9 | 2 | 0 | 0 | 2 | 5 | 0 | 6 | 0 | 2 | 0 | 1 | 5 | 5 | 0 | 40 | 0 | 0 | 0 | 0 |
| Total Survey | 12 | 35 | 4 | 0 | 11 | 14 | 29 | 0 | 38 | 5 | 5 | 0 | 4 | 31 | 31 | 0 | 219 | 1 | 0 | 1 | 0 |

Peak Hour Summary
7:05 AM to 8:05 AM

| By | NorthboundSE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  | North | South | East | West |
| Volume | 26 | 7 | 33 | 0 | 30 | 60 | 90 | 0 | 20 | 35 | 55 | 0 | 38 | 12 | 50 | 0 | 114 | 0 | 0 | 0 | 0 |
| \%HV | 7.7\% |  |  |  | 23.3\% |  |  |  | 5.0\% |  |  |  | 18.4\% |  |  |  | 14.9\% |  |  |  |  |
| PHF | 0.65 |  |  |  | 0.63 |  |  |  | 0.63 |  |  |  | 0.86 |  |  |  | 0.89 |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| By <br> Movement | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |  |  |  |  |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |  |  |  |  |
| Volume | 4 | 20 | 2 | 26 | 9 | 5 | 16 | 30 | 18 | 1 | 1 | 20 | 1 | 15 | 22 | 38 | 114 |  |  |  |  |
| \%HV | 25.0\% | 0.0\% | 50.0\% | 7.7\% | 22.2\% | 20.0\% | 25.0\% | 23.3\% | 5.6\% | 0.0\% | 0.0\% | 5.0\% | 0.0\% | 26.7\% | 13.6\% | 18.4\% | 14.9\% |  |  |  |  |
| PHF | 0.50 | 0.63 | 0.50 | 0.65 | 0.45 | 0.42 | 0.67 | 0.63 | 0.56 | 0.25 | 0.25 | 0.63 | 0.25 | 0.75 | 0.69 | 0.86 | 0.89 |  |  |  |  |

## Rolling Hour Summary

7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 5 | 18 | 2 | 0 | 9 | 5 | 17 | 0 | 16 | 1 | 1 | 0 | 1 | 15 | 21 | 0 | 111 | 0 | 0 | 0 | 0 |
| 7:15 AM | 2 | 21 | 2 | 0 | 8 | 6 | 15 | 0 | 19 | 0 | 1 | 0 | 1 | 15 | 18 | 0 | 108 | 1 | 0 | 0 | 0 |
| 7:30 AM | 4 | 21 | 1 | 0 | 6 | 5 | 14 | 0 | 20 | 1 | 2 | 0 | 0 | 12 | 15 | 0 | 101 | 1 | 0 | 1 | 0 |
| 7:45 AM | 5 | 14 | 0 | 0 | 5 | 7 | 10 | 0 | 24 | 4 | 2 | 0 | 2 | 12 | 13 | 0 | 98 | 1 | 0 | 1 | 0 |
| 8:00 AM | 7 | 17 | 2 | 0 | 2 | 9 | 12 | 0 | 22 | 4 | 4 | 0 | 3 | 16 | 10 | 0 | 108 | 1 | 0 | 1 | 0 |

Out 9
In 1

## SE Langensand Rd \& Dubarko Rd

Wednesday, March 20, 2019
7:00 AM to 9:00 AM


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| $\begin{aligned} & \text { Interval } \\ & \text { Start } \end{aligned}$Time | NorthboundSE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:05 AM | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 7:10 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 7:15 AM | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 2 |
| 7:25 AM | 0 | 0 | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7:35 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 7:50 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 4 |
| 7:55 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| 8:05 AM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8:10 AM | 0 | 0 | 0 | 0 | 0 | 0 |  | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 8:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 8:35 AM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 3 |
| 8:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:55 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Survey | 2 | 1 | 1 | 4 | 2 | 1 | 5 | 8 | 3 | 0 | 0 | 3 | 2 | 4 | 3 | 9 | 24 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM |  | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 7:15 AM | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 5 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7:45 AM | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 3 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 6 |
| 8:00 AM | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 4 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 8:30 AM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 2 | 4 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Surver | 2 | 1 | 1 | 4 | 2 | 1 | 5 | 8 | 3 | 0 | 0 | 3 | 2 | 4 | 3 | 9 | 24 |

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Dubarko Rd |  |  | Westbound Dubarko Rd |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 1 | 3 | 7 | 4 | 11 | 1 | 9 | 10 | 7 | 3 | 10 | 17 |
| PHF | 0.25 |  |  | 0.58 |  |  | 0.25 |  |  | 0.58 |  |  | 0.71 |


| By <br> Movement | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 1 | 0 | 1 | 2 | 2 | 1 | 4 | 7 | 1 | 0 | 0 | 1 | 0 | 4 | 3 | 7 | 17 |
| PHF | 0.25 | 0.00 | 0.25 | 0.25 | 0.25 | 0.25 | 0.50 | 0.58 | 0.25 | 0.00 | 0.00 | 0.25 | 0.00 | 0.33 | 0.38 | 0.58 | 0.71 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 1 | 0 | 1 | 2 | 2 | 0 | 4 | 6 | 1 | 0 | 0 | 1 | 0 | 4 | 2 | 6 | 15 |
| 7:15 AM | 0 | 1 | 1 | 2 | 2 | 1 | 4 | 7 | 1 | 0 | 0 | 1 | 0 | 4 | 2 | 6 | 16 |
| 7:30 AM | 0 | 1 | 0 | 1 | 2 | 1 | 3 | 6 | 2 | 0 | 0 | 2 | 0 | 1 | 2 | 3 | 12 |
| 7:45 AM | 1 | 1 | 0 | 2 | 2 | 1 | 2 | 5 | 3 | 0 | 0 | 3 | 2 | 1 | 2 | 5 | 15 |
| 8:00 AM | 1 | 1 | 0 | 2 | 0 | 1 | 1 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 1 | 3 | 9 |




5-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | NorthboundSE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes | Bikes | T | R | Bikes | L | T | Bikes |  | North | South | East | West |
| 4:00 PM | 2 | 4 | 0 | 0 | 62 | 9 | 0 | 5 | 50 | 0 | 132 | 0 | 0 | 0 | 0 |
| 4:05 PM | 1 | 2 | 0 | 0 | 69 | 6 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:10 PM | 1 | 3 | 0 | 0 | 61 | 3 | 0 | 1 | 74 | 0 | 143 | 0 | 0 | 0 | 0 |
| 4:15 PM | 6 | 1 | 0 | 0 | 76 | 5 | 0 | 1 | 50 | 0 | 139 | 0 | 0 | 0 | 0 |
| 4:20 PM | 5 | 5 | 0 | 0 | 79 | 9 | 0 | 1 | 70 | 0 | 169 | 0 | 0 | 0 | 0 |
| 4:25 PM | 6 | 0 | 1 | 0 | 58 | 8 | 0 | 1 | 49 | 0 | 122 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 3 | 0 | 0 | 75 | 12 | 0 | 1 | 56 | 0 | 147 | 0 | 0 | 0 | 0 |
| 4:35 PM | 2 | 5 | 0 | 0 | 61 | 7 | 0 | 1 | 64 | 0 | 140 | 0 | 0 | 0 | 0 |
| 4:40 PM | 0 | 1 | 0 | 0 | 59 | 1 | 0 | 1 | 55 | 0 | 117 | 0 | 0 | 0 | 0 |
| 4:45 PM | 1 | 1 | 0 | 0 | 64 | 3 | 0 | 2 | 63 | 0 | 134 | 0 | 0 | 0 | 0 |
| 4:50 PM | 6 | 5 | 0 | 0 | 62 | 6 | 0 | 0 | 54 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:55 PM | 3 | 0 | 0 | 0 | 72 | 5 | 0 | 2 | 56 | 0 | 138 | 0 | 0 | 0 | 0 |
| 5:00 PM | 1 | 5 | 0 | 0 | 62 | 10 | 0 | 1 | 55 | 0 | 134 | 0 | 0 | 0 | 0 |
| 5:05 PM | 2 | 3 | 0 | 0 | 72 | 11 | 0 | 4 | 76 | 0 | 168 | 0 | 0 | 0 | 0 |
| 5:10 PM | 2 | 3 | 0 | 0 | 58 | 14 | 0 | 1 | 65 | 0 | 143 | 0 | 0 | 0 | 0 |
| 5:15 PM | 1 | 2 | 0 | 0 | 51 | 8 | 0 | 2 | 59 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:20 PM | 2 | 4 | 0 | 0 | 78 | 7 | 0 | 2 | 43 | 0 | 136 | 0 | 0 | 0 | 0 |
| 5:25 PM | 3 | 1 | 0 | 0 | 71 | 5 | 0 | 1 | 42 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:30 PM | 2 | 2 | 0 | 0 | 67 | 7 | 0 | 3 | 38 | 0 | 119 | 0 | 0 | 0 | 0 |
| 5:35 PM | 1 | 1 | 0 | 0 | 60 | 5 | 0 | 1 | 38 | 0 | 106 | 0 | 0 | 0 | 0 |
| 5:40 PM | 0 | 4 | 0 | 0 | 49 | 7 | 0 | 0 | 34 | 0 | 94 | 0 | 0 | 0 | 0 |
| 5:45 PM | 2 | 1 | 0 | 0 | 69 | 7 | 0 | 1 | 45 | 0 | 125 | 0 | 0 | 0 | 0 |
| 5:50 PM | 0 | 3 | 0 | 0 | 60 | 4 | 0 | 0 | 43 | 0 | 110 | 0 | 0 | 0 | 0 |
| 5:55 PM | 4 | 1 | 0 | 0 | 65 | 8 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| Total Survey | 53 | 60 | 1 | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 | 0 | 0 | 0 | 0 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  |
| 4:00 PM | 4 | 9 | 0 |  | 0 | 192 | 18 | 0 | 9 | 176 | 0 | 408 |
| 4:15 PM | 17 | 6 | 1 |  | 0 | 213 | 22 | 0 | 3 | 169 | 0 | 430 |
| 4:30 PM | 2 | 9 | 0 |  | 0 | 195 | 20 | 0 | 3 | 175 | 0 | 404 |
| 4:45 PM | 10 | 6 | 0 |  | 0 | 198 | 14 | 0 | 4 | 173 | 0 | 405 |
| 5:00 PM | 5 | 11 | 0 |  | 0 | 192 | 35 | 0 | 6 | 196 | 0 | 445 |
| 5:15 PM | 6 | 7 | 0 |  | 0 | 200 | 20 | 0 | 5 | 144 | 0 | 382 |
| 5:30 PM | 3 | 7 | 0 |  | 0 | 176 | 19 | 0 | 4 | 110 | 0 | 319 |
| 5:45 PM | 6 | 5 | 0 |  | 0 | 194 | 19 | 0 | 4 | 140 | 0 | 368 |
| Total Surver | 53 | 60 | 1 |  | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 65 | 96 | 161 | 1 | 0 | 0 | 0 | 0 | 881 | 755 | 1,636 | 0 | 738 | 833 | 1,571 | 0 | 1,684 |
| \%HV | 3.1\% |  |  |  | 0.0\% |  |  |  | 3.3\% |  |  |  | 6.6\% |  |  |  | 4.8\% |
| PHF | 0.71 |  |  |  | 0.00 |  |  |  | 0.91 |  |  |  | 0.94 |  |  |  | 0.93 |
| By <br> Movement | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L |  | R | Total |  |  |  | Total |  | T | R | Total | L | T |  | Total |  |
| Volume | 33 |  | 32 | 65 |  |  |  | 0 |  | 801 | 80 | 881 | 16 | 722 |  | 738 | 1,684 |
| \%HV | 3.0\% | NA | 3.1\% | 3.1\% | NA | NA | NA | 0.0\% | NA | 3.4\% | 2.5\% | 3.3\% | 0.0\% | 6.8\% | NA | 6.6\% | 4.8\% |
| PHF | 0.49 |  | 0.80 | 0.71 |  |  |  | 0.00 |  | 0.93 | 0.69 | 0.91 | 0.57 | 0.93 |  | 0.94 | 0.93 |



Rolling Hour Summary
4:00 PM to 6:00 PM


SE Langensand Rd \& Hwy 26
Tuesday, March 19, 2019
4:00 PM to 6:00 PM
Out 50
In 29


Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total | Total | T | R | Total | L | T | Total |  |
| 4:00 PM | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 11 | 11 | 14 |
| 4:05 PM | 0 | 0 | 0 | 0 | 8 | 0 | 8 | 0 | 5 | 5 | 13 |
| 4:10 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 7 | 7 | 9 |
| 4:15 PM | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 4 | 4 | 9 |
| 4:20 PM | 1 | 0 | 1 | 0 | 4 | 1 | 5 | 0 | 4 | 4 | 10 |
| 4:25 PM | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 5 | 5 | 8 |
| 4:30 PM | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 3 | 3 | 6 |
| 4:35 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 4 | 4 | 5 |
| 4:40 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 3 | 5 |
| 4:45 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 4 | 4 | 5 |
| 4:50 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 6 | 6 | 8 |
| 4:55 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 2 | 3 |
| 5:00 PM | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 1 | 1 | 4 |
| 5:05 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 6 | 6 | 8 |
| 5:10 PM | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | 4 | 5 |
| 5:15 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 3 | 5 |
| 5:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 5 | 5 |
| 5:25 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 2 |
| 5:30 PM | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 2 | 2 | 6 |
| 5:35 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | 3 |
| 5:40 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 3 | 3 | 4 |
| 5:45 PM | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 3 | 3 | 7 |
| 5:50 PM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 2 | 3 |
| 5:55 PM | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 7 | 7 | 9 |
| Total Survey | 1 | 1 | 2 | 0 | 53 | 3 | 56 | 1 | 97 | 98 | 156 |

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | NorthboundSE Langensand Rd |  |  | Southbound <br> SE Langensand Rd |  | $\begin{gathered} \hline \text { Eastbound } \\ \text { Hwy } 26 \\ \hline \end{gathered}$ |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 4:00 PM | 0 | 0 | 0 |  | 0 | 13 | 0 | 13 | 0 | 23 | 23 | 36 |
| 4:15 PM | 1 | 0 | 1 |  | 0 | 12 | 1 | 13 | 0 | 13 | 13 | 27 |
| 4:30 PM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 10 | 10 | 16 |
| 4:45 PM | 0 | 0 | 0 |  | 0 | 4 | 0 | 4 | 0 | 12 | 12 | 16 |
| 5:00 PM | 0 | 0 | 0 |  | 0 | 5 | 1 | 6 | 0 | 11 | 11 | 17 |
| 5:15 PM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 9 | 9 | 12 |
| 5:30 PM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 1 | 7 | 8 | 13 |
| 5:45 PM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 | 12 | 12 | 19 |
| Total Surver | 1 | 1 | 2 |  | 0 | 53 | 3 | 56 | 1 | 97 | 98 | 156 |

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 2 | 4 | 0 | 0 | 0 | 29 | 50 | 79 | 49 | 28 | 77 | 80 |
| PHF | 0.25 |  |  | 0.00 |  |  | 0.56 |  |  | 0.82 |  |  | 0.71 |


| By <br> Movement | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| Volume | 1 | 1 | 2 |  | 0 | 27 | 2 | 29 | 0 | 49 | 49 | 80 |
| PHF | 0.25 | 0.25 | 0.25 |  | 0.00 | 0.56 | 0.25 | 0.56 | 0.00 | 0.82 | 0.82 | 0.71 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | R | Total |  | Total | T | R | Total | L | T | Total | Total |
| 4:00 PM | 1 | 1 | 2 |  | 0 | 33 | 2 | 35 | 0 | 58 | 58 | 95 |
| 4:15 PM | 1 | 1 | 2 |  | 0 | 25 | 3 | 28 | 0 | 46 | 46 | 76 |
| 4:30 PM | 0 | 1 | 1 |  | 0 | 16 | 2 | 18 | 0 | 42 | 42 | 61 |
| 4:45 PM | 0 | 0 | 0 |  | 0 | 17 | 1 | 18 | 1 | 39 | 40 | 58 |
| 5:00 PM | 0 | 0 | 0 |  | 0 | 20 | 1 | 21 | 1 | 39 | 40 | 61 |

## Peak Hour Summary

All Traffic Data

## - EnYn1010110

All Traffic Data

Clay Carney
(503) 833-2740

## SE Langensand Rd \& Hwy 26

## 4:10 PM to 5:10 PM

Tuesday, March 19, 2019


| Approach | PHF | HV\% | Volume |
| :---: | :---: | :---: | :---: |
| EB | 0.91 | $3.3 \%$ | 881 |
| WB | 0.94 | $6.6 \%$ | 738 |
| NB | 0.71 | $3.1 \%$ | 65 |
| SB | 0.00 | $0.0 \%$ | 0 |
| Intersection | 0.93 | $4.8 \%$ | 1,684 |

Count Period: 4:00 PM to 6:00 PM

| Location: | US26; MP 46.38; MT. HOOD HIGHWAY NO. 26; 0.30 mile east of Camp Creek Rd <br> (USFS 28) | Site Name: | Rhododendron (03-006) |
| :--- | :--- | ---: | ---: |

HISTORICAL TRAFFIC DATA

|  |  | Percent of AADT |  |  |  |  |  |
| :---: | ---: | ---: | ---: | ---: | ---: | ---: | :---: |
| Year | AADT | Max <br> Day | Max <br> Hour | 10TH <br> Hour | 20TH <br> Hour | 30TH <br> Hour |  |
| 2008 | 8162 | 233 | 22.9 | 20.1 | 19.1 | 18.2 |  |
| 2009 | 8737 | 197 | 22.3 | 19.6 | 18.4 | 17.8 |  |
| 2010 | 8714 | 207 | 21.6 | 19.8 | 18.9 | 18.5 |  |
| 2011 | 8330 | 214 | 24.7 | 20.0 | 18.6 | 18.1 |  |
| 2012 | 8480 | 227 | 24.0 | 21.0 | 20.2 | 19.4 |  |
| 2013 | 8527 | 213 | 23.4 | 21.1 | 20.3 | 19.1 |  |
| 2014 | 8652 | 216 | 23.2 | 21.1 | 20.3 | 19.2 |  |
| 2015 | 8861 | 242 | 21.4 | 20.3 | 19.4 | 18.7 |  |
| 2016 | 10071 | 208 | 22.9 | 19.6 | 18.8 | 17.9 |  |
| 2017 | 10223 | 200 | 19.9 | 19.1 | 18.1 | 17.5 |  |



2017 TRAFFIC DATA

|  | Average <br> Weekday <br> Traffic | Percent <br> of AADT | Average <br> Daily <br> Traffic | Percent <br> of AADT |
| :--- | ---: | ---: | ---: | ---: |
| January | 6744 | 66 | 9080 | 89 |
| February | 6533 | 64 | 9496 | 93 |
| March | 6763 | 66 | 9337 | 91 |
| April | 6166 | 60 | 8675 | 85 |
| May | 7675 | 75 | 9598 | 94 |
| June | 8568 | 84 | 10695 | 105 |
| July | 11291 | 110 | 13874 | 136 |
| August | 11738 | 115 | 13623 | 133 |
| September | 11300 | 111 | 12734 | 125 |
| October | 6589 | 64 | 8087 | 79 |
| November | 5493 | 54 | 7313 | 72 |
| December | 8753 | 86 | 10161 | 99 |

For Vehicle Classification data near your project, please go to the following web page: https://www.oregon.gov/ODOT/Data /Documents/TVT 2017.xlsx

| Location: | OR35; MP 57.79; MT. HOOD HIGHWAY NO. 26; 0.02 mile east of Warm Springs <br> Highway No. 53 (US26) | Site Name: | Mt. Hood Meadows (03-007) |
| :--- | :--- | ---: | ---: |
|  | Installed: | September, 1995 |  |

HISTORICAL TRAFFIC DATA

|  |  | Percent of AADT |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | AADT | $\begin{aligned} & \text { Max } \\ & \text { Day } \\ & \hline \end{aligned}$ | Max Hour | 10TH <br> Hour | 20TH Hour | 30TH <br> Hour |
| 2008 | 1854 | 398 | 56.8 | 44.2 | 39.9 | 36.1 |
| 2009 | 2130 | *** | *** | *** | *** | *** |
| 2010 | 2145 | 374 | 49.2 | 39.5 | 34.8 | 33.2 |
| 2011 | 1976 | 476 | 79.2 | 49.1 | 45.0 | 39.1 |
| 2012 | 2023 | 452 | 65.4 | 43.4 | 40.3 | 37.7 |
| 2013 | 1868 | 427 | 68.1 | 48.7 | 42.0 | 37.1 |
| 2014 | 1908 | 400 | 60.0 | 41.9 | 37.4 | 33.6 |
| 2015 | 1931 | 393 | 50.4 | 38.6 | 34.4 | 32.6 |
| 2016 | 2455 | 366 | 55.9 | 38.3 | 33.1 | 31.2 |
| 2017 | 2565 | 340 | 52.1 | 37.7 | 32.5 | 31.3 |



2017 TRAFFIC DATA

|  | Average <br> Weekday <br> Traffic | Percent <br> of AADT | Average <br> Daily <br> Traffic | Percent <br> of AADT |
| :--- | ---: | ---: | ---: | ---: |
| January | 2449 | 95 | 3616 | 141 |
| February | 1978 | 77 | 3362 | 131 |
| March | 1781 | 69 | 2833 | 110 |
| April | 1116 | 44 | 2050 | 80 |
| May | 1202 | 47 | 1609 | 63 |
| June | 1794 | 70 | 2070 | 81 |
| July | 2405 | 94 | 2837 | 111 |
| August | 2302 | 90 | 2614 | 102 |
| September | 3956 | 154 | 3993 | 156 |
| October | 1387 | 54 | 1614 | 63 |
| November | 768 | 30 | 1156 | 45 |
| December | 2499 | 97 | 2966 | 116 |

For Vehicle Classification data near your project, please go to the following web page:
https://www.oregon.gov/ODOT/Data /Documents/TVT_2017.xlsx

| HWY | MP | DIR | HS | Location | 2014 | 2015 | 2016 | 2036 | RSQ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 026 | 22.72 | 1 |  | 0.02 mile northwest of S.E. 362nd Drive, west city limits of Sandy |  | 29500 |  | 41400 | MODEL |
| 026 | 23.85 | 1 |  | 0.02 mile west of Bluff Road |  | 30100 |  | 42600 | MODEL |
| 026 | 23.89 | 1 |  | 0.02 mile east of Bluff Road |  | 15100 |  | 21600 | MODEL |
| 026 | 24.02 | 1 |  | 0.02 mile west of Beers Avenue |  | 15100 |  | 21600 | MODEL |
| 026 | 24.35 | 1 |  | 0.05 mile west of Eagle Creek-Sandy Highway (OR211) |  | 14800 |  | 21600 | MODEL |
| 026 | 24.42 | 1 |  | 0.02 mile east of Eagle Creek-Sandy Highway (OR211) |  | 12000 |  | 17100 | MODEL |
| 026 | 24.59 | 1 |  | 0.02 mile west of Ten Eyck Road |  | 11200 |  | 16000 | MODEL |
| 026 | 23.89 | 2 | W | 0.02 mile east of Bluff Road |  | 15200 |  | 21300 | MODEL |
| 026 | 24.04 | 2 | W | 0.02 mile west of Beers Avenue |  | 15200 |  | 21300 | MODEL |
| 026 | 24.36 | 2 | W | 0.05 mile west of Eagle Creek-Sandy Highway (OR211) |  | 14500 |  | 20700 | MODEL |
| 026 | 24.40 | 2 | W | 0.02 mile east of Eagle Creek-Sandy Highway (OR211) |  | 12100 |  | 16900 | MODEL |
| 026 | 24.61 | 2 | W | 0.02 mile west of Ten Eyck Road |  | 11700 |  | 16400 | MODEL |
| 026 | 25.10 | 1 |  | 0.02 mile west of Langensand Road |  | 18000 |  | 25400 | MODEL |
| 026 | 25.66 | 1 |  | 0.10 mile east of Vista Loop Drive |  | 19700 |  | 27600 | MODEL |




| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \％ | 性 |  | ＊ | 个个 | F＇ |  | \＄ |  |  | \＄ |  |
| Traffic Volume（veh／h） | 57 | 770 | 37 |  | 998 | 10 | 134 | 11 | 3 | 15 | 4 | 145 |
| Future Volume（veh／h） | 57 | 770 | 37 | 4 | 998 | 10 | 134 | 11 | 3 | 15 | 4 | 145 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate，veh／h | 61 | 819 | 39 | 4 | 1062 | 11 | 143 | 12 | 3 | 16 | 4 | 154 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh，\％ | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap，veh／h | 75 | 1693 | 81 | 8 | 1692 | 755 | 326 | 25 | 6 | 55 | 29 | 396 |
| Arrive On Green | 0.05 | 0.58 | 0.58 | 0.01 | 0.53 | 0.53 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Sat Flow，veh／h | 1511 | 2929 | 139 | 1589 | 3169 | 1414 | 884 | 84 | 19 | 75 | 95 | 1303 |
| Grp Volume（v），veh／h | 61 | 421 | 437 | 4 | 1062 | 11 | 158 | 0 | 0 | 174 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1511 | 1507 | 1561 | 1589 | 1585 | 1414 | 986 | 0 | 0 | 1472 | 0 | 0 |
| Q Serve（g＿s），s | 4.8 | 19.7 | 19.7 | 0.3 | 28.2 | 0.4 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 4.8 | 19.7 | 19.7 | 0.3 | 28.2 | 0.4 | 19.0 | 0.0 | 0.0 | 11.2 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.09 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.89 |
| Lane Grp Cap（c），veh／h | 75 | 871 | 903 | 8 | 1692 | 755 | 357 | 0 | 0 | 480 | 0 | 0 |
| V／C Ratio（X） | 0.82 | 0.48 | 0.48 | 0.48 | 0.63 | 0.01 | 0.44 | 0.00 | 0.00 | 0.36 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 146 | 871 | 903 | 73 | 1692 | 755 | 357 | 0 | 0 | 480 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 56.5 | 14.8 | 14.8 | 59.5 | 19.6 | 13.1 | 36.7 | 0.0 | 0.0 | 32.9 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 18.7 | 1.9 | 1.9 | 38.0 | 1.8 | 0.0 | 3.9 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 2.2 | 7.1 | 7.4 | 0.2 | 10.7 | 0.2 | 4.4 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 75.2 | 16.7 | 16.7 | 97.5 | 21.4 | 13.2 | 40.6 | 0.0 | 0.0 | 33.4 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol，veh／h |  | 919 |  |  | 1077 |  |  | 158 |  |  | 174 |  |
| Approach Delay，s／veh |  | 20.6 |  |  | 21.6 |  |  | 40.6 |  |  | 33.4 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration（G＋Y＋Rc），s | 5.1 | 73.9 | 41.0 | 10.4 | 68.6 | 41.0 |
| Change Period（Y＋Rc），s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.5 | 64.5 | 36.5 | 11.6 | 58.4 | 36.5 |
| Max Q Clear Time（g＿c＋11），s | 2.3 | 21.7 | 21.0 | 6.8 | 30.2 | 13.2 |
| Green Ext Time（p＿c），s | 0.0 | 7.1 | 0.8 | 0.0 | 9.6 | 1.1 |

Intersection Summary

| HCM 6th Ctrl Delay | 23.4 |
| :--- | ---: |
| HCM 6th LOS | C |





| Major/Minor | Major1 |  |  |  | Minor2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Conflicting Flow All | 982 | 0 |  | 0 | 1412 | 491 |
| Stage 1 | - | - |  | - | 982 | - |
| Stage 2 | - | - |  | - | 430 | - |
| Critical Hdwy | 4.36 | - |  | - | 6.98 | 7.08 |
| Critical Hdwy Stg 1 | - | - |  | - | 5.98 | - |
| Critical Hdwy Stg 2 | - | - |  | - | 5.98 | - |
| Follow-up Hdwy | 2.33 | - |  | - | 3.59 | 3.39 |
| Pot Cap-1 Maneuver | 636 | - | - | - | 121 | 505 |
| Stage 1 | - | - | - | - | 308 | - |
| Stage 2 | - | - | - | - | 604 | - |
| Platoon blocked, \% |  | - | - | - |  |  |
| Mov Cap-1 Maneuver | 636 | - | - | - | 118 | 505 |
| Mov Cap-2 Maneuver | - | - | - | - | 118 | - |
| Stage 1 | - | - | - | - | 300 | - |
| Stage 2 | - | - | - | - | 604 | - |
|  |  |  |  |  |  |  |
| Approach | SE |  | NW |  | SW |  |
| HCM Control Delay, s | 0.2 |  | 0 |  | 12.7 |  |
| HCM LOS |  |  |  |  | B |  |
|  |  |  |  |  |  |  |
| Minor Lane/Major Mvmt |  | NWT NWR |  | SEL | SETSWLn1 |  |
| Capacity (veh/h) |  | - | - | 636 | - | 505 |
| HCM Lane V/C Ratio |  | - | - | 0.027 | - | 0.076 |
| HCM Control Delay (s) |  | - | - | 10.8 | - | 12.7 |
| HCM Lane LOS |  | - | - | B | - | B |
| HCM 95th \%tile Q(veh) |  | - | - | 0.1 | - | 0.2 |




| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5.5 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{7}$ | $\uparrow$ |  |  | * |  |  | * |  |  | * |  |
| Traffic Vol, veh/h | 18 | 1 | 1 | 1 | 15 | 22 | 4 | 20 | 2 | 9 | 5 | 16 |
| Future Vol, veh/h | 18 | 1 | 1 | 1 | 15 | 22 | 4 | 20 | 2 | 9 | 5 | 16 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| Heavy Vehicles, \% | 5 | 5 | 5 | 18 | 18 | 18 | 8 | 8 | 8 | 23 | 23 | 23 |
| Mvmt Flow | 20 | 1 | 1 | 1 | 17 | 25 | 4 | 22 | 2 | 10 | 6 | 18 |



HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/08/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 性 |  | \% | 性 | F |  | \$ |  |  | \$ |  |
| Traffic Volume (veh/h) | 152 | 1130 | 152 | 8 | 1022 | 21 | 131 | 15 | 13 | 38 | 13 | 113 |
| Future Volume (veh/h) | 152 | 1130 | 152 | 8 | 1022 | 21 | 131 | 15 | 13 | 38 | 13 | 113 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate, veh/h | 160 | 1189 | 160 | 8 | 1076 | 22 | 138 | 16 | 14 | 40 | 14 | 119 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, \% | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap, veh/h | 186 | 1765 | 237 | 15 | 1605 | 698 | 285 | 32 | 24 | 108 | 50 | 267 |
| Arrive On Green | 0.11 | 0.62 | 0.62 | 0.01 | 0.51 | 0.51 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |
| Sat Flow, veh/h | 1628 | 2869 | 385 | 1576 | 3143 | 1368 | 876 | 123 | 91 | 270 | 191 | 1016 |
| Grp Volume(v), veh/h | 160 | 671 | 678 | 8 | 1076 | 22 | 168 | 0 | 0 | 173 | 0 | 0 |
| Grp Sat Flow(s),veh/h/n | 1628 | 1624 | 1630 | 1576 | 1572 | 1368 | 1090 | 0 | 0 | 1477 | 0 | 0 |
| Q Serve(g_s), s | 11.6 | 32.5 | 32.9 | 0.6 | 30.6 | 1.0 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 11.6 | 32.5 | 32.9 | 0.6 | 30.6 | 1.0 | 18.1 | 0.0 | 0.0 | 11.3 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.24 | 1.00 |  | 1.00 | 0.82 |  | 0.08 | 0.23 |  | 0.69 |
| Lane Grp Cap(c), veh/h | 186 | 999 | 1003 | 15 | 1605 | 698 | 341 | 0 | 0 | 425 | 0 | 0 |
| V/C Ratio(X) | 0.86 | 0.67 | 0.68 | 0.52 | 0.67 | 0.03 | 0.49 | 0.00 | 0.00 | 0.41 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 264 | 999 | 1003 | 67 | 1605 | 698 | 341 | 0 | 0 | 425 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 52.2 | 15.1 | 15.2 | 59.1 | 21.8 | 14.6 | 39.9 | 0.0 | 0.0 | 36.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 17.6 | 3.6 | 3.7 | 24.7 | 2.2 | 0.1 | 5.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 5.7 | 12.6 | 12.8 | 0.3 | 11.7 | 0.3 | 4.9 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay (d),s/veh | 69.8 | 18.7 | 18.9 | 83.8 | 24.1 | 14.7 | 44.9 | 0.0 | 0.0 | 37.5 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | D | A | A |
| Approach Vol, veh/h |  | 1509 |  |  | 1106 |  |  | 168 |  |  | 173 |  |
| Approach Delay, s/veh |  | 24.2 |  |  | 24.3 |  |  | 44.9 |  |  | 37.5 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | D |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration $(G+Y+R c)$, s | 5.7 | 78.3 | 36.0 | 18.2 | 65.8 | 36.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 69.9 | 31.5 | 19.5 | 55.5 | 31.5 |
| Max Q Clear Time (g_c+11), s | 2.6 | 34.9 | 20.1 | 13.6 | 32.6 | 13.3 |
| Green Ext Time (p_c), s | 0.0 | 13.4 | 0.7 | 0.2 | 9.0 | 1.0 |

Intersection Summary

| HCM 6th Ctrl Delay | 26.2 |
| :--- | ---: |
| HCM 6th LOS | C |


| Intersection |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh 1.6 |  |  |  |  |  |  |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | 44 | T | ${ }^{*}$ | 44 | ${ }^{*}$ | 「 |
| Traffic Vol, veh/h | 1085 | 82 | 16 | 1043 | 34 | 33 |
| Future Vol, veh/h | 1085 | 82 | 16 | 1043 | 34 | 33 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 160 | 215 | - | 120 | 0 |
| Veh in Median Storage, | \# 0 | - | - | 0 | 0 | - |
| Grade, \% | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, \% | 3 | 3 | 7 | 7 | 3 | 3 |
| Mvmt Flow | 1142 | 86 | 17 | 1098 | 36 | 35 |



| Intersection |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Int Delay, s/veh | 0.3 |  |  |  |  |  |
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | 1 | 4. | 个 |  |  |  |
| Traffic Vol, veh/h | 37 | 1070 | 1027 | 0 | 0 | 15 |
| Future Vol, veh/h | 37 | 1070 | 1027 | 0 | 0 | 15 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 1 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 220 | - | - | - | 0 | - |
| Veh in Median Storage, \# | - | 0 | 0 | - | 0 | - |
| Grade, \% | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, \% | 3 | 3 | 7 | 7 | 13 | 13 |
| Mvmt Flow | 38 | 1103 | 1059 | 0 | 0 | 15 |


| Major/Minor | Major1 |  |  | Minor2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Conflicting Flow All | 1060 | 0 | 0 | 1688 | 532 |
| Stage 1 | - | - | - | 1060 | - |
| Stage 2 | - | - | - | 628 | - |
| Critical Hdwy | 4.16 | - | - | 7.06 | 7.16 |
| Critical Hdwy Stg 1 | - | - | - | 6.06 | - |
| Critical Hdwy Stg 2 | - | - | - | 6.06 | - |
| Follow-up Hdwy | 2.23 | - | - | 3.63 | 3.43 |
| Pot Cap-1 Maneuver | 647 | - | - | 75 | 464 |
| Stage 1 | - | - | - | 271 | - |
| Stage 2 | - | - | - | 465 | - |
| Platoon blocked, \% |  | - | - |  |  |
| Mov Cap-1 Maneuver | 646 | - | - | 70 | 463 |
| Mov Cap-2 Maneuver | - | - | - | 70 | - |
| Stage 1 | - | - | - | 255 | - |
| Stage 2 | - | - | - | 465 | - |
|  |  |  |  |  |  |
| Approach | SE |  |  | SW |  |
| HCM Control Delay, s | 0.4 |  |  | 13 |  |
| HCM LOS |  |  |  | B |  |
|  |  |  |  |  |  |
| Minor Lane/Major Mvmt |  | NWT NWR | SEL SETSWLn1 |  |  |
| Capacity (veh/h) |  | - | 646 |  | 463 |
| HCM Lane V/C Ratio |  | - | 0.059 | - | 0.033 |
| HCM Control Delay (s) |  | - | 10.9 | - | 13 |
| HCM Lane LOS |  | - | B | - | B |
| HCM 95th \%tile Q(veh) |  | - | 0.2 |  | 0.1 |




| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5.2 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{*}$ | $\uparrow$ |  |  | \& |  |  | $\uparrow$ |  |  | \& |  |
| Traffic Vol, veh/h | 23 | 23 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 23 | 27 | 28 |
| Future Vol, veh/h | 23 | 23 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 23 | 27 | 28 |
| Conflicting Peds, \#/hr | 2 | 0 | 1 | 3 | 0 | 4 | 1 | 0 | 3 | 4 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, \% | 2 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 3 | 3 | 3 |
| Mvmt Flow | 25 | 25 | 5 | 2 | 7 | 8 | 4 | 11 | 1 | 25 | 30 | 31 |



## Trip Generation Calculation Worksheet

Land Use Description: Multi-Family Housing (Low-Rise)
ITE Land Use Code: 220
Independent Variable: Dwelling Units
Quantity: 158 Dwelling Units

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.46$ trips per dwelling unit
Directional Distribution: 23\% Entering 77\% Exiting

PM Peak Hour of Adjacent Street Traffic
$\begin{array}{lcc}\text { Trip Rate: } \quad 0.56 \text { trips per dwelling unit } & \\ \text { Directional Distribution: } & 63 \% \text { Entering } & 37 \% \text { Exiting }\end{array}$
Total Weekday Traffic
Trip Rate: $\quad 7.32$ trips per dwelling unit
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

158 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 17 | 56 | 73 |
| PM Peak Hour | 55 | 33 | 88 |
| Weekday | 578 | 578 | 1156 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 4 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

| Trip Rate: 0.74 trips per dwelling unit |  |
| :--- | :---: | :--- |
| Directional Distribution: $\quad 25 \%$ Entering |  |
|  | $75 \%$ Exiting |

PM Peak Hour of Adjacent Street Traffic

| Trip Rate: | 0.99 trips per dwelling unit |  |
| :--- | :---: | ---: |
| Directional Distribution: | $63 \%$ Entering | $37 \%$ Exiting |
|  |  |  |
| Total Weekday Traffic |  |  |
| Trip Rate: | 9.44 trips per dwelling unit |  |
| Directional Distribution: | $50 \%$ Entering | $50 \%$ Exiting |

## Site Trip Generation Calculations

4 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 1 | 2 | 3 |
| PM Peak Hour | 3 | 1 | 4 |
| Weekday | 19 | 19 | 38 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 52 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

$\begin{array}{lcl}\text { Trip Rate: } 0.74 \text { trips per dwelling unit } \\ \text { Directional Distribution: } \quad 25 \% \text { Entering } & \\ & 75 \% \text { Exiting }\end{array}$

PM Peak Hour of Adjacent Street Traffic
$\begin{array}{lcc}\text { Trip Rate: } \quad 0.99 \text { trips per dwelling unit } & \\ \text { Directional Distribution: } & 63 \% \text { Entering } & 37 \% \text { Exiting }\end{array}$

Total Weekday Traffic
Trip Rate: $\quad 9.44$ trips per dwelling unit
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

52 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 10 | 28 | 38 |
| PM Peak Hour | 32 | 19 | 51 |
| Weekday | 245 | 245 | 490 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 56 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

$\begin{array}{lcl}\text { Trip Rate: } 0.74 \text { trips per dwelling unit } \\ \text { Directional Distribution: } \quad 25 \% \text { Entering } & \\ & 75 \% \text { Exiting }\end{array}$

PM Peak Hour of Adjacent Street Traffic
$\begin{array}{lcc}\text { Trip Rate: } \quad 0.99 \text { trips per dwelling unit } & \\ \text { Directional Distribution: } & 63 \% \text { Entering } & 37 \% \text { Exiting }\end{array}$
Total Weekday Traffic
Trip Rate: $\quad 9.44$ trips per dwelling unit
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

56 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 10 | 31 | 41 |
| PM Peak Hour | 35 | 20 | 55 |
| Weekday | 264 | 264 | 528 |

## Trip Generation Calculation Worksheet

Land Use Description: Shopping Center
ITE Land Use Code: 820
Independent Variable: Gross Floor Area
Quantity: 30.9 Thousand Square Feet

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.94$ trips per ksf
Directional Distribution: 62\% Entering 38\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 3.81$ trips per ksf
Directional Distribution: $\quad 48 \%$ Entering $52 \%$ Exiting

Total Weekday Traffic
Trip Rate:
37.75 trips per ksf

Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

30.9 ksf Shopping Center

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 18 | 11 | 29 |
| PM Peak Hour | 57 | 61 | 118 |
| Weekday | 583 | 583 | 1166 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 6 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

| Trip Rate: 0.74 trips per dwelling unit |  |
| :--- | :---: | :--- |
| Directional Distribution: $\quad 25 \%$ Entering |  |
|  | $75 \%$ Exiting |

PM Peak Hour of Adjacent Street Traffic

| Trip Rate: $\quad 0.99$ trips per dwelling unit |  |  |
| :--- | :---: | :---: |
| Directional Distribution: | $63 \%$ Entering | $37 \%$ Exiting |

Total Weekday Traffic
Trip Rate: $\quad 9.44$ trips per dwelling unit Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

6 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 1 | 3 | 4 |
| PM Peak Hour | 4 | 2 | 6 |
| Weekday | 28 | 28 | 56 |

## Trip Generation Calculation Worksheet

Land Use Description: Multi-Family Housing (Low-Rise)
ITE Land Use Code: 220
Independent Variable: Dwelling Units
Quantity: 158 Dwelling Units

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.46$ trips per dwelling unit
Directional Distribution: 23\% Entering 77\% Exiting

PM Peak Hour of Adjacent Street Traffic
$\begin{array}{lcc}\text { Trip Rate: } \quad 0.56 \text { trips per dwelling unit } & \\ \text { Directional Distribution: } & 63 \% \text { Entering } & 37 \% \text { Exiting }\end{array}$
Total Weekday Traffic
Trip Rate: $\quad 7.32$ trips per dwelling unit
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

158 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 17 | 56 | 73 |
| PM Peak Hour | 55 | 33 | 88 |
| Weekday | 578 | 578 | 1156 |

## Trip Generation Calculation Worksheet

Land Use Description: Shopping Center
ITE Land Use Code: 820
Independent Variable: Gross Floor Area
Quantity: 34.0 Thousand Square Feet

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.94$ trips per ksf
Directional Distribution: 62\% Entering 38\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 3.81$ trips per ksf
Directional Distribution: $\quad 48 \%$ Entering $52 \%$ Exiting

Total Weekday Traffic
Trip Rate:
37.75 trips per ksf

Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

34.0 ksf Shopping Center

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 20 | 12 | 32 |
| PM Peak Hour | 62 | 68 | 130 |
| Weekday | 642 | 642 | 1284 |

# Trip Generation Calculation Worksheet 

Land Use Description: Public Park
ITE Land Use Code: 411
Independent Variable: Acres
Quantity: 1.43 Acres

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

Trip Rate: $\quad 0.02$ trips per acre
Directional Distribution: 58\% Entering 42\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.11$ trips per acre
Directional Distribution: 50\% Entering 50\% Exiting

Total Weekday Traffic
Trip Rate: $\quad 0.78$ trips per acre
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

1.43 Acre Park

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 0 | 0 | 0 |
| PM Peak Hour | 0 | 0 | 0 |
| Weekday | 1 | 1 | 2 |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 个t |  | \% | 性 | F |  | \$ |  |  | \$ |  |
| Traffic Volume (veh/h) | 59 | 822 | 38 | 4 | 1104 | 10 | 139 | 11 | 3 | 16 | , | 151 |
| Future Volume (veh/h) | 59 | 822 | 38 | 4 | 1104 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate, veh/h | 63 | 874 | 40 | 4 | 1174 | 11 | 148 | 12 | 3 | 17 | 4 | 161 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, \% | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap, veh/h | 77 | 1697 | 78 | 8 | 1687 | 752 | 321 | 24 | 5 | 56 | 28 | 399 |
| Arrive On Green | 0.05 | 0.58 | 0.58 | 0.01 | 0.53 | 0.53 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Sat Flow, veh/h | 1511 | 2935 | 134 | 1589 | 3169 | 1414 | 867 | 79 | 18 | 77 | 94 | 1311 |
| Grp Volume(v), veh/h | 63 | 449 | 465 | 4 | 1174 | 11 | 163 | 0 | 0 | 182 | 0 | 0 |
| Grp Sat Flow(s),veh/h/n | 1511 | 1507 | 1562 | 1589 | 1585 | 1414 | 964 | 0 | 0 | 1482 | 0 | 0 |
| Q Serve(g_s), s | 5.0 | 21.5 | 21.5 | 0.3 | 33.0 | 0.4 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 5.0 | 21.5 | 21.5 | 0.3 | 33.0 | 0.4 | 20.2 | 0.0 | 0.0 | 11.8 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.09 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.88 |
| Lane Grp Cap(c), veh/h | 77 | 871 | 903 | 8 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 0.52 | 0.52 | 0.48 | 0.70 | 0.01 | 0.47 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 145 | 871 | 903 | 68 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 56.4 | 15.2 | 15.2 | 59.5 | 20.9 | 13.2 | 37.3 | 0.0 | 0.0 | 33.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 18.2 | 2.2 | 2.1 | 38.0 | 2.4 | 0.0 | 4.4 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 2.3 | 7.8 | 8.1 | 0.2 | 12.6 | 0.2 | 4.6 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay (d),s/veh | 74.6 | 17.4 | 17.3 | 97.5 | 23.3 | 13.3 | 41.6 | 0.0 | 0.0 | 33.6 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol, veh/h |  | 977 |  |  | 1189 |  |  | 163 |  |  | 182 |  |
| Approach Delay, s/veh |  | 21.0 |  |  | 23.4 |  |  | 41.6 |  |  | 33.6 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration (G+Y+Rc), s | 5.1 | 73.9 | 41.0 | 10.6 | 68.4 | 41.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 64.9 | 36.5 | 11.5 | 58.5 | 36.5 |
| Max Q Clear Time (g_c+11), s | 2.3 | 23.5 | 22.2 | 7.0 | 35.0 | 13.8 |
| Green Ext Time (p_c), s | 0.0 | 7.7 | 0.8 | 0.0 | 10.1 | 1.1 |

Intersection Summary
HCM 6th Ctrl Delay 24.4
HCM 6th LOS



| Intersection |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Int Delay, s/veh | 0.7 |  |  |  |  |  |
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | 4 | 4 | 个 |  |  |  |
| Traffic Vol, veh/h | 28 | 785 | 996 | 1 | 0 | 69 |
| Future Vol, veh/h | 28 | 785 | 996 | 1 | 0 | 69 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 220 | - | - | - | 0 | - |
| Veh in Median Storage, \# | - | 0 | 0 | - | 0 | - |
| Grade, \% | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, \% | 13 | 13 | 6 | 6 | 9 | 9 |
| Mvmt Flow | 30 | 835 | 1060 | 1 | 0 | 73 |


| Major/Minor | Major1 |  |  | Minor2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Conflicting Flow All | 1061 | 0 | 0 | 1539 | 531 |
| Stage 1 | - | - | - | 1061 | - |
| Stage 2 | - | - | - | 478 | - |
| Critical Hdwy | 4.36 | - | - | 6.98 | 7.08 |
| Critical Hdwy Stg 1 | - | - | - | 5.98 | - |
| Critical Hdwy Stg 2 | - | - | - | 5.98 | - |
| Follow-up Hdwy | 2.33 | - | - | 3.59 | 3.39 |
| Pot Cap-1 Maneuver | 591 | - | - | 99 | 475 |
| Stage 1 | - | - | - | 279 | - |
| Stage 2 | - | - | - | 570 | - |
| Platoon blocked, \% |  | - | - |  |  |
| Mov Cap-1 Maneuver | 591 | - | - | 94 | 475 |
| Mov Cap-2 Maneuver | - | - | - | 94 | - |
| Stage 1 | - | - | - | 265 | - |
| Stage 2 | - | - | - | 570 | - |
|  |  |  |  |  |  |
| Approach | SE |  |  | SW |  |
| HCM Control Delay, s | 0.4 |  |  | 14 |  |
| HCM LOS |  |  |  | B |  |
|  |  |  |  |  |  |
| Minor Lane/Major Mvmt |  | NWT NWR | SEL | SETSWLn1 |  |
| Capacity (veh/h) |  | - | 591 | - | 475 |
| HCM Lane V/C Ratio |  | - | 0.05 | - | 0.155 |
| HCM Control Delay (s) |  | - | 11.4 | - | 14 |
| HCM Lane LOS |  | - | B | - | B |
| HCM 95th \%tile Q(veh) |  | - | 0.2 | - | 0.5 |






HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/08/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | ${ }^{4}$ | 个 ${ }_{\text {a }}$ |  | ＊ | 个4 | 「 |  | ¢ |  |  | \＄ |  |
| Traffic Volume（veh／h） | 158 | 1244 | 158 |  | 1105 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Future Volume（veh／h） | 158 | 1244 | 158 | 8 | 1105 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate，veh／h | 166 | 1309 | 166 | 8 | 1163 | 23 | 143 | 17 | 15 | 42 | 15 | 124 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh，\％ | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap，veh／h | 192 | 1780 | 224 | 15 | 1594 | 694 | 279 | 33 | 24 | 109 | 51 | 267 |
| Arrive On Green | 0.12 | 0.62 | 0.62 | 0.01 | 0.51 | 0.51 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |
| Sat Flow，veh／h | 1628 | 2893 | 364 | 1576 | 3143 | 1368 | 857 | 124 | 92 | 273 | 194 | 1017 |
| Grp Volume（v），veh／h | 166 | 731 | 744 | 8 | 1163 | 23 | 175 | 0 | 0 | 181 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1628 | 1624 | 1634 | 1576 | 1572 | 1368 | 1073 | 0 | 0 | 1484 | 0 | 0 |
| Q Serve（g＿s），s | 12.0 | 37.8 | 38.6 | 0.6 | 34.7 | 1.0 | 7.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 12.0 | 37.8 | 38.6 | 0.6 | 34.7 | 1.0 | 19.3 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.22 | 1.00 |  | 1.00 | 0.82 |  | 0.09 | 0.23 |  | 0.69 |
| Lane Grp Cap（c），veh／h | 192 | 999 | 1005 | 15 | 1594 | 694 | 336 | 0 | 0 | 426 | 0 | 0 |
| V／C Ratio（X） | 0.87 | 0.73 | 0.74 | 0.52 | 0.73 | 0.03 | 0.52 | 0.00 | 0.00 | 0.42 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 251 | 999 | 1005 | 67 | 1594 | 694 | 336 | 0 | 0 | 426 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 52.0 | 16.2 | 16.3 | 59.1 | 23.1 | 14.8 | 40.4 | 0.0 | 0.0 | 37.1 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 21.1 | 4.7 | 4.9 | 24.7 | 3.0 | 0.1 | 5.7 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 6.1 | 14.8 | 15.3 | 0.3 | 13.4 | 0.3 | 5.2 | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 73.1 | 20.9 | 21.2 | 83.8 | 26.1 | 14.9 | 46.1 | 0.0 | 0.0 | 37.8 | 0.0 | 0.0 |
| LnGrp LOS | E | C | C | F | C | B | D | A | A | D | A | A |
| Approach Vol，veh／h |  | 1641 |  |  | 1194 |  |  | 175 |  |  | 181 |  |
| Approach Delay，s／veh |  | 26.3 |  |  | 26.3 |  |  | 46.1 |  |  | 37.8 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | D |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration（G＋Y＋Rc），s | 5.7 | 78.3 | 36.0 | 18.6 | 65.4 | 36.0 |
| Change Period（Y＋Rc），s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.1 | 69.9 | 31.5 | 18.5 | 56.5 | 31.5 |
| Max Q Clear Time（g＿c＋11），s | 2.6 | 40.6 | 21.3 | 14.0 | 36.7 | 13.9 |
| Green Ext Time（p＿c），s | 0.0 | 14.2 | 0.7 | 0.2 | 9.2 | 1.0 |

Intersection Summary

| HCM 6th Ctrl Delay | 28.0 |
| :--- | ---: |
| HCM 6th LOS | C |




| Intersection |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Int Delay, s/veh | 0.6 |  |  |  |  |  |
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | 4 | 4 | 个 |  |  |  |
| Traffic Vol, veh/h | 72 | 1150 | 1089 | 0 | 0 | 37 |
| Future Vol, veh/h | 72 | 1150 | 1089 | 0 | 0 | 37 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 1 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 220 | - | - | - | 0 | - |
| Veh in Median Storage, \# | - | 0 | 0 | - | 0 | - |
| Grade, \% | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, \% | 3 | 3 | 7 | 7 | 13 | 13 |
| Mvmt Flow | 74 | 1186 | 1123 | 0 | 0 | 38 |


| Major/Minor | Major1 | Major2 |  |  | Minor2 |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | :---: |
| Conflicting Flow All | 1124 | 0 | - | 0 | 1865 | 564 |  |
| Stage 1 | - | - | - | -1124 | - |  |  |
| Stage 2 | - | - | - | - | 741 | - |  |
| Critical Hdwy | 4.16 | - | - | - | 7.06 | 7.16 |  |
| Critical Hdwy Stg 1 | - | - | - | - | 6.06 | - |  |
| Critical Hdwy Stg 2 | - | - | - | - | 6.06 | - |  |
| Follow-up Hdwy | 2.23 | - | - | - | 3.63 | 3.43 |  |
| Pot Cap-1 Maneuver | 611 | - | - | - | 57 | 442 |  |
| $\quad$ Stage 1 | - | - | - | - | 250 | - |  |
| Stage 2 | - | - | - | - | 404 | - |  |
| Platoon blocked, \% |  | - | - | - |  |  |  |
| Mov Cap-1 Maneuver | 610 | - | - | - | 50 | 441 |  |
| Mov Cap-2 Maneuver | - | - | - | - | 50 | - |  |
| Stage 1 | - | - | - | - | 220 | - |  |
| Stage 2 | - | - | - | - | 404 | - |  |


| Approach | SE | NW | SW |
| :--- | ---: | ---: | ---: |
| HCM Control Delay, s | 0.7 | 0 | 13.9 |
| HCM LOS |  |  | B |


| Minor Lane/Major Mvmt | NWT | NWR | SEL | SETSWLn1 |
| :--- | ---: | ---: | ---: | ---: |
| Capacity (veh/h) | - | - | 610 | - |
| HCM Lane V/C Ratio | - | - | 0.122 | -0.086 |
| HCM Control Delay (s) | - | - | 11.7 | -13.9 |
| HCM Lane LOS | - | - | B | - |
| HCM 95th \%tile Q(veh) | - | - | 0.4 | - |




| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{*}$ | $\uparrow$ |  |  | \& |  |  | $\uparrow$ |  |  | \& |  |
| Traffic Vol, veh/h | 24 | 24 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 24 | 28 | 29 |
| Future Vol, veh/h | 24 | 24 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 24 | 28 | 29 |
| Conflicting Peds, \#/hr | 2 | 0 | 1 | 3 | 0 | 4 | 1 | 0 | 3 | 4 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, \% | 2 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 3 | 3 | 3 |
| Mvmt Flow | 26 | 26 | 5 | 2 | 7 | 8 | 4 | 11 | 1 | 26 | 31 | 32 |




| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 个t |  | \% | 性 | F |  | \$ |  |  | \$ |  |
| Traffic Volume (veh/h) | 59 | 732 | 38 | 4 | 1070 | 10 | 139 | 11 | 3 | 16 | , | 151 |
| Future Volume (veh/h) | 59 | 732 | 38 | 4 | 1070 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate, veh/h | 63 | 779 | 40 | 4 | 1138 | 11 | 148 | 12 | 3 | 17 | 4 | 161 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, \% | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap, veh/h | 77 | 1686 | 87 | 8 | 1687 | 752 | 321 | 24 | 5 | 56 | 28 | 399 |
| Arrive On Green | 0.05 | 0.58 | 0.58 | 0.01 | 0.53 | 0.53 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Sat Flow, veh/h | 1511 | 2916 | 150 | 1589 | 3169 | 1414 | 867 | 79 | 18 | 77 | 94 | 1311 |
| Grp Volume(v), veh/h | 63 | 402 | 417 | 4 | 1138 | 11 | 163 | 0 | 0 | 182 | 0 | 0 |
| Grp Sat Flow(s),veh/h/n | 1511 | 1507 | 1559 | 1589 | 1585 | 1414 | 964 | 0 | 0 | 1482 | 0 | 0 |
| Q Serve(g_s), s | 5.0 | 18.4 | 18.5 | 0.3 | 31.4 | 0.4 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 5.0 | 18.4 | 18.5 | 0.3 | 31.4 | 0.4 | 20.2 | 0.0 | 0.0 | 11.8 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.10 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.88 |
| Lane Grp Cap(c), veh/h | 77 | 871 | 901 | 8 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 0.46 | 0.46 | 0.48 | 0.67 | 0.01 | 0.47 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 145 | 871 | 901 | 68 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 56.4 | 14.6 | 14.6 | 59.5 | 20.5 | 13.2 | 37.3 | 0.0 | 0.0 | 33.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 18.2 | 1.8 | 1.7 | 38.0 | 2.2 | 0.0 | 4.4 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 2.3 | 6.7 | 6.9 | 0.2 | 12.0 | 0.2 | 4.6 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay (d),s/veh | 74.6 | 16.3 | 16.3 | 97.5 | 22.7 | 13.3 | 41.6 | 0.0 | 0.0 | 33.6 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol, veh/h |  | 882 |  |  | 1153 |  |  | 163 |  |  | 182 |  |
| Approach Delay, s/veh |  | 20.5 |  |  | 22.8 |  |  | 41.6 |  |  | 33.6 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration (G+Y+Rc), s | 5.1 | 73.9 | 41.0 | 10.6 | 68.4 | 41.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 64.9 | 36.5 | 11.5 | 58.5 | 36.5 |
| Max Q Clear Time (g_c+11), s | 2.3 | 20.5 | 22.2 | 7.0 | 33.4 | 13.8 |
| Green Ext Time (p_c), s | 0.0 | 6.7 | 0.8 | 0.0 | 10.0 | 1.1 |

Intersection Summary
HCM 6th Ctrl Delay 24.1
HCM 6th LOS
C



HCM 6th TWSC
3：Dubarko Road／Vista Loop Drive \＆Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 6 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{1}$ | 㻢 |  | ${ }^{7}$ | 車 ${ }^{\text {a }}$ |  |  | $\uparrow$ | 「 |  | $\uparrow$ |  |
| Traffic Vol，veh／h | 22 | 689 | 12 | 57 | 942 | 1 | 38 | 6 | 107 | 0 | 18 | 51 |
| Future Vol，veh／h | 22 | 689 | 12 | 57 | 942 | 1 | 38 | 6 | 107 | 0 | 18 | 51 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | － | － | None | － | － | None | － | － | None | － | － | None |
| Storage Length | 220 | － | － | 200 | － | － | － | － | 0 | － | － | － |
| Veh in Median Storage，\＃ | \＃ | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Grade，\％ | － | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles，\％ | 13 | 13 | 2 | 2 | 6 | 6 | 2 | 2 | 2 | 9 | 2 | 9 |
| Mvmt Flow | 23 | 725 | 13 | 60 | 992 | 1 | 40 | 6 | 113 | 0 | 19 | 54 |







HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/09/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | ${ }^{7}$ | 性 |  | \％ | 个4 | 「 |  | $\uparrow$ |  |  | ¢ |  |
| Traffic Volume（veh／h） | 158 | 1168 | 158 | 8 | 1011 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Future Volume（veh／h） | 158 | 1168 | 158 | 8 | 1011 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate，veh／h | 166 | 1229 | 166 | 8 | 1064 | 23 | 143 | 17 | 15 | 42 | 15 | 124 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh，\％ | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap，veh／h | 192 | 1717 | 231 | 15 | 1541 | 670 | 298 | 35 | 26 | 114 | 53 | 282 |
| Arrive On Green | 0.12 | 0.60 | 0.60 | 0.01 | 0.49 | 0.49 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 |
| Sat Flow，veh／h | 1628 | 2868 | 385 | 1576 | 3143 | 1367 | 871 | 124 | 93 | 275 | 189 | 1010 |
| Grp Volume（v），veh／h | 166 | 693 | 702 | 8 | 1064 | 23 | 175 | 0 | 0 | 181 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1628 | 1624 | 1630 | 1576 | 1572 | 1367 | 1088 | 0 | 0 | 1474 | 0 | 0 |
| Q Serve（g＿s），s | 12.0 | 35.9 | 36.4 | 0.6 | 31.3 | 1.0 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 12.0 | 35.9 | 36.4 | 0.6 | 31.3 | 1.0 | 18.7 | 0.0 | 0.0 | 11.6 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.24 | 1.00 |  | 1.00 | 0.82 |  | 0.09 | 0.23 |  | 0.69 |
| Lane Grp Cap（c），veh／h | 192 | 972 | 976 | 15 | 1541 | 670 | 358 | 0 | 0 | 449 | 0 | 0 |
| V／C Ratio（X） | 0.86 | 0.71 | 0.72 | 0.52 | 0.69 | 0.03 | 0.49 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 264 | 972 | 976 | 67 | 1541 | 670 | 358 | 0 | 0 | 449 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 52.0 | 16.9 | 17.0 | 59.1 | 23.6 | 15.9 | 38.6 | 0.0 | 0.0 | 35.4 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 18.9 | 4.5 | 4.6 | 24.7 | 2.6 | 0.1 | 4.7 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 6.0 | 14.2 | 14.4 | 0.3 | 12.1 | 0.4 | 5.0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 70.9 | 21.3 | 21.5 | 83.8 | 26.1 | 15.9 | 43.3 | 0.0 | 0.0 | 36.0 | 0.0 | 0.0 |


|  | E | C | C | F | C | B | D | A | A | D |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| LnGrp LOS | 1561 |  | 1095 |  | 175 | A |  |  |  |  |
| Approach Vol，veh／h | 26.7 |  | 26.3 |  | 43.3 | 181 |  |  |  |  |
| Approach Delay，s／veh | C |  | C |  | D | 36.0 |  |  |  |  |
| Approach LOS |  |  |  |  |  |  |  | D |  |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration $(G+Y+R c)$ ，s | 5.7 | 76.3 | 38.0 | 18.7 | 63.3 | 38.0 |
| Change Period（Y＋Rc），s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.1 | 67.9 | 33.5 | 19.5 | 53.5 | 33.5 |
| Max Q Clear Time（g＿c＋11），s | 2.6 | 38.4 | 20.7 | 14.0 | 33.3 | 13.6 |
| Green Ext Time（p＿C），s | 0.0 | 13.1 | 0.8 | 0.2 | 8.4 | 1.1 |

Intersection Summary
HCM 6th Ctrl Delay 28.1
HCM 6th LOS
C

| Intersection |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 3 |  |  |  |  |  |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | 44 | 「 | ${ }^{7}$ | 中4 | ${ }^{*}$ | 「 |
| Traffic Vol，veh／h | 1123 | 85 | 17 | 1018 | 49 | 34 |
| Future Vol，veh／h | 1123 | 85 | 17 | 1018 | 49 | 34 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | － | None | － | None | － | None |
| Storage Length | － | 160 | 215 | － | 120 | 0 |
| Veh in Median Storage， | \＃ 0 | － | － | 0 | 0 | － |
| Grade，\％ | 0 | － | － | 0 | 0 | － |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles，\％ | 3 | 3 | 7 | 7 | 3 | 3 |
| Mvmt Flow | 1182 | 89 | 18 | 1072 | 52 | 36 |



HCM 6th TWSC
3：Dubarko Road／Vista Loop Drive \＆Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 5.4 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{7}$ | 中 ${ }^{\text {a }}$ |  | ${ }^{7}$ | 中 ${ }^{\text {a }}$ |  |  | 4 | 「 |  | \＆ |  |
| Traffic Vol，veh／h | 62 | 1046 | 38 | 118 | 982 | 0 | 8 | 5 | 116 | 0 | 9 | 28 |
| Future Vol，veh／h | 62 | 1046 | 38 | 118 | 982 | 0 | 8 | 5 | 116 | 0 | 9 | 28 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | － | － | None | － | － | None | － | － | None | － | － | None |
| Storage Length | 220 | － | － | 200 | － | － | － | － | 0 | － | － | － |
| Veh in Median Storage，\＃ | \＃ | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Grade，\％ | － | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles，\％ | 3 | 3 | 2 | 2 | 7 | 7 | 2 | 2 | 2 | 13 | 2 | 13 |
| Mvmt Flow | 64 | 1078 | 39 | 122 | 1012 | 0 | 8 | 5 | 120 | 0 | 9 | 29 |








| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 中 ${ }^{\text {a }}$ |  | \% | 44 | 「 |  | ¢ |  |  | ¢ |  |
| Traffic Volume (veh/h) | 59 | 738 | 38 | , | 1145 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Future Volume (veh/h) | 59 | 738 | 38 | 4 | 1145 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate, veh/h | 63 | 785 | 40 | 4 | 1218 | 11 | 148 | 12 | 3 | 17 | 4 | 161 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, \% | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap, veh/h | 77 | 1662 | 85 | 8 | 1660 | 741 | 331 | 25 | 6 | 57 | 29 | 408 |
| Arrive On Green | 0.05 | 0.57 | 0.57 | 0.01 | 0.52 | 0.52 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |
| Sat Flow, veh/h | 1511 | 2918 | 149 | 1589 | 3169 | 1414 | 875 | 80 | 18 | 78 | 92 | 1307 |
| Grp Volume(v), veh/h | 63 | 405 | 420 | 4 | 1218 | 11 | 163 | 0 | 0 | 182 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1511 | 1507 | 1559 | 1589 | 1585 | 1414 | 972 | 0 | 0 | 1477 | 0 | 0 |
| Q Serve(g_s), s | 5.0 | 19.0 | 19.0 | 0.3 | 35.7 | 0.4 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 5.0 | 19.0 | 19.0 | 0.3 | 35.7 | 0.4 | 19.9 | 0.0 | 0.0 | 11.6 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.10 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.88 |
| Lane Grp Cap(c), veh/h | 77 | 859 | 889 | 8 | 1660 | 741 | 361 | 0 | 0 | 495 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 0.47 | 0.47 | 0.48 | 0.73 | 0.01 | 0.45 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 132 | 859 | 889 | 68 | 1660 | 741 | 361 | 0 | 0 | 495 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 56.4 | 15.2 | 15.2 | 59.5 | 22.1 | 13.7 | 36.3 | 0.0 | 0.0 | 32.4 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 18.3 | 1.9 | 1.8 | 38.0 | 2.9 | 0.0 | 4.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 2.3 | 6.9 | 7.2 | 0.2 | 13.7 | 0.2 | 4.5 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay(d),s/veh | 74.7 | 17.1 | 17.0 | 97.5 | 25.0 | 13.7 | 40.4 | 0.0 | 0.0 | 32.8 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol, veh/h |  | 888 |  |  | 1233 |  |  | 163 |  |  | 182 |  |
| Approach Delay, s/veh |  | 21.1 |  |  | 25.1 |  |  | 40.4 |  |  | 32.8 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration (G+Y+Rc), s | 5.1 | 72.9 | 42.0 | 10.6 | 67.4 | 42.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 63.9 | 37.5 | 10.5 | 58.5 | 37.5 |
| Max Q Clear Time (g_c+11), s | 2.3 | 21.0 | 21.9 | 7.0 | 37.7 | 13.6 |
| Green Ext Time (p_c), s | 0.0 | 6.7 | 0.8 | 0.0 | 9.9 | 1.2 |

Intersection Summary
HCM 6th Ctrl Delay 25.3
HCM 6th LOS
C

| Intersection |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 6 |  |  |  |  |  |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | 44 | T | ${ }^{*}$ | 44 | ${ }^{7}$ | 「 |
| Traffic Vol, veh/h | 746 | 36 | 19 | 1019 | 105 | 16 |
| Future Vol, veh/h | 746 | 36 | 19 | 1019 | 105 | 16 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 160 | 215 | - | 120 | 0 |
| Veh in Median Storage, \# | \# 0 | - | - | 0 | 0 | - |
| Grade, \% | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, \% | 13 | 13 | 7 | 7 | 4 | 4 |
| Mvmt Flow | 794 | 38 | 20 | 1084 | 112 | 17 |



HCM 6th TWSC
3：Dubarko Road／Vista Loop Drive \＆Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 1.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{1}$ | 㻢 |  |  | 中 $\uparrow$ |  |  |  | 「＇ |  | \＆ |  |
| Traffic Vol，veh／h | 28 | 689 | 12 | 0 | 999 | 1 | 0 | 0 | 107 | 0 | 0 | 69 |
| Future Vol，veh／h | 28 | 689 | 12 | 0 | 999 | 1 | 0 | 0 | 107 | 0 | 0 | 69 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | － | － | None | － | － | None | － | ， | None | － | － | None |
| Storage Length | 220 | － | － | － | － | － | － | － | 0 | － | － | － |
| Veh in Median Storage，\＃ | \＃－ | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Grade，\％ | － | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles，\％ | 13 | 13 | 2 | 2 | 6 | 6 | 2 | 2 | 2 | 9 | 2 | 9 |
| Mvmt Flow | 30 | 733 | 13 | 0 | 1063 | 1 | 0 | 0 | 114 | 0 | 0 | 73 |



| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |  |
| Lane Configurations |  | $\uparrow$ | 7 |  | $\uparrow$ | 「 |  | $\uparrow$ |  |  | $\uparrow$ | F |  |
| Traffic Vol, veh/h | 8 | 9 | 34 | 75 | 43 | 34 | 45 | 191 | 118 | 4 | 182 | 2 |  |
| Future Vol, veh/h | 8 | 9 | 34 | 75 | 43 | 34 | 45 | 191 | 118 | 4 | 182 | 2 |  |
| Conflicting Peds, \#/hr | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 |  |
| Sign Control Stor | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |  |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |  |
| Storage Length | - | - | 90 | - | - | 125 | - | - | - | - | - | 330 |  |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |  |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |  |
| Peak Hour Factor | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |  |
| Heavy Vehicles, \% | 1 | 1 | 1 | 5 | 5 | 5 | 2 | 2 | 2 | 5 | 5 | 5 |  |
| Mvmt Flow | 9 | 10 | 38 | 83 | 48 | 38 | 50 | 212 | 131 | 4 | 202 | 2 |  |



| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 8.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{7}$ | $\uparrow$ |  |  | \& |  |  | \& |  |  | $\uparrow$ |  |
| Traffic Vol, veh/h | 19 | 108 | 1 | 1 | 40 | 61 | 4 | 21 | 2 | 12 | 5 | 17 |
| Future Vol, veh/h | 19 | 108 | 1 | 1 | 40 | 61 | 4 | 21 | 2 | 12 | 5 | 17 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| Heavy Vehicles, \% | 5 | 5 | 5 | 18 | 18 | 18 | 8 | 8 | 8 | 23 | 23 | 23 |
| Mvmt Flow | 21 | 121 | 1 | 1 | 45 | 69 | 4 | 24 | 2 | 13 | 6 | 19 |



HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/09/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |

[^2]| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | ${ }^{7}$ | 性 |  | \％ | 个4 | 「 |  | $\uparrow$ |  |  | ¢ |  |
| Traffic Volume（veh／h） | 158 | 1173 | 158 | 8 | 1133 | 22 | 141 | 16 | 14 | 40 | 14 | 118 |
| Future Volume（veh／h） | 158 | 1173 | 158 | 8 | 1133 | 22 | 141 | 16 | 14 | 40 | 14 | 118 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate，veh／h | 166 | 1235 | 166 | 8 | 1193 | 23 | 148 | 17 | 15 | 42 | 15 | 124 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh，\％ | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap，veh／h | 192 | 1742 | 233 | 15 | 1568 | 682 | 290 | 33 | 24 | 112 | 52 | 275 |
| Arrive On Green | 0.12 | 0.61 | 0.61 | 0.01 | 0.50 | 0.50 | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 |
| Sat Flow，veh／h | 1628 | 2870 | 384 | 1576 | 3143 | 1367 | 868 | 121 | 90 | 275 | 192 | 1016 |
| Grp Volume（v），veh／h | 166 | 696 | 705 | 8 | 1193 | 23 | 180 | 0 | 0 | 181 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1628 | 1624 | 1630 | 1576 | 1572 | 1367 | 1078 | 0 | 0 | 1483 | 0 | 0 |
| Q Serve（g＿s），s | 12.0 | 35.4 | 36.0 | 0.6 | 36.8 | 1.0 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 12.0 | 35.4 | 36.0 | 0.6 | 36.8 | 1.0 | 19.6 | 0.0 | 0.0 | 11.8 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.24 | 1.00 |  | 1.00 | 0.82 |  | 0.08 | 0.23 |  | 0.69 |
| Lane Grp Cap（c），veh／h | 192 | 985 | 989 | 15 | 1568 | 682 | 347 | 0 | 0 | 439 | 0 | 0 |
| V／C Ratio（X） | 0.87 | 0.71 | 0.71 | 0.52 | 0.76 | 0.03 | 0.52 | 0.00 | 0.00 | 0.41 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 251 | 985 | 989 | 67 | 1568 | 682 | 347 | 0 | 0 | 439 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 52.0 | 16.2 | 16.3 | 59.1 | 24.3 | 15.3 | 39.8 | 0.0 | 0.0 | 36.3 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 21.1 | 4.3 | 4.4 | 24.7 | 3.5 | 0.1 | 5.5 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 6.1 | 13.9 | 14.2 | 0.3 | 14.3 | 0.3 | 5.3 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 73.1 | 20.5 | 20.7 | 83.8 | 27.8 | 15.4 | 45.2 | 0.0 | 0.0 | 36.9 | 0.0 | 0.0 |


| LnGrp LOS | E | C | C | F | C | B | D | A | A | D |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Approach Vol，veh／h | 1567 |  | 1224 |  | 180 |  | A |  |  |  |
| Approach Delay，s／veh | 26.2 |  | 28.0 |  | 45.2 |  | 361 |  |  |  |
| Approach LOS | C |  | C |  | D | D |  |  |  |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration $(G+Y+R c)$ ，s | 5.7 | 77.3 | 37.0 | 18.6 | 64.4 | 37.0 |
| Change Period $(\mathrm{Y}+\mathrm{Rc})$ ，s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.1 | 68.9 | 32.5 | 18.5 | 55.5 | 32.5 |
| Max Q Clear Time（g＿c＋11），s | 2.6 | 38.0 | 21.6 | 14.0 | 38.8 | 13.8 |
| Green Ext Time（p＿c），s | 0.0 | 13.5 | 0.8 | 0.2 | 8.6 | 1.0 |

Intersection Summary

| HCM 6th Ctrl Delay | 28.6 |
| :--- | ---: |
| HCM 6th LOS | C |




HCM 6th TWSC
3: Dubarko Road/Vista Loop Drive \& Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 1.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{7}$ | 中 ${ }^{\text {a }}$ |  |  | 中 ${ }^{\text {a }}$ |  |  |  | 7 |  | \& |  |
| Traffic Vol, veh/h | 67 | 1046 | 38 | 0 | 1100 | 0 | 0 | 0 | 116 | 0 | 0 | 37 |
| Future Vol, veh/h | 67 | 1046 | 38 | 0 | 1100 | 0 | 0 | 0 | 116 | 0 | 0 | 37 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 220 | - | - | - | - | - | - | - | 0 | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, \% | 3 | 3 | 2 | 2 | 7 | 7 | 2 | 2 | 2 | 13 | 2 | 13 |
| Mvmt Flow | 69 | 1078 | 39 | 0 | 1134 | 0 | 0 | 0 | 120 | 0 | 0 | 38 |





| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 7.9 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{*}$ | 个 |  |  | $\leqslant$ |  |  | $\uparrow$ |  |  | \& |  |
| Traffic Vol, veh/h | 24 | 142 | 5 | 2 | 11 | 29 | 4 | 10 | 1 | 24 | 28 | 29 |
| Future Vol, veh/h | 24 | 142 | 5 | 2 | 11 | 29 | 4 | 10 | 1 | 24 | 28 | 29 |
| Conflicting Peds, \#/hr | 2 | 0 | 1 | 3 | 0 | 4 | 1 | 0 | 3 | 4 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, \% | 2 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 3 | 3 | 3 |
| Mvmt Flow | 26 | 156 | 5 | 2 | 12 | 32 | 4 | 11 | 1 | 26 | 31 | 32 |



Intersection: 1: Wolf Drive/Ten Eyck Road \& Highway 26

| Movement | EB | EB | EB | WB | WB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | T | TR | L | T | T | R | LTR | LTR |
| Maximum Queue (ft) | 189 | 333 | 318 | 124 | 431 | 374 | 68 | 201 | 146 |
| Average Queue (ft) | 62 | 186 | 139 | 11 | 271 | 221 | 5 | 94 | 56 |
| 95th Queue (ft) | 147 | 293 | 265 | 62 | 372 | 327 | 36 | 165 | 111 |
| Link Distance (ft) |  | 538 | 538 |  | 613 | 613 |  | 315 | 380 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |  |  |  |
| Storage Bay Dist (ft) | 165 |  |  | 120 |  |  | 70 |  |  |
| Storage Blk Time (\%) | 1 | 9 |  |  | 30 | 26 | 0 |  |  |
| Queuing Penalty (veh) | 2 | 5 |  |  | 1 | 3 | 0 |  |  |

Intersection: 2: Langensand Road \& Highway 26

| Movement | EB | WB | NB | NB |
| :--- | ---: | ---: | ---: | ---: |
| Directions Served | T | L | L | R |
| Maximum Queue (ft) | 4 | 42 | 140 | 234 |
| Average Queue (ft) | 0 | 8 | 78 | 113 |
| 95th Queue (ft) | 3 | 30 | 155 | 490 |
| Link Distance (ft) | 701 |  |  | 876 |
| Upstream Blk Time (\%) |  |  |  | 0 |
| Queuing Penalty (veh) |  |  |  | 0 |
| Storage Bay Dist (ft) |  | 215 | 120 |  |
| Storage Blk Time (\%) |  |  | 25 | 0 |
| Queuing Penalty (veh) |  |  | 4 | 0 |

Intersection: 3: Dubarko Road/Vista Loop Drive \& Highway 26

| Movement | SE | NW | NE | NE | SW |
| :--- | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | L | LT | R | LTR |
| Maximum Queue (ft) | 61 | 46 | 223 | 92 | 271 |
| Average Queue (ft) | 14 | 17 | 105 | 41 | 115 |
| 95th Queue (ft) | 42 | 38 | 277 | 70 | 292 |
| Link Distance (ft) |  |  | 752 | 752 | 575 |
| Upstream Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
| Storage Bay Dist (ft) | 220 | 200 |  |  |  |
| Storage Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |

Intersection: 4: Highway 211 \& Dubarko Road

| Movement | EB | EB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | LT | R | LT | R | LTR | LT |
| Maximum Queue (ft) | 51 | 46 | 120 | 63 | 48 | 23 |
| Average Queue (ft) | 15 | 20 | 53 | 19 | 4 | 1 |
| 95th Queue (ft) | 41 | 44 | 94 | 46 | 23 | 9 |
| Link Distance (ft) | 645 |  | 745 |  | 654 | 862 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |
| Storage Bay Dist (ft) |  | 90 |  | 125 |  |  |
| Storage Blk Time (\%) |  |  | 0 |  |  |  |
| Queuing Penalty (veh) |  |  | 0 |  |  |  |

Intersection: 5: Langensand Road \& Dubarko Road

| Movement | EB | EB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | TR | LTR | LTR | LTR |
| Maximum Queue (ft) | 43 | 74 | 94 | 15 | 6 |
| Average Queue (ft) | 14 | 38 | 49 | 1 | 0 |
| 95th Queue (ft) | 40 | 59 | 82 | 8 | 4 |
| Link Distance (ft) |  | 604 | 851 | 716 | 706 |
| Upstream Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
| Storage Bay Dist (ft) | 115 |  |  |  |  |
| Storage Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
|  |  |  |  |  |  |

Network wide Queuing Penalty: 15

Intersection: 1: Wolf Drive/Ten Eyck Road \& Highway 26

| Movement | EB | EB | EB | WB | WB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | T | TR | L | T | T | R | LTR | LTR |
| Maximum Queue (ft) | 190 | 424 | 367 | 101 | 459 | 418 | 86 | 193 | 194 |
| Average Queue (ft) | 136 | 262 | 231 | 10 | 288 | 242 | 8 | 93 | 79 |
| 95th Queue (ft) | 223 | 381 | 352 | 52 | 405 | 363 | 41 | 168 | 166 |
| Link Distance (ft) |  | 538 | 538 |  | 613 | 613 |  | 315 | 380 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |  |  |  |
| Storage Bay Dist (ft) | 165 |  |  | 120 |  |  | 70 |  |  |
| Storage Blk Time (\%) | 9 | 12 |  |  | 35 | 31 | 0 |  |  |
| Queuing Penalty (veh) | 52 | 20 |  |  | 3 | 7 | 0 |  |  |

Intersection: 2: Langensand Road \& Highway 26

| Movement | EB | WB | NB | NB |
| :--- | ---: | ---: | ---: | ---: |
| Directions Served | R | L | L | R |
| Maximum Queue (ft) | 4 | 47 | 134 | 168 |
| Average Queue (ft) | 0 | 12 | 61 | 39 |
| 95th Queue (ft) | 3 | 38 | 136 | 145 |
| Link Distance (ft) |  |  |  | 876 |
| Upstream Blk Time (\%) |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |
| Storage Bay Dist (ft) | 160 | 215 | 120 |  |
| Storage Blk Time (\%) |  |  | 14 |  |
| Queuing Penalty (veh) |  |  | 5 |  |

Intersection: 3: Dubarko Road/Vista Loop Drive \& Highway 26

| Movement | SE | SE | SE | NW | NW | NW | NE | NE | SW |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | T | TR | L | T | TR | LT | R | LTR |
| Maximum Queue (ft) | 85 | 22 | 20 | 109 | 15 | 4 | 341 | 126 | 435 |
| Average Queue (ft) | 29 | 1 | 2 | 40 | 1 | 0 | 169 | 50 | 233 |
| 95th Queue (ft) | 64 | 11 | 11 | 80 | 12 | 3 | 338 | 94 | 567 |
| Link Distance (ft) |  | 1135 | 1135 |  | 800 | 800 | 615 | 615 | 575 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |  |  | 7 |
| Queuing Penalty (veh) |  |  |  |  |  |  |  |  | 0 |

## Intersection: 4: Highway 211 \& Dubarko Road

| Movement | EB | EB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | LT | R | LT | R | LTR | LT |
| Maximum Queue (ft) | 77 | 73 | 213 | 117 | 64 | 48 |
| Average Queue (ft) | 32 | 29 | 84 | 21 | 13 | 4 |
| 95th Queue (ft) | 64 | 55 | 169 | 69 | 43 | 21 |
| Link Distance (ft) | 645 |  | 745 |  | 654 | 862 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |
| Storage Bay Dist (ft) |  | 90 |  | 125 |  |  |
| Storage Blk Time (\%) | 0 | 0 | 8 | 0 |  |  |
| Queuing Penalty (veh) | 0 | 0 | 2 | 0 |  |  |

Intersection: 5: Langensand Road \& Dubarko Road

| Movement | EB | EB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | TR | LTR | LTR | LTR |
| Maximum Queue ( ft ) | 36 | 76 | 83 | 12 | 38 |
| Average Queue $(\mathrm{ft})$ | 17 | 40 | 42 | 0 | 2 |
| 95th Queue (ft) | 42 | 63 | 66 | 6 | 17 |
| Link Distance (ft) |  | 604 | 851 | 716 | 706 |
| Upstream Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
| Storage Bay Dist (ft) | 115 |  |  |  |  |
| Storage Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |

Network wide Queuing Penalty: 88


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LANGENSAND RD at MT HOOD HY, City of Sandy, Clackamas County, 01/01/2013 to $12 / 31 / 2017$ of 6 Crash records shown

| $\begin{aligned} & \text { Move } \\ & \text { FROM } \end{aligned}$ | ${ }^{\text {PRTC }}$ |
| :---: | :---: |
| то | P\# TYPE |
| $\begin{aligned} & \begin{array}{l} \text { STRGHT } \\ \text { NW-SE } \end{array} \end{aligned}$ |  |
|  | 02 Psng |
| $\begin{aligned} & \text { TURN-L } \\ & \text { SE-S } \end{aligned}$ |  |
|  | 01 DRvR |
|  |  |
| $s-w$ |  |
|  | 01 DRVR |
| $\begin{aligned} & \text { STRGHT } \\ & \mathrm{W}-\mathrm{E} \end{aligned}$ |  |
|  | 01 DRvR |
| $\begin{aligned} & \text { STRGHT } \\ & \mathrm{E}-\mathrm{W} \end{aligned}$ |  |
|  | 01 DRVR |
| $\begin{aligned} & \text { STRGHT } \\ & \mathrm{E}-\mathrm{W} \end{aligned}$ |  |
|  | 02 PSNG |

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CDS380
$07 / 07 / 2020$
CITY OF SAI
OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION




## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 26 at Langensand Road
Scenario: 2022 Background Plus Site Trips
Number of Major Street Lanes $\qquad$ PM Peak Hour Volume $\qquad$ 2243 (sum of both approaches) PM Peak Hour Volume $\qquad$ (highest-volume approach) ${ }^{\text {a }}$
Number of Minor Street Lanes 1 49 Posted or 85th percentile speed > 40 mph : Yes

Isolated Population Less than 10,000: $\qquad$ No

## Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving traffic on each approach |  | Vehicles per hour on major street (total of both approaches) |  |  |  | Vehicles per hour on minor street (total of both approaches) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | 100\% | 80\% | 70\% | 56\% | 100\% | 80\% | 70\% | 56\% |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |
| Warrant Anaylsis Calculations |  |  |  | 8th Highest Hour ${ }^{\text {b }}$ |  | Minimum Volume |  | Warrant Satisfied? |  |
| Condition A - Minimum Vehicular Volume |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 420 |  |  |  |
| Minor Street Volume |  |  |  | 28 |  | 105 |  | No |  |
| Condition B - Interruption of Continuous Traffic |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 630 |  |  |  |
| Minor Street Volume |  |  |  | 28 |  | 53 |  | No |  |
| Combination Warrant ${ }^{\text {c }}$ |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 504 |  |  |  |
| Minor Street Volume |  |  |  | 28 |  | 84 |  | No |  |
| ${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red. |  |  |  |  |  |  |  |  |  |
| ${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems. |  |  |  |  |  |  |  |  |  |

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 26 at Dubarko Road
Scenario: 2022 Background Plus Site Trips
Number of Major Street Lanes $\qquad$ PM Peak Hour Volume $\qquad$ 2243 (sum of both approaches) PM Peak Hour Volume $\qquad$ (highest-volume approach) ${ }^{\text {a }}$
Number of Minor Street Lanes 1 13
Posted or 85 th percentile speed $>40 \mathrm{mph}$ : $\qquad$
Isolated Population Less than 10,000: $\qquad$
Warrant 1, Eight-Hour Vehicular Volume
Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving traffic on each approach |  | Vehicles per hour on major street (total of both approaches) |  |  |  | Vehicles per hour on minor street (total of both approaches) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | 100\% | 80\% | 70\% | 56\% | 100\% | 80\% | 70\% | 56\% |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |
| Warrant Anaylsis Calculations |  |  |  | 8th Highest Hour ${ }^{\text {b }}$ |  | Minimum Volume |  | Warrant Satisfied? |  |
| Condition A - Minimum Vehicular Volume |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 420 |  |  |  |
| Minor Street Volume |  |  |  | 7 |  | 105 |  | No |  |
| Condition B - Interruption of Continuous Traffic |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 630 |  |  |  |
| Minor Street Volume |  |  |  | 7 |  | 53 |  | No |  |
| Combination Warrant ${ }^{\text {c }}$ |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 504 |  |  |  |
| Minor Street Volume |  |  |  | 7 |  | 84 |  | No |  |
| ${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {b }}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems. |  |  |  |  |  |  |  |  |  |

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 211 at Dubarko Road
Scenario: 2022 Background Plus Site Trips (30th-Highest Hour)
Number of Major Street Lanes: 1
Number of Minor Street Lanes 1 PM Peak Hour Volume $\qquad$ 644 (sum of both approaches) Posted or 85 th percentile speed $>40 \mathrm{mph}$ : Yes
Isolated Population Less than 10,000: $\qquad$ PM Peak Hour Volume 199 (highest-volume approach) ${ }^{\text {a }}$

Warrant 1, Eight-Hour Vehicular Volume
Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |

## Warrant Anaylsis Calculations

Condition A - Minimum Vehicular Volume
Major Street Volume
Minor Street Volume
Condition B - Interruption of Continuous Traffic
Major Street Volume
Minor Street Volume
Combination Warrant ${ }^{\text {c }}$
Major Street Volume
Minor Street Volume364

420
112
84

350
105 Yes

525
53
No
${ }^{a}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red.
${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume.
${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems.

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 211 at Dubarko Road
Scenario: 2022 Background Plus Site Trips (30th-Highest Hour, with RIRO at Hwy 26)
Number of Major Street Lanes $\qquad$ PM Peak Hour Volume $\qquad$ (sum of both approaches)
Number of Minor Street Lanes 1 PM Peak Hour Volume $\qquad$ 83 (highest-volume approach) ${ }^{\text {a }}$
Posted or 85 th percentile speed $>40 \mathrm{mph}$ : $\qquad$
Isolated Population Less than 10,000: $\qquad$

## Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving traffic on each approach |  | Vehicles per hour on major street (total of both approaches) |  |  |  | Vehicles per hour on minor street (total of both approaches) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | 100\% | 80\% | 70\% | 56\% | 100\% | 80\% | 70\% | 56\% |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |
| Warrant Anaylsis Calculations |  |  |  | 8th Highest Hour ${ }^{\text {b }}$ |  | Minimum Volume |  | Warrant Satisfied? |  |
| Condition A - Minimum Vehicular Volume |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 436 |  | 350 |  |  |  |
| Minor Street Volume |  |  |  | 47 |  | 105 |  | No |  |
| Condition B - Interruption of Continuous Traffic |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 436 |  | 525 |  |  |  |
| Minor Street Volume |  |  |  | 47 |  | 53 |  | No |  |
| Combination Warrant ${ }^{\text {c }}$ |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 436 |  | 420 |  |  |  |
| Minor Street Volume |  |  |  | 47 |  | 84 |  | No |  |
| ${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red. |  |  |  |  |  |  |  |  |  |
| ${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems. |  |  |  |  |  |  |  |  |  |

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Dubarko Road at Langensand Road
Scenario: 2021 Background Plus Site Trips
Number of Major Street Lanes: 1
Number of Minor Street Lanes 1

PM Peak Hour Volume $\qquad$ 306 (sum of both approaches) PM Peak Hour Volume $\qquad$ 74 (highest-volume approach) ${ }^{\text {a }}$

Posted or 85th percentile speed > 40 mph : No
Isolated Population Less than 10,000: $\qquad$
Warrant 1, Eight-Hour Vehicular Volume
Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |

8th Highest Hour ${ }^{\text {b }} \quad$ Minimum Volume Warrant Satisfied?

## Warrant Anaylsis Calculations

Condition A - Minimum Vehicular Volume
Major Street Volume
173
42

173
42

173
42
600
Major Street Volume
Minor Street Volume
Minor Street Volume
Condition B - Interruption of Continuous Traffic
Major Street Volume
Minor Street Volume
Combination Warrant ${ }^{\text {c }}$
${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red.
${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume.
${ }^{c}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems.

## Left-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 26 WB at Dubarko Road
Scenario: 2022 Background plus Site Trips

Number of Advancing Lanes: 2
Number of Opposing Lanes: 2
Major-Street Design Speed: 55 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Advancing Volume for Design Hour: | 1000 | 1100 |
| Opposing Volume for Design Hour: | 723 | 1146 |
|  |  |  |
| Design Hour Volume Per Lane: | 861.5 | 1123 |
| Number of Left Turns per Hour: | 57 | 118 |

Left-turn lane warrants satisfied?
YES
YES

## Exhibit 7-1 Left Turn Lane Criterion (TTI)


*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)

## Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 26 Eastbound at Dubarko Road
Scenario: 2022 Background Plus Site Trips

Major-Street Design Speed: 55 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Number of Right Turns per Hour: | 12 | 38 |
| Approaching DVH in Outside Lane: | 351 | 542 |
| Calculated Turn Volume Threshold: | 32 | 20 |
| Right Turn Volume Exceeds Threshold? | NO | YES |

## Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

## Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

## Left-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 211 NB at Dubarko Road
Scenario: 2022 Background plus Site Trips
$\begin{array}{lcl}\text { Number of Advancing Lanes: } & 1 & \\ \text { Number of Opposing Lanes: } & 1 & \\ \text { Major-Street Design Speed: } & 45 & \mathrm{mph}\end{array}$

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Advancing Volume for Design Hour: | 354 | 408 |
| Opposing Volume for Design Hour: | 111 | 236 |
|  |  |  |
| Design Hour Volume Per Lane: | 465 | 644 |
| Number of Left Turns per Hour: | 45 | 61 |
| Left-turn lane warrants satisfied? | YES | YES |

## Exhibit 7-1 Left Turn Lane Criterion (TTI)


*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)

## Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 211 Northbound at Dubarko Road
Scenario: 2019 Existing Conditions

Major-Street Design Speed: 45 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Number of Right Turns per Hour: | 13 | 52 |
| Approaching DVH in Outside Lane: | 321 | 366 |
| Calculated Turn Volume Threshold: | 34 | 31 |
| Right Turn Volume Exceeds Threshold? | NO | YES |

## Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

## Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

## Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Dubarko Road Westbound and Langensand Road
Scenario: 2022 Background Plus Site Trips (RIRO)

Major-Street Design Speed: 25 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Number of Right Turns per Hour: | 61 | 29 |
| Approaching DVH in Outside Lane: | 102 | 42 |
| Calculated Turn Volume Threshold: | 99 | 107 |
| Right Turn Volume Exceeds Threshold? | NO | NO |

## Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

## Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

| Intersection |  |
| :--- | ---: | :--- |
| Intersection Delay，s／veh | 13.7 |
| Intersection LOS | B |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations |  | $\uparrow$ | 「 |  | $\uparrow$ | 「 |  | \＆ |  |  | \＄ | 「 |
| Traffic Vol，veh／h | 8 | 9 | 34 | 132 | 43 | 34 | 45 | 191 | 118 | 4 | 107 | 2 |
| Future Vol，veh／h | 8 | 9 | 34 | 132 | 43 | 34 | 45 | 191 | 118 | 4 | 107 | 2 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles，\％ | 1 | 1 | 1 | 5 | 5 | 5 | 2 | 2 | 2 | 5 | 5 | 5 |
| Mvmt Flow | 9 | 10 | 38 | 147 | 48 | 38 | 50 | 212 | 131 | 4 | 119 | 2 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| Approach | EB |  |  | WB |  |  | NB |  |  | SB |  |  |
| Opposing Approach | WB |  |  | EB |  |  | SB |  |  | NB |  |  |
| Opposing Lanes | 2 |  |  | 2 |  |  | 2 |  |  | 1 |  |  |
| Conflicting Approach Left | SB |  |  | NB |  |  | EB |  |  | WB |  |  |
| Conflicting Lanes Left | 2 |  |  | 1 |  |  | 2 |  |  | 2 |  |  |
| Conflicting Approach Right | NB |  |  | SB |  |  | WB |  |  | EB |  |  |
| Conflicting Lanes Right | 1 |  |  | 2 |  |  | 2 |  |  | 2 |  |  |
| HCM Control Delay | 9.1 |  |  | 12.1 |  |  | 16.4 |  |  | 10.3 |  |  |
| HCM LOS | A |  |  | B |  |  | C |  |  | B |  |  |


| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Vol Left，\％ | $13 \%$ | $47 \%$ | $0 \%$ | $75 \%$ | $0 \%$ | $4 \%$ | $0 \%$ |
| Vol Thru，\％ | $54 \%$ | $53 \%$ | $0 \%$ | $25 \%$ | $0 \%$ | $96 \%$ | $0 \%$ |
| Vol Right，\％ | $33 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 354 | 17 | 34 | 175 | 34 | 111 | 2 |
| LT Vol | 45 | 8 | 0 | 132 | 0 | 4 | 0 |
| Through Vol | 191 | 9 | 0 | 43 | 0 | 107 | 0 |
| RT Vol | 118 | 0 | 34 | 0 | 34 | 0 | 2 |
| Lane Flow Rate | 393 | 19 | 38 | 194 | 38 | 123 | 2 |
| Geometry Grp | 6 | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util（X） | 0.6 | 0.035 | 0.06 | 0.353 | 0.057 | 0.207 | 0.003 |
| Departure Headway（Hd） | 5.494 | 6.677 | 5.724 | 6.543 | 5.45 | 6.031 | 5.303 |
| Convergence，Y／N | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 661 | 536 | 624 | 550 | 657 | 596 | 674 |
| Service Time | 3.494 | 4.423 | 3.469 | 4.279 | 3.186 | 3.766 | 3.038 |
| HCM Lane V／C Ratio | 0.595 | 0.035 | 0.061 | 0.353 | 0.058 | 0.206 | 0.003 |
| HCM Control Delay | 16.4 | 9.7 | 8.8 | 12.8 | 8.5 | 10.3 | 8.1 |
| HCM Lane LOS | C | A | A | B | A | B | A |
| HCM 95th－tile Q | 4 | 0.1 | 0.2 | 1.6 | 0.2 | 0.8 | 0 |


| Intersection |  |
| :--- | ---: | :--- |
| Intersection Delay，s／veh | 18.2 |
| Intersection LOS | C |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations |  | $\uparrow$ | 「 |  | $\uparrow$ | 「 |  | \＆ |  |  | $\uparrow$ | 「 |
| Traffic Vol，veh／h | 11 | 51 | 55 | 149 | 53 | 27 | 61 | 171 | 176 | 10 | 223 | 11 |
| Future Vol，veh／h | 11 | 51 | 55 | 149 | 53 | 27 | 61 | 171 | 176 | 10 | 223 | 11 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles，\％ | 1 | 1 | 1 | 5 | 5 | 5 | 2 | 2 | 2 | 5 | 5 | 5 |
| Mvmt Flow | 12 | 54 | 59 | 159 | 56 | 29 | 65 | 182 | 187 | 11 | 237 | 12 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| Approach | EB |  |  | WB |  |  | NB |  |  | SB |  |  |
| Opposing Approach | WB |  |  | EB |  |  | SB |  |  | NB |  |  |
| Opposing Lanes | 2 |  |  | 2 |  |  | 2 |  |  | 1 |  |  |
| Conflicting Approach Left | SB |  |  | NB |  |  | EB |  |  | WB |  |  |
| Conflicting Lanes Left | 2 |  |  | 1 |  |  | 2 |  |  | 2 |  |  |
| Conflicting Approach Right | NB |  |  | SB |  |  | WB |  |  | EB |  |  |
| Conflicting Lanes Right | 1 |  |  | 2 |  |  | 2 |  |  | 2 |  |  |
| HCM Control Delay | 10.7 |  |  | 15.1 |  |  | 24.1 |  |  | 14.7 |  |  |
| HCM LOS | B |  |  | C |  |  | C |  |  | B |  |  |


| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Vol Left，\％ | $15 \%$ | $18 \%$ | $0 \%$ | $74 \%$ | $0 \%$ | $4 \%$ | $0 \%$ |
| Vol Thru，\％ | $42 \%$ | $82 \%$ | $0 \%$ | $26 \%$ | $0 \%$ | $96 \%$ | $0 \%$ |
| Vol Right，\％ | $43 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 408 | 62 | 55 | 202 | 27 | 233 | 11 |
| LT Vol | 61 | 11 | 0 | 149 | 0 | 10 | 0 |
| Through Vol | 171 | 51 | 0 | 53 | 0 | 223 | 0 |
| RT Vol | 176 | 0 | 55 | 0 | 27 | 0 | 11 |
| Lane Flow Rate | 434 | 66 | 59 | 215 | 29 | 248 | 12 |
| Geometry Grp | 6 | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util（X） | 0.731 | 0.136 | 0.108 | 0.443 | 0.051 | 0.46 | 0.019 |
| Departure Headway（Hd） | 6.176 | 7.426 | 6.615 | 7.428 | 6.333 | 6.681 | 5.945 |
| Convergence，Y／N | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 590 | 484 | 544 | 488 | 568 | 540 | 604 |
| Service Time | 4.176 | 5.148 | 4.337 | 5.139 | 4.044 | 4.396 | 3.66 |
| HCM Lane V／C Ratio | 0.736 | 0.136 | 0.108 | 0.441 | 0.051 | 0.459 | 0.02 |
| HCM Control Delay | 24.1 | 11.3 | 10.1 | 15.9 | 9.4 | 15 | 8.8 |
| HCM Lane LOS | C | B | B | C | A | B | A |
| HCM 95th－tile Q | 6.2 | 0.5 | 0.4 | 2.2 | 0.2 | 2.4 | 0.1 |

## DATE: $\quad$ December 14, 2019

TO: Alex Reverman (Roll Tide Corporation)
FROM: Todd Prager, RCA \#597, ISA Board Certified Master Arborist
RE: $\quad$ Tree Plan for the Dubarko Road Subdivision and Condominiums

## Summary

This report includes tree removal, preservation, and protection recommendations for the proposed Dubarko Road Subdivision and Condominiums in Sandy, Oregon.

## Background

Roll Tide Corporation is proposing to construct a four lot subdivision and 216 unit condominium complex with parking, street access, sidewalks, utilities, and open space at the east end of Dubarko Road in Sandy, Oregon. An existing conditions map of the site and trees is provided in Attachment 1. The proposed site plan with the proposed tree removal and retention is provided in Attachment 2. A detail of the grove of trees to be retained along Highway 26 is provided in Attachment 3.

The assignment requested of our firm for this project was to:

- Assess the existing grove of trees along Highway 26;
- Identify the trees to be removed and retained in the grove;
- Identify trees that are in good condition within the park tract within the northwest portion of the site; and
- Provide tree protection recommendations for the trees to be retained in the grove and park.


## Tree Assessment

On September 12 and December 11, 2019 I completed the inventory of existing trees in the grove and park.

The complete inventory data for each tree is provided in Attachment 4 and includes the tree number, common name, scientific name, trunk diameter (DBH), crown
radius, health condition, structural condition, pertinent comments, and whether it is an onsite 11 -inch DBH or greater tree in good condition to be retained. ${ }^{1}$

The tree numbers in the inventory in Attachment 4 correspond to the tree numbers on the plans in Attachments 1 through 3.

Note that since the site is 15.91 acres, Section 17.102.50 requires 48 trees over 11inch DBH that are in good condition to be retained. My assignment was to identify at least 48 trees in the grove that meet this criteria. While I assessed 97 trees total in the grove and park, I found 59 that were over 11-inch DBH and in good condition.

## Tree Removal and Retention

This section of the report includes tree removal and retention recommendations based on the proposed site plan.

## Tree Removal

The standard tree protection requirements in the City of Sandy Code range from at least 10 feet from the trunks of retained trees (SDC 17.102.50.B.1) to five feet beyond the driplines (SDC 17.92.10.D) unless otherwise approved by the Planning Director.

A typical alternative minimum protection zone allows encroachments no closer than a radius from a tree of . 5 feet per inch of DBH as long as no more than 25 percent of the critical root protection zone area (estimated at one foot radius per inch of DBH) is impacted. Figure 1 illustrates this concept.


Figure 1: Alterative minimum protection zone

Using the criteria described above, while considering the tree conditions and their locations relative to grading, paving, construction, and other site improvements, 21 of the assessed trees at the edges of the grove and park are proposed for removal.

Note that the grove is comprised of relatively young trees that are competing for space, water, nutrients, and light. The grove could benefit from selective thinning of trees to improve the growth of the more dominant trees that are presently in good condition. Also, invasive understory and vine species such as Himalayan blackberry (Rubus armeniacus) and English ivy (Hedera helix) should be removed to improve the condition of the understory and prevent vine growth on the retained trees. At a minimum, the trees in the grove that are in good condition will be retained while other trees may be marked for selective removal to improve the overall health of the grove. The invasive understory species may also be removed to improve the health of the grove.

[^3]
## Tree Retention

Fifty-nine (59) trees within the grove and park that are in good condition and over 11 -inch DBH are proposed to be retained. Tree preservation has been maximized to the extent practicable with trees removed only as necessary for building construction, parking lot construction, street construction, and improvements to Highway 26. Note that trees 15584.1 and 15644 are in poor or very poor health and/or structural condition, along the new edges of the grove, and proposed for removal for safety purposes.

Section 17.102.50.A of the City of Sandy Code includes five criteria for tree retention with development. The five criteria followed by my findings in italics are listed below:

1. At least three trees 11 inches DBH or greater are to be retained for every one-acre of contiguous ownership.

Finding: The site is 15.91 acres in size so 48 trees over 11-inch DBH in good condition are required to be retained. The proposed preservation includes 59 trees over 11-inch DBH in good condition within the grove along Highway 26 and park tract to be retained. This criterion is met.
2. Retained trees can be located anywhere on the site at the landowner's discretion before the harvest begins. Clusters of trees are encouraged.

Finding: The retained trees are clustered within the grove of trees along Highway 26. Clusters of trees will also be retained within the park tract. This criterion is met.
3. Trees proposed for retention shall be healthy and likely to grow to maturity, and be located to minimize the potential for blow-down following the harvest.

Finding: All of the trees subject to this standard are in good health condition and likely to grow to maturity. Future selective thinning of the grove is recommended to improve the availability of space, water, nutrients, and light for the retained trees. Also, invasive understory and vine species such as Himalayan blackberry and English ivy should be removed to improve the condition of the understory and prevent vine growth on the retained trees.

Trees along portions of the southwest, east, and north sides of the grove are proposed for removal for construction. It will be important to reassess and monitor the trees along the newly exposed edges following site clearing and periodically during construction and after high wind events to ensure they do not pose a high risk. Since the bulk of the grove will be retained, I anticipate that the overall grove will remain viable. However, selective thinning of trees within the grove should be delayed until the changes in wind dynamics from edge tree removal is more thoroughly assessed. Retaining more of the interior trees will help to protect the overall integrity of grove from blow-down during the near term. It will also be very

[^4]important to protect the root zones of the trees in the grove and park tract from construction impacts with tree protection fencing and other measures to further minimize the risk of blow-down. Tree protection measures are further described in the next section of this report.

Since the bulk of the grove will be retained and measures to monitor and protect the trees in the grove and park tract will be implemented, this criterion is met.
4. If possible, at least two of the required trees per acre must be of conifer species.

Finding: All 59 trees over 11-inch DBH and in good condition are conifer species. This criterion is met.
5. Trees within the required protected setback areas may be counted towards the tree retention standard if they meet these requirements.

Finding: The trees that are over 11-inch DBH and in good condition that are within the conservation easement along Highway 26 will be counted towards the tree retention standards. This criterion is met.

## Tree Protection Recommendations

The standard tree protection requirements in the City of Sandy Code range from at least 10 feet from the trunks of retained trees (SDC 17.102.50.B.1) to five feet beyond the driplines (SDC 17.92.10.D) unless otherwise approved by the Planning Director.

A typical alternative minimum protection zone allows encroachments no closer than a radius from a tree of .5 feet per inch of DBH as long as no more than 25 percent of the critical root protection zone area (estimated at one foot radius per inch of DBH) is impacted. Figure 1 illustrates this concept.

The reason for using this alternative is because it allows the tree protection zone to better relate to the size of the tree and its root zone. For example, a 10 foot tree protection setback would not be adequate for a 36-inch DBH tree which should have a minimum setback of at least 18 feet. Also, driplines can be highly variable based on species growth habits and onsite conditions such as the presence of adjacent trees or past pruning.

The critical root zone radii of 1 foot per inch of DBH is shown for the trees to be retained along the edges of the grove and park on the plan sheets in Attachments 2 and 3 . The trees to be retained can be adequately protected by placing tree protection fencing as shown in Attachments 2 and 3. The tree protection fencing will protect at least 75 percent of their critical roots zones and avoid any encroachments closer than a radius of .5 feet per inch of DBH to a tree to be retained. No grading, stockpiling, storage, disposal, or any other construction related activity shall occur in the tree protection zones unless specifically reviewed and approved by the project arborist.

[^5]The following additional protection measures shall apply to the trees at the site:

- Tree Protection Fencing: Establish tree protection fencing in the locations shown in Attachments 2 and 3. Required fencing shall be a minimum of six feet tall supported with metal posts placed no farther than ten feet apart installed flush with the initial undisturbed grade.
- Directional Felling: Fell the trees to be removed away from the trees to be retained so they do not contact or otherwise damage the trunks or branches of the trees to be retained. No vehicles or heavy equipment shall be permitted within the tree protection zones during tree removal operations.
- Stump Removal: The stumps of the trees to be removed from within the tree protection zones shall either be retained in place or stump ground to protect the root systems of the trees to be retained.
- Retaining Wall on North Side of Grove: A low retaining wall is recommended on the north side of the grove of trees along Highway 26 to eliminate grading in the tree protection zone to better protect the root systems of the trees at the northern edge of the grove.
- Protect Tree Crowns: Care will need to be taken to not contact or otherwise damage the crowns of the trees that may extend into the construction area.
- Monitoring of New Grove Edges: Trees along portions of the southwest, east, and north sides of the grove are proposed for removal for construction. It will be important to reassess and monitor the trees along the newly exposed edges following site clearing and periodically during construction and after high wind events to ensure they do not pose a high risk. This monitoring should occur for the next two to three storm seasons following site clearing.
- Selective Thinning of Grove Trees: Selective thinning of the grove is recommended to improve the availability of space, water, nutrients, and light for the retained trees. Also, invasive understory and vine species such as Himalayan blackberry and English ivy should be removed to improve the condition of the understory and prevent vine growth on the retained trees.

Any thinning of trees within the grove should be delayed until the changes in wind dynamics from edge tree removal is more thoroughly assessed.
Retaining more of the interior trees will help to protect the overall integrity of the grove from blow-down during the near term. After, site adaptations of the trees are better understood in the following two to three storm seasons following disturbance, the project arborist may prescribe a selective thinning treatment.

Additional tree protection recommendations for the trees to be retained are provided in Attachment 5.

## Conclusion

Fifty-nine (59) trees over 11-inch DBH in good condition are proposed to be retained within the grove of trees along Highway 26 and park tract at the northeast portion of the site. The required tree retention for the 15.91 acre site is 48 trees.

While the grove of trees will have areas of disturbance along the edges, I anticipate that the overall grove will remain viable. It will be important to reassess and monitor the trees along the newly exposed edges following site clearing and periodically during construction and after high wind events to ensure they do not pose a high risk.

Once the grove is stabilized, I recommend selective thinning of trees to improve the availability of space, water, nutrients, and light for the retained trees. Also, invasive understory and vine species such as Himalayan blackberry and English ivy should be removed to improve the condition of the understory and prevent vine growth on the retained trees.

Please contact me if you have questions, concerns, or need any additional information.

Sincerely,


## Todd Prager

ASCA Registered Consulting Arborist \#597
ISA Board Certified Master Arborist, WE-6723B
ISA Qualified Tree Risk Assessor
AICP, American Planning Association
Attachments: Attachment 1 - Existing Site Conditions with Existing Trees
Attachment 2 - Site Plan with Trees Removal and Retention
Attachment 3 - Grove Detail with Tree Removal and Protection
Attachment 4 - Tree Inventory
Attachment 5 - Tree Protection Recommendations
Attachment 6 - Assumptions and Limiting Conditions






## Attachment 4

| Tree No | Common Name | Scientific Name | DBH ${ }^{1}$ | C-Rad ${ }^{2}$ | Condition ${ }^{3}$ | Structure ${ }^{3}$ | Comments | Treatment | Onsite Trees >11" DBH in Good Cond. to be Retained |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 13096 | Douglas-fir | Pseudotsuga menziesii | 11 | 10 | good | good |  | retain | x |
| 13134 | bigleaf maple | Acer macrophyllum | 55 | 38 | good | fair | open grown, multiple leaders at 10', cable constricting lower trunk | remove |  |
| 13142 | Douglas-fir | Pseudotsuga menziesii | 32 | 28 | fair | fair | one sided, codominant at 5' with included bark, 70\% girdled at lower trunk | retain |  |
| 13143 | Douglas-fir | Pseudotsuga menziesii | 13 | 13 | fair | poor | overtopped by adjacent trees, poor trunk taper | retain |  |
| 13144 | Douglas-fir | Pseudotsuga menziesii | 34 | 23 | good | fair | multiple leaders at 5' with included bark, one sided, west 10" leader dead | retain | x |
| 13145 | Douglas-fir | Pseudotsuga menziesii | 14 | 5 | fair | poor | overtopped by adjacent trees, poor trunk taper | retain |  |
| 13146 | Douglas-fir | Pseudotsuga menziesii | 26 | 23 | good | fair | one sided | retain | x |
| 13147 | Douglas-fir | Pseudotsuga menziesii | 15 | 19 | good | fair | one sided, marginal trunk taper | retain | X |
| 13148 | Douglas-fir | Pseudotsuga menziesii | 25 | 24 | good | fair | one sided | retain | X |
| 13149 | Douglas-fir | Pseudotsuga menziesii | 17 | 20 | poor | poor | overtopped by adjacent trees, one sided, suppressed | retain |  |
| 13150 | Douglas-fir | Pseudotsuga menziesii | 22 | 30 | good | fair | one sided | retain | x |
| 13151 | Douglas-fir | Pseudotsuga menziesii | 24,12 | 25 | good | fair | one sided, codominant at ground level | retain | x |
| 13152 | Douglas-fir | Pseudotsuga menziesii | 37 | 26 | good | fair | open grown, multiple leaders at 25' | retain | x |
| 13169 | Douglas-fir | Pseudotsuga menziesii | 24 | 24 | good | fair | one sided | retain | x |
| 13170 | Douglas-fir | Pseudotsuga menziesii | 19 | 20 | good | fair | one sided | retain | X |
| 13171 | western redcedar | Thuja plicata | 28 | 20 | good | fair | moderately one sided | retain | x |
| 13172 | western redcedar | Thuja plicata | 30 | 17 | good | fair | one sided, pressed against trees 13172.1 | retain | x |
| 13172.1 | Douglas-fir | Pseudotsuga menziesii | 25 | 21 | good | fair | one sided, pressed against trees 13172 | retain | x |
| 13538 | western redcedar | Thuja plicata | 39 | 24 | good | fair | codominant at 6' with included bark | remove |  |
| 13539 | Douglas-fir | Pseudotsuga menziesii | 32 | 23 | good | fair | moderately one sided | remove |  |
| 13540 | western redcedar | Thuja plicata | 37,33 | 29 | good | fair | codominant at 3' with included bark | remove |  |
| 13541 | western redcedar | Thuja plicata | 29 | 21 | good | good |  | retain | x |
| 13653 | Douglas-fir | Pseudotsuga menziesii | 11 | 15 | fair | fair | thin crown, large wound at lower trunk | remove |  |
| 15500 | Douglas-fir | Pseudotsuga menziesii | 34 | 21 | good | good |  | retain | x |
| 15546 | Douglas-fir | Pseudotsuga menziesii | 15 | 15 | good | poor | 25\% live crown ratio, poor trunk taper | retain | x |
| 15550 | Douglas-fir | Pseudotsuga menziesii | 6 | 0 | very poor | very poor | dead | retain |  |
| 15551 | Douglas-fir | Pseudotsuga menziesii | 30 | 15 | good | fair | codominant at 1', west stem has $33 \%$ live crown ratio | retain | x |
| 15552 | n/a | n/a | n/a | n/a | n/a | n/a | same as tree 15551 | n/a | n/a |
| 15553 | Douglas-fir | Pseudotsuga menziesii | 13 | 15 | good | poor | 25\% live crown ratio, poor trunk taper | retain | x |
| 15554 | Douglas-fir | Pseudotsuga menziesii | 11 | 10 | fair | poor | poor trunk taper, suppressed | retain |  |
| 15555 | Douglas-fir | Pseudotsuga menziesii | 30 | 25 | good | fair | moderately one sided | retain | x |

## Teragan Associates, Inc

3145 Westview Circle •Lake Oswego, OR 97034
Phone: 971.295.4835 • Fax: 503.697.1976
Email:todd@teragan.com•Website:teragan.com

Attachment 4

| Tree No | Common Name | Scientific Name | DBH ${ }^{1}$ | C-Rad ${ }^{2}$ | Condition ${ }^{3}$ | Structure ${ }^{3}$ | Comments | Treatment | Onsite Trees >11" DBH in Good Cond. to be Retained |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 15556 | Douglas-fir | Pseudotsuga menziesii | 12 | 10 | poor | poor | overtopped by adjacent trees, suppressed | retain |  |
| 15557 | grand fir | Abies grandis | 22 | 20 | good | fair | one sided, codominant at 30 with included bark | retain | x |
| 15558 | Douglas-fir | Pseudotsuga menziesii | 12 | 15 | good | poor | 33\% live crown ratio, poor trunk taper | retain | x |
| 15562 | Douglas-fir | Pseudotsuga menziesii | 20 | 15 | good | fair | 40\% live crown ratio, marginal trunk taper | retain | x |
| 15564 | Douglas-fir | Pseudotsuga menziesii | 14 | 15 | good | poor | marginal trunk taper, $33 \%$ live crown ratio | retain | x |
| 15565 | Douglas-fir | Pseudotsuga menziesii | 11 | 15 | fair | fair | one sided, marginal trunk taper, $5^{\prime \prime}$ codominant dead stem at $3^{\prime}$ | retain |  |
| 15566 | Douglas-fir | Pseudotsuga menziesii | 23 | 20 | good | fair | one sided | retain | x |
| 15567 | Douglas-fir | Pseudotsuga menziesii | 17 | 15 | good | fair | marginal trunk taper, $40 \%$ live crown ratio | retain | x |
| 15568 | Douglas-fir | Pseudotsuga menziesii | 7 | 0 | very poor | very poor | dead | retain |  |
| 15569 | Douglas-fir | Pseudotsuga menziesii | 11 | 8 | fair | poor | poor trunk taper | retain |  |
| 15570 | Douglas-fir | Pseudotsuga menziesii | 14 | 15 | fair | fair | one sided, overtopped by adjacent trees | retain |  |
| 15571 | Douglas-fir | Pseudotsuga menziesii | 9 | 5 | fair | poor | poor trunk taper, suppressed | retain |  |
| 15582 | Douglas-fir | Pseudotsuga menziesii | 10 | 5 | fair | poor | poor trunk taper, suppressed | retain |  |
| 15583 | Douglas-fir | Pseudotsuga menziesii | 13 | 15 | good | poor | poor trunk taper, $25 \%$ live crown ratio | retain | x |
| 15584 | Douglas-fir | Pseudotsuga menziesii | 14 | 15 | good | fair | marginal trunk taper, $40 \%$ live crown ratio | retain | x |
| 15584.1 | Douglas-fir | Pseudotsuga menziesii | 8 | 0 | very poor | very poor | dead | remove |  |
| 15585 | Douglas-fir | Pseudotsuga menziesii | 15 | 20 | good | poor | 35\% live crown ratio, poor trunk taper | retain | x |
| 15589 | Douglas-fir | Pseudotsuga menziesii | 18 | 20 | good | poor | $33 \%$ live crown ratio, marginal trunk taper | retain | x |
| 15590 | Douglas-fir | Pseudotsuga menziesii | 13 | 15 | good | poor | 35\% live crown ratio, poor trunk taper | retain | x |
| 15612 | Douglas-fir | Pseudotsuga menziesii | 9 | 0 | very poor | very poor | dead | retain |  |
| 15614 | Douglas-fir | Pseudotsuga menziesii | 9 | 10 | fair | poor | 25\% live crown ratio, poor trunk taper | retain |  |
| 15615 | Douglas-fir | Pseudotsuga menziesii | 14 | 15 | good | poor | 25\% live crown ratio, poor trunk taper | retain | x |
| 15619 | Douglas-fir | Pseudotsuga menziesii | 20,16 | 20 | good | fair | codominant at ground level with included bark, marginal trunk taper | retain | x |
| 15620 | n/a | n/a | n/a | n/a | n/a | n/a | same as tree 15619 | n/a | n/a |
| 15621 | n/a | n/a | n/a | n/a | n/a | n/a | duplicate tree point? | n/a | n/a |
| 15622 | Douglas-fir | Pseudotsuga menziesii | 19 | 20 | good | fair | one sided, bowed trunk, marginal trunk taper | retain | x |
| 15623 | Douglas-fir | Pseudotsuga menziesii | 8 | 10 | good | poor | one sided, poor trunk taper | retain |  |
| 15624 | Douglas-fir | Pseudotsuga menziesii | 9 | 0 | very poor | very poor | dead | retain |  |
| 15630 | Douglas-fir | Pseudotsuga menziesii | 18 | 20 | good | fair | one sided | retain | $x$ |
| 15631 | Douglas-fir | Pseudotsuga menziesii | 24 | 20 | good | fair | one sided | retain | x |
| 15632 | Douglas-fir | Pseudotsuga menziesii | 13 | 15 | good | poor | 40\% live crown ratio, poor trunk taper | retain | $x$ |
| 15638 | Douglas-fir | Pseudotsuga menziesii | 21 | 20 | good | fair | one sided | retain | $x$ |
| 15639 | Douglas-fir | Pseudotsuga menziesii | 14 | 15 | good | fair | one sided, marginal trunk taper, bowed trunk | retain | x |

## Attachment 4

| Tree No | Common Name | Scientific Name | DBH ${ }^{1}$ | C-Rad ${ }^{2}$ | Condition ${ }^{3}$ | Structure ${ }^{3}$ | Comments | Treatment | Onsite Trees >11" DBH in Good Cond. to be Retained |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 15640 | Douglas-fir | Pseudotsuga menziesii | 15 | 15 | good | fair | one sided, $70 \%$ live crown ratio, marginal trunk taper | retain | x |
| 15641 | Douglas-fir | Pseudotsuga menziesii | 19 | 20 | good | fair | 40\% live crown ratio, marginal trunk taper | retain | x |
| 15642 | Douglas-fir | Pseudotsuga menziesii | 19 | 15 | good | fair | moderately one sided, marginal trunk taper, 50\% live crown ratio | retain | x |
| 15643 | Douglas-fir | Pseudotsuga menziesii | 16 | 15 | good | fair | one sided | retain | x |
| 15644 | Douglas-fir | Pseudotsuga menziesii | 17 | 20 | good | poor | $33 \%$ live crown ratio, marginal trunk taper | remove |  |
| 15645 | Douglas-fir | Pseudotsuga menziesii | 24 | 25 | good | fair | one sided | retain | x |
| 15646 | Douglas-fir | Pseudotsuga menziesii | 16 | 15 | good | fair | one sided | retain | x |
| 15648 | Douglas-fir | Pseudotsuga menziesii | 17 | 15 | good | fair | one sided, $60 \%$ live crown ratio, marginal trunk taper | retain | x |
| 15649 | Douglas-fir | Pseudotsuga menziesii | 16 | 20 | good | fair | one sided, marginal trunk taper | retain | x |
| 15649.1 | Douglas-fir | Pseudotsuga menziesii | 17 | 20 | good | fair | moderately one sided, marginal trunk taper | retain | x |
| 15650 | Douglas-fir | Pseudotsuga menziesii | 23,16 | 25 | good | fair | codominant at ground level, north stem has poor trunk taper | remove |  |
| 15651 | n/a | n/a | n/a | n/a | n/a | n/a | same as tree 15650 | n/a | n/a |
| 15654 | Douglas-fir | Pseudotsuga menziesii | 21 | 20 | good | fair | one sided, codominant at 12' with included bark | remove |  |
| 15655 | Douglas-fir | Pseudotsuga menziesii | 24 | 25 | good | fair | one sided | remove |  |
| 15656 | Douglas-fir | Pseudotsuga menziesii | 16 | 15 | good | fair | marginal trunk taper, $40 \%$ live crown ratio | remove |  |
| 15659 | Douglas-fir | Pseudotsuga menziesii | 21 | 20 | good | fair | moderately one sided, 6 " dead codominant stem at base of trunk | remove |  |
| 15660 | Douglas-fir | Pseudotsuga menziesii | 19 | 20 | good | fair | 35\% live crown ratio, marginal trunk taper, dead 8" codominant stem at 15' | remove |  |
| 15662 | Douglas-fir | Pseudotsuga menziesii | 8 | 0 | very poor | very poor | dead | remove |  |
| 15666 | Douglas-fir | Pseudotsuga menziesii | 13 | 15 | good | fair | marginal trunk taper, 35\% live crown ratio | remove |  |
| 15667 | Douglas-fir | Pseudotsuga menziesii | 16 | 15 | good | fair | 40\% live crown ratio, marginal trunk taper | remove |  |
| 15668 | Douglas-fir | Pseudotsuga menziesii | 14 | 15 | good | fair | 40\% live crown ratio, marginal trunk taper | retain | x |
| 15669 | Douglas-fir | Pseudotsuga menziesii | 15 | 15 | good | fair | one sided, overtopped by adjacent trees | remove |  |
| 15670 | Douglas-fir | Pseudotsuga menziesii | 23 | 20 | good | fair | moderately one sided | remove |  |
| 15671 | Douglas-fir | Pseudotsuga menziesii | 10 | 10 | good | poor | one sided, poor trunk taper | remove |  |
| 15672 | Douglas-fir | Pseudotsuga menziesii | 15 | 20 | good | poor | $33 \%$ live crown ratio, marginal trunk taper | remove |  |
| 15673 | Douglas-fir | Pseudotsuga menziesii | 15 | 15 | good | fair | $35 \%$ live crown ration, marginal trunk taper | retain | x |
| 15674 | Douglas-fir | Pseudotsuga menziesii | 13 | 10 | good | poor | 25\% live crown ratio, poor trunk taper | retain | x |
| 15677 | Douglas-fir | Pseudotsuga menziesii | 13 | 10 | good | poor | 25\% live crown ratio, poor trunk taper | retain | x |
| 15678 | Douglas-fir | Pseudotsuga menziesii | 14 | 10 | good | poor | 33\% live crown ratio, poor trunk taper | retain | x |

## Attachment 4

| Tree No | Common Name | Scientific Name | DBH ${ }^{1}$ | C-Rad ${ }^{2}$ | Condition ${ }^{3}$ | Structure ${ }^{3}$ | Comments | Treatment | Onsite Trees >11" DBH in Good Cond. to be Retained |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 15679 | Douglas-fir | Pseudotsuga menziesii | 16,12 | 20 | good | fair | codominant at ground level with included bark, south stem has marginal trunk taper with $25 \%$ live crown ratio | retain | x |
| 15680 | Douglas-fir | Pseudotsuga menziesii | 11 | 10 | good | poor | 25\% live crown ratio, poor trunk taper | retain | x |
| 15681 | Douglas-fir | Pseudotsuga menziesii | 14 | 10 | good | poor | poor trunk taper, 20\% live crown ratio | retain | x |
| 15682 | Douglas-fir | Pseudotsuga menziesii | 26 | 20 | good | fair | one sided | remove |  |
| 15685 | Douglas-fir | Pseudotsuga menziesii | 22 | 20 | good | fair | moderately one sided | retain | x |
| 15686 | Douglas-fir | Pseudotsuga menziesii | 25 | 25 | good | fair | one sided | retain | x |
| 15688 | Douglas-fir | Pseudotsuga menziesii | 20 | 20 | good | fair | marginal trunk taper, 50\% live crown ratio | retain | x |
| 15690 | Douglas-fir | Pseudotsuga menziesii | 16 | 20 | good | poor | 33\% live crown ratio, poor trunk taper | retain | x |

${ }^{1}$ DBH is the trunk diameter in inches measured in accordance with International Society of Arboriculture standards.
C-Rad is the approximate crown radius in feet.
${ }^{2}$ Condition and Structure ratings range from very poor, poor, fair, to good.

## Attachment 5

## Additional Tree Protection Recommendations

The following recommendations meet or exceed City of Sandy Code requirements:

## Before Construction Begins

1. Notify all contractors of tree protection procedures. For successful tree protection on a construction site, all contractors must know and understand the goals of tree protection.
a. Hold a tree protection meeting with all contractors to explain the goals of tree protection.
c. Have all contractors sign memoranda of understanding regarding the goals of tree protection. The memoranda should include a penalty for violating the tree protection plan. The penalty should equal the resulting fines issued by the local jurisdiction plus the appraised value of the tree(s) within the violated tree protection zone per the current Trunk Formula Method as outline in the current edition of the Guide for Plant Appraisal by the Council of Tree \& Landscape Appraisers. The penalty should be paid to the owner of the property.
2. Fencing
a. Trees to remain in the grove should be protected by installation of tree protection fencing as shown in Attachments 2 and 3.
b. The fencing should be put in place before the ground is cleared in order to protect the trees and the soil around the trees from disturbances.
c. Fencing should be established by the project arborist based on the needs of the trees to be protected and to facilitate construction.
d. Fencing should consist of 6 -foot high steel fencing on concrete blocks or 6foot metal fencing secured to the ground with 8 -foot metal posts placed no farther than ten feet apart to prevent it from being moved by contractors, sagging, or falling down.
e. Fencing should remain in the position that is established by the project arborist and not be moved without approval from the project arborist until final project approval.
3. Signage
a. All tree protection fencing should have signage as follows so that all contractors understand the purpose of the fencing:

TREE PROTECTION ZONE

## DO NOT REMOVE OR ADJUST THE APPROVED LOCATION OF THIS TREE PROTECTION FENCING.

Please contact the project arborist if alterations to the approved location of the tree protection fencing are necessary.

Todd Prager, Project Arborist - 971-295-4835
b. Signage should be placed every 75 -feet or less.

## During Construction

1. Protection Guidelines Within the Tree Protection Zones:
a. No new buildings; grade change or cut and fill, during or after construction; new impervious surfaces; or utility or drainage field placement should be allowed within the tree protection zones.
b. No traffic should be allowed within the tree protection zones. This includes but is not limited to vehicle, heavy equipment, or even repeated foot traffic.
c. No storage of materials including but not limiting to soil, construction material, or waste from the site should be permitted within the tree protection zones. Waste includes but is not limited to concrete wash out, gasoline, diesel, paint, cleaner, thinners, etc.
d. Construction trailers should not to be parked/placed within the tree protection zones.
e. No vehicles should be allowed to park within the tree protection zones.
f. No other activities should be allowed that will cause soil compaction within the tree protection zones.
2. The trees should be protected from any cutting, skinning or breaking of branches, trunks or woody roots.
3. The project arborist should be notified prior to the cutting of woody roots from trees that are to be retained to evaluate and oversee the proper cutting of roots with sharp cutting tools. Cut roots should be immediately covered with soil or mulch to prevent them from drying out.
4. Trees that have roots cut should be provided supplemental water during the summer months.
5. Any necessary passage of utilities through the tree protection zones should be by means of tunneling under woody roots by hand digging or boring with oversight by the project arborist.
6. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

## After Construction

1. Carefully landscape the areas within the tree protection zones. Do not allow trenching for irrigation or other utilities within the tree protection zones.
2. Carefully plant new plants within the tree protection zones. Avoid cutting the woody roots of trees that are retained.
3. Do not install permanent irrigation within the tree protection zones unless it is drip irrigation to support a specific planting or the irrigation is approved by the project arborist.
4. Provide adequate drainage within the tree protection zones and do not alter soil hydrology significantly from existing conditions for the trees to be retained.
5. Provide for the ongoing inspection and treatment of insect and disease populations that are capable of damaging the retained trees and plants.
6. The retained trees may need to be fertilized if recommended by the project arborist.
7. Any deviation from the recommendations in this section should receive prior approval from the project arborist.
[^6]
## Attachment 6 <br> Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. The site plans and other information provided by Roll Tide Corporation and their consultants was the basis of the information provided in this report.
2. It is assumed that this property is not in violation of any codes, statutes, ordinances, or other governmental regulations.
3. The consultant is not responsible for information gathered from others involved in various activities pertaining to this project. Care has been taken to obtain information from reliable sources.
4. Loss or alteration of any part of this delivered report invalidates the entire report.
5. Drawings and information contained in this report may not be to scale and are intended to be used as display points of reference only.
6. The consultant's role is only to make recommendations. Inaction on the part of those receiving the report is not the responsibility of the consultant.
7. The purpose of this report is to:

- Assess the existing grove of trees along Highway 26;
- Identify the trees to be removed and retained in the grove;
- Identify trees that are in good condition within the park tract within the northwest portion of the site; and
- Provide tree protection recommendations for the trees to be retained in the grove.

[^7]May 3, 2019
Carey Sheldon

## EXHIBIT H

PO Box 883
Fairview, OR 97024
RE: Dubarko Road Subdivision - Wetland Determination
Carey:
This letter provides findings of a wetlands determination conducted by Environmental Science \& Assessment, LLC (ES\&A) at 40808 \& 41010 Highway 26 in Sandy, Oregon (TL\# 25E18CD00900 \& TL\#25E18CD01000) to evaluate the existing conditions. The 16.12-acre site is located directly east of a subdivision near Dubarko Road and Meadows Avenue and south of Highway 26 in the east end of Sandy, Oregon (Figure 1; Attachment A). The parcel boundaries and base topographic survey were provided by All County Surveyors and Planners, Inc.

A 6-lot subdivision and 216 -unit condominium complex site is planned for the project. The project developer contracted ES\&A to determine the presence of jurisdictional resources on site and determine the presence or absence of potential stream or wetland within the site.

## METHODOLOGY

Potential wetland areas on the parcel were evaluated using the methodology provided in the Army Corps of Engineers Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, (U.S. Army Corps of Engineers, 2010). This methodology defines criteria for hydrology, soils, and vegetation to identify wetland areas.

Two levels of investigation were used to evaluate the presence or absence of Sensitive Areas. The first level included a review of existing and available background data. The second level consisted of an on-site field investigation.

Reviewed background data included the following information:

- Aerial Photography (Google Earth, 2018)
- City of Sandy Local Wetland Inventory (Sri/Shapiro AGCO Inc., 1997)
- USFWS National Wetland Inventory (NWI) (USFWS, 2019)
- Natural Resource Conservation Service (NRCS) Soil Survey of Clackamas County, Oregon (Web Soil Survey, 2019)
- Topography (Metro Data Resource Center's MetroMap, 2018)

The lots within site are currently undeveloped, but a small structure was located on TL 1000 in 2012 based on the available 2012 aerial photos (Figure 2). The only evidence of water or wetland resources on site is an intermittent stream mapped on the City of Sandy Local Wetland Inventory (LWI) extending east to west through the site. The USFWS NWI does not map wetland or waters within the site (Figure 3) and the NRCS soil survey does not map hydric soils on site (Figure 4).

ES\&A wetland scientist, Jack Dalton, conducted the site assessment on March 23, 2019, with a preliminary site visit on June 8, 2018. Three (3) wetland determination data plots were established to document existing conditions on-site (Figure 5). The data sheets are included in Appendix C of this report. Data plot locations were mapped in the field using a hand-held resource grade GPS unit and transferred to a base topographic survey provided by All County Surveyors and Planners, Inc. (Attachment A).

## EXISTING CONDITIONS

The 16.12-acre site located at 40808 \& 41010 Highway 26, Sandy, Oregon (TL\# 25E18CD00900 \& TL\#25E18CD01000) is bordered by Highway 26 to the north and a neighborhood to the west. Agricultural land is located east of the site and a single-family residence is located on the lot directly east (Figure 1). A stub for Dubarko Road and a second road stub for Fawn Street are located along the west site boundary (Figure 2).

The investigation found no water feature at the mapped location in the middle of the site. While there is a narrow linear depression extending roughly east to west through the site, no defined channel bed or bank is present, as documented by site data plot locations (Figure 5). No evidence of ponding was observed in the lowest points in the west end of the site and no evidence of seasonal surface water flow was observed in the area of the mapped stream. The plant community is primarily a weedy cleared field dominated by Himalayan blackberry (Rubus armeniacus, FAC) and pasture grasses. The tree groves on site are primarily Douglas fit (Pseudotsuga menziesii, FACU) with small clusters of western red-cedar (Thuja plicata, FAC). No wetland vegetation is present on site. Soils sampled at the three data plots all lacked hydric soil indicators and showed no evidence of sub-surface saturation, high seasonal groundwater, saturation or other hydrology indicators. Photos documenting the existing conditions and plant community are provided in Attachment B. Detailed plant and soil data is provided in Attachment C.

It is my conclusion that the intermittent stream feature mapped on the LWI mapping is not longer accurate and no stream feature or wetland is currently present on site. Any historic drainage that may have extended through the site has is no longer present and was altered by past land use or a change in the surrounding basin hydrology up slope of site. There is no evidence of any surface water entering the site from the east and no evidence of wetland or seasonal ponded water features was observed in the lowest topographic point of site where wetland or were most likely to be located.

If you have any questions about the findings presented in this letter, I would be happy to discuss the determination findings further.

Sincerely,


Jack Dalton
Environmental Science \& Assessment, LLC
Cc: Alex Reverman (via email)
Ray Moore (via email)
Attachments
A - Figures
B - Site Photos
C - Wetland Determination Data


Source: Metro Data Resource Center. http://gis.oregonmetro.gov/metromap/

| Environmental <br> Science <br> Assessment, LLC <br> $e$ | Vicinity Map <br> $S^{8} a$ | Dubarko Road Subdivision <br> Sandy, Oregon |
| :---: | :---: | :---: |



Environmental
Science \&
Assessment, LLC

Aerial Photograph Dubarko Road Subdivision Sandy, Oregon

Approx. Scale:
$1 \mathrm{in} .=345 \mathrm{ft}$.

Figure 2


Source: National Wetlands Inventory https://www.fws.gov/wetlands/data/mapper.HTML

Environmental Science \&
Assessment, LLC


NWI Map Dubarko Road Subdivision Sandy, Oregon


Source: NRCS Web Soil Survey https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Environmental Science \&
Assessment, LLC esia

NRCS Soil Map
Dubarko Road Subdivision Sandy, Oregon

Figure 4
Not to
Scale



Photo 1: View SE of low point in the middle of the site.

Photo 2: View S by DP-1 and DP-2. Shallow swale with no offsite connection.

Photo 3: View NW of the middle of the site.


Photo 4: View NE of overgrown blackberry area.

Photo 5: View S of Doug fir forest in SW corner.

Photo 6: View NE of doug fir grove at N end.

## WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region



## SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

| Hydrophytic Vegetation Present? <br> Hydric Soil Present? <br> Wetland Hydrology Present? | Yes <br> Yes <br> Yes |  | Is the Sampled Area within a Wetland? | Yes | No $\times$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Remarks: Data point taken at grassy, flat area in the lower topo in west end. |  |  |  |  |  |

## VEGETATION - Use scientific names of plants.



Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)


Remarks:

## HYDROLOGY

## Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)
_ Surface Water (A1)
_ High Water Table (A2)
_ Saturation (A3)
_ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5

- S

Surface Soil Cracks (B6)
Inundation Visible on Aerial Imagery (B7)
Sparsely Vegetated Concave Surface (B8)

## Field Observations:



Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No saturation/O.R. or evidence of surface flow.

## WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region



## SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

| Hydrophytic Vegetation Present? <br> Hydric Soil Present? <br> Wetland Hydrology Present? |  |  | Is the Sampled Area within a Wetland? |  | No $\times$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Remarks: Data point taken at low point in linear swale in the west end - no evidence of wetland hydrology. |  |  |  |  |  |

## VEGETATION - Use scientific names of plants.



Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)


Remarks:

## HYDROLOGY

## Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)
_ Surface Water (A1)
_ High Water Table (A2)
_ Saturation (A3)
_ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5
-
Surface Soil Cracks (B6)
Inundation Visible on Aerial Imagery (B7)
Sparsely Vegetated Concave Surface (B8)

## Field Observations:



Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: No saturation, O.R. or evidence of surface flow.

## WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region



## SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.



## VEGETATION - Use scientific names of plants.

|  | Absolute | Dominant | Indicator | Dominance Test worksheet: |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Tree Stratum (Plot size: 30' diameter) | \% Cover | Species? | Status | Number of Dominant Species |  |  |
| 1. |  |  |  | That Are OBL, FACW, or FAC: | 2 | (A) |
| 2. |  |  |  | Total Number of Domi |  |  |
| 3. |  |  |  | Species Across All Strata: | 4 | (B) |
| 4. |  |  |  |  |  |  |
|  |  | = Total Cov |  | Percent of Dominant Species That Are OBL, FACW, or FAC | 50 | (A/B) |
| Sapling/Shrub Stratum (Plot size: $\qquad$ <br> 1. Rubus armeniacus |  |  |  | Prevalence Index worksheet:$\qquad$ Total \% Cover of: |  |  |
|  | 50 | yes | FAC |  | Multiply by: |  |
|  |  |  |  | OBL species $\qquad$ $x$ <br> FACW species $\qquad$ x |  |  |
|  |  |  |  |  | = |  |
|  |  |  |  | $\begin{aligned} & \text { FACW species } \\ & \text { FAC species } \\ & \hline \end{aligned}$ | 1 |  |
|  |  |  |  | FACU species $\quad 80$ | = |  |
| Herb Stratum (Plot size: | 50 | tal Cover |  |  | 5 $=$ |  |
|  | 35 | yes | FAC | Column Totals: 150 | - 5 |  |
| 2. Anthoxanthum odoratum | 30 | yes | FACU | Prevalence Index $=\mathrm{B} / \mathrm{A}=$ | 3. |  |
| 3. Agrostis sp. | 30 | yes | UPL |  |  |  |
| 4. Schedonorus arundinaceus | 5 |  | FAC | Hydrophytic Vegetation Indicators: <br> _ 1 - Rapid Test for Hydrophytic Vegetation |  |  |
| 5. |  |  |  | - 2 - Dominance Test is $>50 \%$ |  |  |
| 6. |  |  |  | - 3 - Prevalence Index is $\leq 3.0^{1}$ |  |  |
| 7. |  |  |  | _ 4-Morphological Adaptations ${ }^{1}$ (Provide supporting data in Remarks or on a separate sheet) |  |  |
| 8. |  |  |  |  |  |  |  |
| 9. |  |  |  | _ 5 - Wetland Non-Vascular Plants ${ }^{1}$ <br> Problematic Hydrophytic Vegetation ${ }^{1}$ (Explain) |  |  |
| 10. |  |  |  |  |  |  |  |
| 11. |  |  |  | ${ }^{1}$ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic. |  |  |
| Woody Vine Stratum (Plot size: $\quad$ - $\quad 100$ Total Cover |  |  |  |  |  |  |  |
|  |  |  |  | Hydrophytic Vegetation | No $\times$ |  |
|  |  |  |  |  |  |  |  |
| \% Bare Ground in Herb Stratum |  | $=$ Total Cover |  | Present? Yes |  |  |  |

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)


Remarks:

## HYDROLOGY

## Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)
_ Surface Water (A1)
_ High Water Table (A2)
_ Saturation (A3)
_ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5

- S

Surface Soil Cracks (B6)
Inundation Visible on Aerial Imagery (B7)
Sparsely Vegetated Concave Surface (B8)

## Field Observations:

| Surface Water Present? | Yes | No $\downarrow$ | Depth (inches): |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Water Table Present? | Yes | No $\checkmark$ | Depth (inches): |  |  |  |  |
| Saturation Present? (includes capillary fringe) | Yes | No $\sqrt{ }$ | Depth (inches): | Wetland Hydrology Present? | Yes |  | $\times$ |

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: faint O.R. at 13"

OFFSITE WETLAND DETERMINATION REPORT
OREGON DEPARTMENT OF STATE LANDS

775 Summer Street NE, Suite 100, Salem OR 97301-1279 Phone: (503) 986-5200
At your request, an offsite wetland determination has been conducted on the property described below.
County: Clackamas
City: Sandy
Agent Name \& Address: Tracy Brown, Tracy Brown Planning Consultants, LLC, 17075 Fir Dr., Sandy, OR 97055
Township: 2S Range: 5E Section: 18 Q/Q: CD Tax Lot(s): 900, 1000

## Project Name: Site Evaluation

Site Address/Location: 40808 and 41010 Highway 26, Sandy, OR
$\square$ The National Wetlands Inventory or Local Wetlands Inventory shows a wetland on the property.
$\square$ The county soil survey shows hydric (wet) soils on the property. Hydric soils indicate that there may be wetlands.
$\boxtimes$ It is unlikely that there are jurisdictional wetlands or waterways on the property based upon a review of wetlands maps, the county soil survey and other information. An onsite investigation by a qualified professional is the only way to be certain that there are no wetlands.
$\square$ There may be wetlands/waterways on the property that are subject to the state Removal-Fill Law.
$\boxtimes$ A state permit is required for $\geq 50$ cubic yards of fill, removal, or ground alteration in the wetlands or waterways.
$\square$ A state permit may be required for any amount of fill, removal, or other ground alteration in the Essential Salmonid Habitat and hydrologically associated wetlands.
$\square$ A state permit will be/will not be required for project because/ifThe proposed parcel division may create a lot that is largely wetland and thus create future development problems.A wetland delineation by a qualified wetland consultant is recommended prior to site development. The wetland delineation report should be submitted to DSL for review and approval.
$\square$ A permit may be required by the Army Corps of Engineers: (503) 808-4373
Note: This report is for the state Removal-Fill Law only. City or County permits may be required for the proposed activity.
Comments: Based on a review of the available information, there are no jurisdictional wetlands or waters on the property.

Determination by:
 Date: 7/03/9
$\square$ This jurisdictional determination is valid for five years from the above date, unless new information necessitates a revision. Circumstances under which the Department may change a determination and procedures for renewal of an expired determination are found in OAR 141-090-0045 (available on our web site or upon request). The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months from the above date.
$\boxtimes$ This is a preliminary jurisdictional determination and is advisory only.
Copy To: $\square$ Other $\boxtimes$ Enclosures: email: tbrownplan@gmail.com
$\square$ City of Sandy
FOR OFFICE USE ONLY
Entire Lot(s) Checked? $\boxtimes$ Yes $\square$ No Waters Present $\square$ Yes $\boxtimes$ No $\square$ Maybe Request Received: 6/27/2019
LWI Area: Sandy LWI Code: N/A Latitude: 45.390763 Longitude: - 122.244278 Related DSL File \# N/A
 Adjacent Waterbody: N/A NWI Quad: Sandy of Scanned o Mailings Completed Data Entry Completed

$$
\text { proj\# } 78454
$$

August 16, 2005
Project No. 05-9268

Reat-World Gatechnical Solutions

- Constructlon Sapprint

Cascade Communities, Inc. 13535 SE $145^{\text {m }}$ Avenue
Clackamas, OR 97015
Attention: Don Oakley (Fax 503-658-4544)

## RE: GEOTECHNICAL AND SLOPE STABILITY INVESTIGATION VISTA LOOP NORTH AND VISTA LOOP SOUTH SUBDIVISIONS SANDY, OREGON

This report presents the results of our geotechnical and slope stability investigation of the proposed Vista Loop Planned Development in the City of Sandy, Clackamas County, Oregon. The purpose of our investigation was to evaluate subsurface conditions and slope stability at the site, and provide geotechnical recommendations for site development and construction. Our work was performed in accurdance with GeoPacific Engineering, Inc.'s (GeoPacific) proposal letter No. P2463, dated May 4, 2005. The scope of our work included extensive investigation of Vista Loop North with parlicular attention to slopes on northern portion of the site. On Vista Loop South, the scope of our work was limited to a localized several acre area where slopes exceed $15 \%$ grade.

### 1.0 PROJECT INFORMATION

| Location: | The subject property is approximately 25.14 acres located in the City of Sandy, Clackamas County, Oregon (Figure 1). |
| :---: | :---: |
| Owner/ | Cacoade Communities, Inc. |
| Developer: | 13535 SE $145^{\text {th }}$ Avenue, Clackamas, OR 97015 |
| Clvil | Don Oakley, P.E. |
| Encineer: | 13535 SE $145^{\text {th }}$ Avenue, Clackamas, OR 97015 |
| Jurisdictional |  |
| Agency: | City of Sandy, Oregon |

### 2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The subject property includes approximately 25.14 acres that is divided by Highway 26 and is located in the Clity of Sandy. Clackamas County, Oregon (Figure 1). Vista Loop North, which is bordered on the south by the street right of way for Highway 26, consists of approximately 9.14 acres. Vista Loop South, which is bordered by Highway 26 on the north, consists of approximately 15.57 acres. These proposed residentlal develupments are situated on the margin of an upland

Prolect No. 05-9266
Vista Loop
plateau with Vista Loop North at the top of an approximately 300 foot high slope that forms the southern portion of the Cedar Creek drainage. Slopos on the upland plateau portion of the site generally incline to the west at about $5 \%$ to $15 \%$ grade. Slopes on the northern portion of Vista Loop North are moderately sleep inclining at $40 \%$ to $70 \%$ grade. An old logging road is present at the top of this slope. Vegetation consists of low grasses, brush, and young to mature trees.

The proposed subdivision layout and gradiry plan) for Vista Loop North and Vista Loop South are shown in Figure 2 and Figure 4, respectively. On Figure 2, the plan also shows conservation easement limits which sat the northerly extend of building foundations on Lots 6 through 16 . We presume that underground utilities will generally be constructed at depths of less than 10 feet.

### 3.0 SITE GEOLOGY

The subject property lies on the far eastern margin of the Willamette Valley/Puget Sound physiographic province, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. Underlying the slte vicinlty Is the Pliu-Pleistocene age (about 2 million years ago) Springwater Formation, a broad fluvial/alluvial fan deposit of outwash sediment derived from the Cescado Range (Schlicker and Finlayson, 1979). Reginnally, the Springwater Formation consists of fluvial conglomerate, volcaniclastic sandstone, siltstone and debris flows. The conglomerate typically consists of deeply weathered to decomposed, wellrounded pebbles to cobbles of basalt, andesite and dacite with a sand matrix composed of feldspathic and volcanic lithics. Siltstone units typically consist of quartzofeldspathic silt, volcanic ash and clay. The estimated thickness of the Springwater Formation in the site vicinity based on mapped thicknesses exposed in the Sandy River dralnage is 150 to 200 hundred feet.

Underlying the Springwater Formation is the Pliocene age ( 3 to 5 million years ago) Troutdale Formation, which is informally divided into an upper and lower member (Schlicker and Finlayson, 1979). The upper member consists primarily of induraled sandstone and conglomerate with localized clay seams. In the site vicinity, the estimated thickness of the upper member is 100 to 150 feet. The lower member, alsa known as the Sandy River Mudstone, consists of moderately-well indurated siltstone, claystone, very-fine-grained sandstone and some volcanic lapilli tuff layers with a total estimated thickness of about 725 feet. In the site vicinity, these strala are generally horizontally bedded with maximum dip angles on the order of 2 degrees (Schllcker and Finlayson, 1979).

### 4.0 SUBSURFACE CONDITIONS

In order to characterize subsurface conditions on the subject property, GeoPacific conducted a two phase program of subsurface exploration. The first phase consisted of 12 test pits excavated to depths of 8 to 12 feet will an 8 -ton trackhoe. The second phase consisted of drilling 3 exploratory borings with a track-mounted drill rig to depths of 51.5 and 61.5 feet below the ground surface, using mud-rotary drilling techniques. Exploration locations shown in Figure 2 were located in the field by pacing distances from apparent property corners and other site features, and as such should be considered approximate.

The following section presents generalized discussions of soil, rock and groundwater conditions anticipated on site based on subsurface explorations performed for the project. Each of the geologic deposits encountered is discussed separately below. For additional details regarding conditions at specific exploration locations, refer to the attached test pit and boring logs.

Hroject No．05－9266
Vista Loop

## 4．1 Soil

Fill：A localized fill wedge is present on the nutboard edge of the existing logging road which skirts the top of the moderately steep slope on the northern portion of the site（see Figure 3）．This fill consists of organic silt and clayey silt soil that is poorly compacted．In test pits（TP－4，TP－5，\＆TP－7）， the fill ranges between 2 and 5 teet thick．

Topsoil：Over most of the site，the ground surface is directly underlain by topsoil consisting of dark brown，organic SILT（OL）with common fine roots in grassland areas and many roots in forested areas．The observed thickness of topsoil generally varies from about 12 to 18 inches．

Native Soll Horizon／Colluvium：On the gently sloping portions of the site，the topsoil is underlain by a native soil horizon，while on the more atcoply sloping portions the topsoil is underlain by colluvial soil．The native soil horizon generally consists of brown to red－brown，clayey SILT（ML）derived from in－place weathering and mineral decomposition．In general，this soil horizon has a stiff to very－stiff consistency．Pocket penetrometer measurements indicate an approxirnale unconfined compressive strength of 1.5 to greater than 3.0 tons $/ \mathrm{t}^{2}$ ．The thickness of this layer ranges between 2 and 3 feet． Calluvial soil underlying the topsoil ir sluping areas is derived from weathering，mincral decomposition，erosion and soil creep．The collivial soil consists of brown to red－brown，clayey SILT （ML）to sandy SILT（MII）with fragments of weathered volcanic rocks and cobbles．In general，the consistency of the colluvial soil ranges from stiff with loose pockets to very－stiff．Pocket penetrometer measurements indicate approximate unconfined compressive strengths of 0.5 to 3.5 tons／$/ \mathrm{t}^{2}$ ．In test pits，the thickness of colluvial soil ranges between 2.5 and 4 reet．

Residual Soil：Underlying the native and colluvial soil is residual soil derived from in－place decomposition of the Springwater Formation．The residual soil consists of red－brown，clayey SILT （ML），sandy SILT（ML），and silly CLAY（CL）with some sand and weathered rock fragments．In general，this soil horizon has a stiff to very－stiff consistency．Pocket penetrometer measurements indicate an approximate uncanfined compressive strength of 1.5 to 3.0 tons $/ \mathrm{ft}^{2}$ ．In test pits，the thickness of this layer ranges from about 3 foet to greater than 7 feet thick，while in some sloping areas，the residual soil is absent．

Springwater Formation：Underlying the above soil units is the Springwater Formation．In test pits， the Springwater Formation consists of multi－colored，sandy SILT（ML）with clay and abundant weathered voicanic lithics and decomposed rounded cobbles．The consistency is generally medium－stiff to very－stiff but is variable depending on the original sediment mineralogy and degree of weathering and decomposition．In borings，Standard Penetration Test（SPT）N－values generally range between $N=5$ and $N=$ greater than 50 consistent with a medium－stiff to hard consistency． Springwater Formation extends below the maximum depth explored of 60 feet below the ground surface．

## 4．2 Soll Moisture and Groundwater

In May of 2005，near surface soil moisture conditions observed in test pits generally ranged from damp to moist．Minor groundwater seepage was observed in test pits TP－1 and TP－3 at a depth of 7 feet below the ground surface．

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Vista Loop

Seasonal springs are common in the Springwater Formation and tend to occur in localized areas in a varlety of topuyraplici settings. No springs or geomorphic evidence of scesonal springe was observed during our reconnaissance of the site. However, we anlicipale that minor seasonal perching of infiltrating surface water and localized groundwater seepage may be encountered in cuts and in shallow excavations during the wet weather season. Because mud-rotary drilling techniques do not permit measurement of groundwater, the exploratory borings provided no information regarding groundwater conditions.

### 5.0 SLOPE STABILITY

For the purpose of evaluating slope stability, we: (1) pertormed a review of published geologic literature, (2) performed a series of field reconnaissance traverses of the subject property and adjacent areas, (3) conducted a program of subeurface exploration, (4) constructed geningic cross sections and slope stability models, and (5) performed a quantitative analyses of slope stability.

### 5.1 Regional Landslide Hazard Mapping

Regional slope inslability mapping identifies the slopes on the northern margin of the site as a moderate to high relative slope hazard zone based primarily on slope gradient (Hofmeister et al., 2003). Regional geologic hazard mapping of the westward projection of these slopes identifies numerous "landslide topography" fealures (Schlicker and Finlayson, 1979). Common slope instability in this area is attributed to weak horizuns in the Troutdale Formation underlying the lower portion of the slope and erosional oversteeping of slopes by stream undercutting. The mapped "landslide topography" closest to the subject site lies approximately 2.000 feet to the west. Based on our review of $1: 24,000$ scale lopographic mapping, there appears to be a possible landslide feature expressed as benched topography located approximately 500 feet east of the site (see Figure 1).

These mapped hazard zone designations are general in nature based largely on prevailing slopes, and are intended to indicate the need for sile-specific geotechnical investigation such as this report.

### 5.2 Slope Geomorphology and Subsurface Soil Structure

We performed a series of slope reconnaissance traverses of the moderately steep slope on the northem margin the subject site and adjacent property. This north-facing slope is approximately 300 feet high and extends to the bottom of Ihe Cedar Creek dralnage, a small tributary to the Sandy River (See Figure 1). Based on review of the site topographic survey (see Figure 2) and clinometer measurements collected during our reconnaissance traverses, the upper portion of this slope inclines at $40 \%$ to $70 \%$ grade and includes both concave and slightly convex slope geometries. In contrast the lower portion of the slope, inclines at grades of less than $40 \%$ with a concave geometry becoming more gentle towards the toe of the slope at Cedar Creek. Figure 3 presents a slope profile constructed using hand-held clinometer and cloth tape techniques.

Based on observations made during our reconnaissance traverses, slope geomorphology on and directly below the site is gencrally smooth and uniform consistant with ralatively stable slope conditions. No geomorphic evidence of significant slope movement, such as benches, closed depressions, scarps, ground cracks, etc., was observed during our reconnaissance.

Subsurface soil conditions were evaluated in three exploratory borings drilled along the top of blope on the northern margin of the site. Soil samples were collected and slandard penetration tests (SPTs) of soil strength were performed on 5 foot intervals. Logs of the borings are presented in Appendix $A$. The borings indicate that the Springwater Formation underlying the upper portion of the slope generally consists of highly luffaceous, clayey silt with varying amounts of highly weathered volcanic lithics and decomposed cobbles. Due to the high degree of weatheririy and decomposition, the consistency of the Springwater Formation is variable, ranging between medium-stiff and hard. Standard penetration tests of soil strength indicale that Springwater Formation within 35 feet of the ground surface is generally medium-stiff to stiff with SPT $N$-values of between $N=5$ and $N=12$. These N -values are considered to be consistent with low to moderate strength and low to moderate resistance to slope instability. In contrast, standard penetration tests indicate that the Springwater Formation at depths of 35 to 60 feet is generally stiff to hard with SPT $N$-values of $N=13$ to $N=$ greater than 50 for 1 inch of penetration. These $N$-values are considered to be consistent with moderale strength and moderate resistance to slope instability.

### 5.3 Slope Stabllity - Lower Slope

We performed a qualitative geologic evaluation of the potential for desp scated slope instability in the Troutdate Formation underlying the lower portion of the slope that extends beyond the northern limits of the subject site. Regionally, the lower section of the Troutdale Formation has a relatively high susceptibility to slope instability due to the presence of weak bedding plane layers and a low internal strength. Because reported bedding plantes in the Troutdale Formation generally inclinc gently to the west at approximate dips of 2 to 3 degrees (Schlicker and Finlayson, 1979), weak bedding planes are unlikely to provide potential failure planes slope movement. Regional distribution patterns indicate that slope failures in the lower section of the Troutdale Formation are triggered more by oversteepening of slopes due to underculting by stream erosion.

In our assessment, the presence of Troutdale Formation underlying the lower portion of the slope beyond the northern boundary of the subject property does not appear to present a significant instability hazard on the subject site, because: (1) the lower slope inclines at relatively gentle grades (about $10 \%$ to $40 \%$ grade), (2) the slope is not significantly undercut by Cedar Creek, (3) the Troutdale Formation is somewhat buttressed by deposition of colluvial and alluvial sediments at the toe the slope, and (4) we observed no geomorphic evidence of prior, deep-seated slope instability on the lower slope directly below the subject site.

### 5.4 Slope Stability Modeling and Quantltative Stability Analys|s - Upper Slope

Our slope protile and relevant subsurface data was compiled and used to construct a representative geologic cross section of the slope geometry on and adjacenl to the northern portion of the site (Figure 3). A quantitative slope model was then constructed and stability analyses performed to evaluate local slope stability under future conditlons with the proposed development cuts at the top of slope. Our analysis presumes that a substantial cut is made at the top of the slope as shown in the project grading plan (Figure ${ }^{2}$ ).

The slope was modcled as a multi-layerad system with each lizyer being an isotropic medium. For the stability evaluation, the most critical circular failure surface was found by analyzing 100 potential failure surfaces. Shear strength parameters used in the model were selected based on correlations

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with field SPT $N$-value measurements and our local experience with similar soil and geologic conditions. The parameters assumed in the slope stability calculations arc summarized in Tabla 1.

Tabie 1 - Summary of Assumed Soil Strength Parameters

| Geologic Unit | Moist Unit <br> Welgnt <br> (pci) | Frictlon Angla | Coheslon <br> (psi) |
| :---: | :---: | :---: | :---: |
| Weathered Springwater 「.m. | 125 | $33^{\circ}$ | 300 |
| Springwater Fm. | 130 | $36^{\circ}$ | 500 |
| Troutdale Formation | 125 | $32^{\circ}$ | 250 |

Slope stability analyses were performed using the SLOPEN computer program devaloped by GeoSlope International of Calgary, Canada. This numerical analysis program utilizes a two-dimensional limiting equilibrium method to calculate the factor of safety of a potential slip surface and incorporates search routines to identify the most critical potential tailure surfaces for the cases analyzed. Factors of safety were calculated using Spencer's method of slices. Potential seismic forces were also incorporated into the analysis using a pseudostatic approach. The pseudnstatic analysis used a horizontal ground acceleration of 0.1 g , which is approximately 50 percent of our maximum estimated acceleration for a design seismic event ( 10 percent probability of exceedence in 50 years). Due to the inherent conservatism of the pseudostatic methodology, it is standard engineering practice to utilize one-half to two-thirds of the expected horizontal accelerations in pseudostatic slope stabllity calculations.

Results of the slope stability factor of safety calculations are presented in Table 2. Graphic plots of the slope model and analysis output are presented in Appendix B.

Table 2 - Summary of Slope Stability Analysis Results

| Cross <br> Section | Slope Conditions | Factor of Safraty <br> (Static Conditions) | Factor of Safety <br> (Psoudostatic <br> Conditions) |
| :---: | :---: | :---: | :---: |
| $A-A^{\prime}$ | Prellminary Plan Finish Grade | 1.46 | - |
| $A-A^{\prime}$ | Preliminary Plan Finish Grade | - | 1.19 |

Our slope stability analysis indicales that a factor of safety of 1.46 is achieved under post development, static conditions with a finish grade setback from the top of the slope of 40 feet (see Appendix B). Pseudostatic stability calculations indicate that the factor of safety under seismic loading during tie maximum probable event is 1.1. Potential failure surfaces closer than 40 feet to the top of slope (finish grade) will have reduced factors-of-safety.

In our opinion, the factors of safoty presented in Table 2 against slope instability tor both static and pseudostatic conditions are adequate for conventional foundation construction that maintains a minimum 40 foot horizontal selback from the top of the moderately-steep slope on the northern margin of Vista Loop North (Lots 6 through 16). Structures located closer than 40 feet horizontal from the top of slnpe will need to be evaluated individually and will likely require deepened

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foundations and/or soil anchors. For the purpose of determining setbacks from the top of slope, "top of slope" refers to the top of slope resulting after the project grading culs shown on Figure 2 are made.

### 6.0 CONCLUSIONS AND RECOMMENDATIONS

Our geotechnical investigation indicates that the proposed residential development is geotechnically feasible provided that the site is developed and constructed in accordance with our recommendalions. The potential for damaging deep-seated slope instability is considered to be low for conventional house foundations that maintain a minimum setback of 40 feet from the top of the moderately-steep slope on the northern portion of Vista Loop North. Houses on Vista Loop North Lots 6 through 16 that are situated closer than 40 feel from the top of the slope will likely require deep foundations such as drilled piers or driven piles and soil anchors.

Appendix $C$ contains an itemized checklist of soil testing and inspection procedures that are recommended to help guide the project io rompletion.

### 6.1 Slope Stability

The northorn margin of Vista Loop North is situated at the top of a moderately-steep, 300-foot-high, north-facing slope. In our opinion, the primary slope instability hazard is the potential for localized slope failure on the steeper upper portion of the slope where grades incline up to $70 \%$. Quantitative slope stability modeling and analysis indicates that at distances of less than 40 feet from the top of the slope, the upper slope has a factor of safety against movement of less than 1.46. We secommend that houses supported on conventional shallow foundations maintain a minimum setback of 40 feet from the top of the moderately-steep slope on the northern portion of the properly. Houses on Vista Loop North Lots 6 through 16 situated closer than 40 feet from the top of the slope will likely require deep foundations such as drilled piers or driven piles and soil anchors. Inese foundations will need to be evaluated and designed Individually. For maintaining slope stablity, stormwater runoff from the developirienl should not be allowed to flow onto the moderately-ste日p slopes on the northem margin of the development.

Slope gradients on Vista Loop South are generally gentle except for a localized approximately 20 foot high slope inclining at about $35 \%$ to $50 \%$ grade on the east-central portion of the site (Figure 4). Exploratory test pits indicate that this slope is underlain by relalively competent soils that have a moderate to high resistance to instabillty on moderate slopes. The preliminary grading plan specifies that 8 foct of structural fill will be placed at the the nf this slope. In our opinion, the potential for damaging slope instability on this slope is low and no special mitigating measures are necessary for slope stablity.

### 6.2 Site Preparation

All areas to be graded should first be cleared of debris, trees, stumps, vegetation, etc., and all debris from clearing should be removed from the site. Organic-rich topsoil should then be stripped. We anticipate that an average stripping depth of 8 to 10 inches will be necessary to remove organic-rich
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topsoil. Localized deeper stripping, or tilling and root-picking, to depths of 12 to 24 inches may be necessary lu remive thick topsoil and abundant roots around trece. The final depth of stripping removal will be determined on the basis of a site inspection after the initial stripping has been performed. Stripped topsoil should be stockpiled only in designated areas and stripping operations should be observed and documented by GeoPacific.

Once stripping is approved, the area should be aerated, and/or ripped ur tilled to a depth of B inches, moisture conditioned, and compacted in-place prior to the placement of engineered fill or crushed aggregate base for pavement (dry weather only). Exposed subgrade soils should be evaluated by the geotechnical engineer. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe.

Old fill, subsurface structures, etc, in future structural areas should be demolished, removed from the site, and the excavations backfilled with fill compacted to engineered fill specificatlons. We anticipate that some old fill may be present on Vista Loop North in the vicinity of Lots 49 through 58 .

### 6.4 Rough Grading

Grading fir the proposed development should be performed as engineered grading in accordance with Appendix Chapter 33 of the 1997 Uniform Building Code (UBC) with the exceptions and additions noted herein. Proper test frequency and earthwork documentation usually requires daily observation and testing during strlpping, iughl grading, and placement of engincercd fill. Imported fill material must be approved by the geotechnical engineer prior to its arrival on site.

Engineered fill should be compacted in horizontal lifts not exceeding 8 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least $95 \%$ of the maximum dry density determined by Standard Proctor AASHTO T-99 or equivalent. Field density lesting should conform to ASTM D2922 and D3017, or D1556. Engineered fill should be observed and tested by GcoPacific. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every $500 \mathrm{yd}^{3}$, whichever requires more testing. Because the standard of practice is to perform testing on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency.

Earthwork is usually performed in the summer monthe, generally mid-June to mid-October, when warm dry weather is available for proper moisture conditioning of soils. Earthwork performed during the wet-weather season will probably require expensive measures such as cement treatment or imported granular material to compact fill to the recommended engineering specifications.

The preliminary grading plan for Vlsta Lodp Suuth specifies an approximately 10 foot thick fill in the bottom of a broad drainage swale extending through the site (Figure 4). We anticipate that soft soils and shallow groundwater may he present in the drainage bottom such that subgrade stablization measures may be necessary to construct structural fills for lots and streets. We recommend that this area be evaluated In construction prior to fill placement. Recommended subgrade stabilization measures may include imported rock stabilization layers, subdrains, drying out ("baking") of exposed subgrade during hot weather conditions, etc.

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### 6.5 Landscaping Fill

Landscaping fill not supporting structures may consist of organic soils (such as topsoil strippings) that are free of large woody debris and/or other delelerinus material. To limit settlement and shifting, landscaping fill should be compacted to a firm, unyielding state as determined by GeoPacific (typically $90 \%$ of standard proctor AASHTO T-99 or equivalent).

### 6.6 Erosion Control Considarations

Due to the presence of gentle to moderate slope gradients, we consider the potential for adverse erosion during construction to be moderate. Erosion at the site during construction can be minimized by implementing the project erosion control plan specified by the civil englneer, which lypiceilly includes the use of straw bales, bio-bags, and silt fences. Where used, these arosion control devices should be in place and remain in place throughout site preparation and construction.

Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets. Areas of exposed soil requiring permanent stabillzatlon should be seeded willi an approved grass seed mixture, or hydrosecded with an approved seed-mulch-fertilizer mixture. Cut and fill slopes should be seeded or planted as soon as possible after construction, so that vegetation has time to become established before the onset of the next wet-weather season.

### 6.7 Excavating Conditions and Temporary Excavations

Based on subsurface test pit exploration, we anticipate that the planned excavation depths will generally be achievable with conventional heavy equipment. Some boulders may be encountered, particularly in deeper excavations. All temporary cuts in excess of 4 feet in helght should be sluped in accordance with U.S. Occupational Safety and Heath Administration (OSHA) regulations (29 CFR Part 1926), or be shored. At the timc of our exploration, native soils at the site were generally classified as Type A and Type B Soil. Temporary excavatlon side slope inclinations as steep as $3 / 4: 1$ (Type A) and $1 \mathrm{H}: 1 \mathrm{~V}$ (Type B) may be assumed for planning purposes. This cut slope inclination is applicable to excavations above the water table only. Malntenance of sate working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope incilinatlons at the time uf comstruction should be determined bescd on safety requirements and actual soil and groundwater conditions.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible disliess to existing or proviously constructed structural improvements.

### 6.8 Utilities

PVC pipe should be installed in accordance with the procedures specified in ASTM D2321. We recommend that structural trench backfill be compacted to at least $95 \%$ of the maximum dry density determined by Standard Proctor AASHTO T-99 or equivalent. Initial backfill lift thickness for a $3 / 4=0$ crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying

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flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (c.g. hoe compactor altachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is lested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verlfy that the recummerided relative compaction is achieved. Typically, one density test is taken for every 4 vertical feet of backfill on each 200 -lineal-foot section of trench. -Franchise tutilify trenches are generally not compacted unless they are located near a structural area. Trench spoils spread over lots should be kept to a minimum.

### 6.9 Pavement Construction

It is our understanding that the project will incorporate the standard City pavement section for dry weather construction consisting of 2.5 inches of asphaltic concrete over 8 inches of crushed aggregate ( $11 / 2^{\prime \prime}-0$ or $3 / 4$ "-0) compacted to at least $95 \%$ of AASHTO T-180 or equivalent. For the purpose of evalualiny native soil strength for support of pavement, we performed Portable Dynamic Cone Penetrometer (PDCP) field tests which approximato the California Bearing Ratio (CBR) of insitu snils (see Appendix A). Using a CBR of 10 for in-situ, native soil at damp to dry moisture conditions, and empirical correlations between CBR and resilient modulus ( $\mathrm{M}_{r}$ ), in-situ native soil strength is considered adequate for support of the standard pavement section assuming a light duly traffic index of 4.0 and a design Ilfe of 20 years.

Areas of yielding, native soil subgrade should be fillad to a minimum depth of 12 to 24 inches, aerated, and recompacted in-place to at least $95 \%$ of the maximum dry density obtained by AASHTO T-99 or equivalent. GeoPacific recommends that subgrade strength be verified visually by proof-rolling directly on soil subgrade with a loaded dump truck during dry weather and on top of base course in wet weather. Soft areas which rut, pump, or weave by more than $1 / 4$ inch on soil and $1 / 0$ inch on basc course should be stabilized prior to paving. Generally, one subgrade. one base course, and one asphalt compaction test is performed for every 100 to 200 linear feet of paving.

If pavement areas are to be constructed during wet weather, GeoPacitic should review the subgrade and proposed construction methods immedlately prior to the placement of base course so that specific recummendations can be provided. Wed-wcather pavement construction is likely to require soil amendment, or woven geotextile fabric and a minimum additional 6 inches of crushed aggregate base.

### 6.10 Anticipated House Foundatlons

The majority of the subject site to within 40 feet of the top of slope on Vista Ridge North is suitable for shallow foundations bearing on stiff, native soil and/or engineered fill. Foundation design, construction, and setback requirements should conform to the applicable code at the time of permitting. For protection against trost heave, spread footings should be embedded at a minimum depth of 18 inches below exterior grade. The recommended minimum widths for continuous footings supporting wood framed walls without masonry are presented in Table 3. Minimum reinforcement consisting of three horizontal No. 4 bars, two in the footing and one in the stem wall, is

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recommended. Actual fooling widths, sizing, and reinforcement should be determined by the house designer, anchitect- or engineer-of-record.

Table 3 - Recommended Minlmum Width of Continuous Spread Footings

| Number of Stories | MinImum Width of Cantinuous Spread Footings |
| :---: | :---: |
| $1-$ Story | $\frac{12}{15}$ inches |
| 2 Story |  |
| $3-$ Slory |  |

I he recommended allowable soll bearing pressure is $1,500 \mathrm{lbs} / \mathrm{fl}$ ' for footings on stlff, native soil and engineered fill. A maximum chimney and column load of 35 kips is recommended for the site. For heavier loads, GeoPacific should be consulted. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.40 (no factor of safety included). The maximurn anticipated total and differential footing movements (generally from sail expansion and/or settlement) are 1 inch and $\not / 4$ inch over a span of 20 feet, respectively. Excavations near structural foolings should not extend within a $1 \mathrm{H}: 1 \mathrm{~V}$ plane projected downward from the bottom edge of footings.

Footing excavations should penetrate through topsoil and any loose soil to stiff subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require overexcavation of footings and backfill with compacted, crushed aggregate.

### 6.11 House Foundations Incorporating Retaining Walls

Lateral soil pressures recommended by GeoPacific for design of permanent retaining structures with adequate drainage can be calculated using the equivalent fluid unit weights provided in Table 4. The effect of surcharges or live loads on lateral pressures has not been included. The recommended values assume that adequate drainage measures are incorporated, and that no hydrostalic pressures develop behind the walls. The unit weights in Table 4 are for backfill cousisling of free-draining granular material such as crushed aggregate; on-site soils are not recommended for use as retaining wall backfill. Wall backfill ehould be compacted to at least $9.5 \%$ of the maximum dry density determined by ASTM D698 or equivalent.

The average allowable bearing pressure for retaining walls may be taken as $2,000 \mathrm{lus} / \mathrm{fl}^{2}$ with a maximum allowable toe pressure of $2,500 \mathrm{lbs} / \mathrm{ft}^{2}$. The coefficient of friction between native soil or engineered granular fill and poured-in-place concrete may be taken as 0.45 (no factor of safely added).

Subdrains should be installed behind all retaining walls to prevent the build-up ol adverse nydrostatic pressure. We recommend that subdralns consist of ADS Highway Grade (or equivalent), perforated, plastic plpe enveloped in a minimum of $3 \mathrm{ft}^{3}$ per lineal foot of $2^{\prime \prime} \cdot 1_{2^{\prime \prime}}$, open-graded gravel (drain rock) wrapped with geofabric filter (Amoco 4545, Trevia 1120, or equivalent). A minimum 0.5 percent fall should be maintained throughout the drain and non-perforaled pipe outlet.

Table 4 -Recommended Equivalent Fluid Lateral Earth Prescuras

|  | Unrestrained Wall |  | Restrained Wall |  |
| :---: | :---: | :---: | :---: | :---: |
| Type | Level Profile | 2H:1V Upslope | Leve! Profile | 2H:1V Upslope |
| Active Pressure ( $\mathrm{lb} s / \mathrm{ft}^{2} / \mathrm{ft}$ ) | 32 | 45 | - | - |
| At-Rest Pressure ( $\mathrm{lbs} / \mathrm{ft}^{2} / \mathrm{ft}$ ) | $\because--$ | $\cdots-\cdots$ | $50$ | $\therefore \overline{85}$ |
| Passiva Pressure* ( $\mathrm{b}=/ f \mathrm{t}^{2} \mathrm{Kt}$ ) | 280 | 280 | 250 | 250 |

- Passive uressure values are allowable and include a factor of safety of 1.5. For passive pressure calculations, the upper 6 inches of embedment should be ignored.

For concrete retaining walls in living spaces, waterproofing and a geocomposite wall drain such as Tuff-N-Dry and Warm-N-Dry or CONTECH C-DRAIN 11 K , or equivalent are recommonded to minimize the potential for interior moisture problems.

### 6.12 Footing Subdrains, Roof Drains, and Drainage

Footing subdrains constructed as standard practice should consist of a minimum 3-inch diameter ADS Highway Grade (or equivalent), perforated, plastic pipe enveloped in a minimum of $1 \mathrm{ft}^{3}$ per lineal foot of $2^{\prime \prime}-1 / 2$ ", open, graded gravel (drain rock) wrapped with geofabric filter (Amoco 4545, Trevia 1120, or equivalent). Subdrains should be connected to the storm drain system or daylight to a suitable outfall location. A minimum $0.5 \%$ tall should be maintained throughout all subdrains and non-perforated pipe outlets. Footing subdrains are normally installed for mitigating detrimental effects of water on foundations only, and are not intended for elimination of all potential sources of water beneath the house or within crawl spaces.

Additional subdrains such as cut-off trenches or blanket drains may be necessary to facilitate drainage of springs encountered during construction. If springs are encountered during construction, GeoPacific Engineering should be contacted to make site-spacific recommendations.

Surface water drainage should be directed away from structures. In no case should roof drains be connected to footing drains.

### 6.13 Seismic Design

The subject site is located in a region of moderate seismic risk, and moderate levels of earthquake shaking should be anticipated during the design life of the proposed structures and improvements. Probabilistic assessments of the seismic shaking nazard in Oregon predict that in the next 50 years bedrock underlying the subject site has a $10 \%$ probability of experiencing a peak ground acceleration (PGA) of 0.18 g , a $5 \%$ probability of experiencing a PGA of 0.22 g , and a $2 \%$ probability of experiencing a PGA of 0.34 g (Geomatrix, 1995).

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Seismic design requirements for single-family homes are included in the Oregon One- and TwoFamily Dwelling Specialty Code, which specifies tho sitc location as being in Seismic Design Category $\mathrm{D}_{1}$. Structures not governed by the One- and Two-Family Dwelling Specialty Code should be designed to resist earthquake loading in accordance with the methodology described in section 1615 of the State of Oregon 2004 Structural Specialty Code (OSSC) Amendments to the 2003 Intemational Building Code (IBC). The maximum considered earthquake ground motion for short period and 1.0 second period spectral response may be determined from map Fiyuies $1015(1)$ and 1615(2) of the State of Oregon 2004 Structural Specialty Code (OSSC) or the 2003 National Earthquake Hażard Reduction Program (NEHRP)-"Recnmmended Provisions-for Seismic Regulations for New Buildings and Other Struclures" published by the Building Seismic Safety Council. We recommend Site Class D be used for design per the OSSC, Table 1615.1.1. Using this information, the structural engineer can select the appropriate site coefficient values ( $F_{a}$ and $\bar{F}_{v}$ ) from Tables $1615.1 .2(1)$ and $1615.1,2(2)$ of the 2003 IBC to delermine the maximum considered earthquake spcciral response acceleration for design of the project.

In our opinion, the potential for liquefaction or liquefaction-related ground failure at the subject site is very low, and no special mitigating measures are recammended against liquetaction.

### 7.0 UNCERTAINTY AND LIMITATIONS

We have prepared this report for the developer and designers, for use on this project only. The report should be provided In Its entirely lu prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the suhsurface conditions. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such If necessary.

We recommend that GeoPacific perform sufficient geotechnical monitoring, testing and consultation during construction to confirm that the conditions encountered are consistent with those indicated by explorations, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipatad. The checklist attached to this report (Appendix C) outlines the minimum recommended geotechnical observations and testing for the project.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and prootices in the flelds of geotechnical enginearing and engineering geology at the time the report was prepared. No warranty, express or implled, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

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Vista Loop

We appreciate this opportunity to be of service.
Sincerely,
Geopacific Engineering, Inc.


Paul A. Crenna, C.E.G. Engineering Geologist


James D. Imbrie, P.E., C.E.G Geotechnical Engineer

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Vista Loop

### 8.0 REFERENCES CITED

Geomatrix Consultants, 1995, Seismic Design Mapping. State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

Hofmeister ${ }_{-}$R.J., Hasenberg, C.S.; Madin, I.P, -and Wang, Y., 2003, Relative earthquake and - -- landslide hazards -in Clackamas County. Oregon Department of -Geology "and Mineral Industries Open File Report 0-03-09, map scale 1:100,000

Schlicker, H.G. and Finlayson, C.T., 1y/9, Geology and Geologic Hazards of northwestem Clackamas County, Oregon: Oregon Department of Geology and Mineral Industries, Bulletin No. 99, 79 p., scale 1:24,000.




APPENDIX A<br>FIELD EXPLORATIONS, SAMPLING, LABORATORY AND FIELD TESTING

On May 18, 2005, twelve exploratory test pits were excavated on the subject property to depths of 8 to 12 teet. Un May 31 and June 1 of 2005, three exploratory borings were advanced to depths of 51.5 to 61.5 feel. The approximate exploration locations are shown on Figure 2. A GeoPacific Engineoring Geologist evalualed and logged the explorations with regard to soit type- moisture content, relative strength, groundwater content, etc. and collected representative samples. Logs of the explorations are presented in this Appendix. The borings were drilled with track-mounted drillrigs operated by Geotechnical Explorations, Inc. of Tualatin, Oregon. Standard penetration tests were performed on 5 -foot intervals using a standard 2 -inch O.D., split-spoon sampler driven with a 140 pound auto-hammer. The test pits were excavaled with a $16,000 \mathrm{lbs}$ trackhoe operated by Dan Fisher Excavating of Banks, Oregon using a 30 -inch-wide bucket. All excavations were backfilled immediately after completion of logging and sampling. At the completion of the test pit logging, the test pits were backfilled with the excavated spoils and tamped with the backhoe bucket. This backfill should not be expected to behave as compacted structural fill and some minor settling of the ground surface may occur.

## Classification, Moisture Content, and Unit Weiahts

Soil samples were evaluated, described, and classified in accordance with the Unified Soil Classification System. Rock hardness was characterized using a mudified version of the Oregon Department of Transportation (ODOT) Soil and Rock Classification Manual (Table A2). All natural moisture samples were collected in plastic bags, and tested in accondance with the methods outlined in ASTM D2216. Moisture content is expressed as a percentage of the mass of water lost during oven drying to the dry weight of soil.

## Moisture-Denslty Relationship

A Standard Proctor compaction test was performed on one bulk sample from the site to determine the moisture-density relationship of native soils. The test was conducted in accordance with AASHTO T-99. The results obtained may be compared with fjeld densities for the purpose of evaluating relative compaction of fill and native soils. The test results are summarized in Table B1.

Table B1 - Proctor Test Results (AASHTO T-99)

| Material Description | Max/mum Dry Denslty (lbs/ft') | Optimum Moisture Content |
| :---: | :---: | :---: |
| Clayey SILT (ML) | 88.0 | $30.8 \%$ |

## Portable Dynamic Cone Penetrometer Tests

Field tests were conducted with a Portable Dynamic Cone Penetrometer (PDPC) to determine the strength parameters of the native soil for support of pavement.





7312 SW Durham Road
Portland, Oregon 97224
TEST PIT LOG
Tel: (503) 598-8445 Fax: (503) 508.8705


Note: No seepage or groundwater encountered.

| LEGEND |  |  |  | Waike กaming 7 nria | Water Lovglat Abancionmani | Date Excavated: 5/18/05 Logyed By: P. Crenna Surface Elevation: |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |















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Visla Loop

APPENDIX B



## APPENDIX C

## CHECKLIST OF RECOMMENDED SOIL TESTIING \& INSPECTIONS

| Item <br> No. | Procedure | Timing | By Whom | Done |
| :---: | :---: | :---: | :---: | :---: |
| 1 | Pre-construction meeting | Prior to beginning <br> site work | Contractor, Developer, <br> Civil and Geotechnical <br> Engineers |  |
| 2 | Stripping, aeration, and <br> root-picking operations | During stripping | Soil Technician |  |
| 3 | Compaction testing of <br> engineered fill <br> (96\% of Standard Proctor) | During filling, tested <br> every 2 vertical feet <br> per Int | Soil Technician |  |
| 4 | Compaction testing of <br> trench backfill (95\% of <br> Standard Proctor) | During backfilling, <br> tested every 4 <br> vertical feet for every <br> 200 lineal feet | Soll Technician |  |
| 5 | Street subgrade <br> compaction (95\% of <br> Standard Proctor) | Prior to base course <br> every 200 lineal feet | Soil Technician |  |
| 6 | Base course compaction <br> (95\% of Modified Proctor) | Prior to paving, <br> tested every 200 <br> lineal feet | Soil Technician |  |
| 7 | AC Compaction <br> (91\% (bottom lift)/ 92\% <br> (top lift) of Rice) | During paving, tested <br> every 200 lineal feet | Soll Technician |  |
| 8 | Final Geotechnical <br> Engineer's certification | Completion of project | Geotechnical Engineer |  |


|  |
| :---: |
|  |  |
|  |  |
|  |  |






BULLRUN TERRACE
SINGLE FAMILY HOME FOOTPRINT EXHIBIT



## MEMORANDUM

DATE: $\quad$ September 15, 2020
TO: Alex Reverman (Roll Tide Corporation)
FROM: Todd Prager, RCA \#597, ISA Board Certified Master Arborist

RE: $\quad$| Additional Tree Preservation at the Dubarko Road Subdivision and |
| :--- |
| Condominiums |

## Summary

This report includes recommendations for preserving additional trees along the west property line at the proposed Dubarko Road Subdivision and Condominiums in Sandy, Oregon.

## Background

Teragan \& Associates prepared an arborist report dated December 14, 2019 with a tree assessment, preservation, removal, and protection recommendations for the Dubarko Road Subdivision and Condominiums project.

Roll Tide Corporation has requested my review and recommendations regarding the preservation of additional trees along the west property line of the site.

## Tree Assessment

On September 15, 2020, I assessed the additional trees along the west property line of the site. Attachment 1 is a site plan with the tree locations and Attachment 2 is a summary of my assessment data for each tree.

Of the six trees that I assessed, all but one (tree 13438) can be retained and protected according to the recommendations in the next section of this report.

## Tree Protection Recommendations

The standard tree protection requirements in the City of Sandy Code range from at least 10 feet from the trunks of retained trees (SDC 17.102.50.B.1) to five feet beyond the driplines (SDC 17.92.10.D) unless otherwise approved by the Planning Director.

A typical alternative minimum protection zone allows encroachments no closer than a radius from a tree of .5 feet per inch of DBH as long as no more than 25 percent of the critical root protection zone area (estimated at one foot radius per inch of DBH) is impacted. Figure 1 illustrates this concept.


Figure 1: Alterative minimum protection zone and typical minimum construction setback of 5 feet per inch of DBH is shown for the trees to be retained along the west property line in Attachment 1. The trees to be retained will have at least 75 percent of their critical roots zones radii protected from construction. However, trees 13421 and 13423 will have encroachments for construction of the driveway for lot 4 closer than a radius of .5 feet per inch of DBH from their trunks.

Even with the driveway construction, the trees along the west property line can be retained and protected as follows:

- Tree Protection Fencing: Establish tree protection fencing in the locations shown in Attachment 1. Required fencing shall be a minimum of six feet tall supported with metal posts placed no farther than ten feet apart installed flush with the initial undisturbed grade.
- Directional Felling: Fell the trees to be removed away from the trees to be retained so they do not contact or otherwise damage the trunks or branches of the trees to be retained. No vehicles or heavy equipment shall be permitted within the tree protection zones during tree removal operations.
- Stump Removal: The stump of the tree 13438 shall be stump ground to protect the root systems of the trees to be retained.
- Curb/Pavement Construction: Construction of the new curb/paving in the tree protection zone of trees 13421 and 13423 shall occur under project arborist supervision. Use extruded curbs and a modified pavement profile as shown in Figure 1 for new pavement in the tree protection zones.


Figure 1. Sample profile for areas within tree protection zones. Depth of rock is dependent on grading.

[^8]The additional tree protection recommendations from my December 14, 2019 report are provided in Attachment 3.

## Conclusion

Five of the six additional trees along the west property line of the site can be retained and protected according to the recommendations in this report.

Please contact me if you have questions, concerns, or need any additional information.

Sincerely,


Todd Prager
ASCA Registered Consulting Arborist \#597
ISA Board Certified Master Arborist, WE-6723B
ISA Qualified Tree Risk Assessor
AICP, American Planning Association
$\begin{array}{cl}\text { Attachments: } & \text { Attachment } 1 \text { - Site Plan with Additional Tree Removal and Retention } \\ & \text { Attachment } 2 \text { - Additional Tree Inventory } \\ & \text { Attachment 3-Tree Protection Recommendations } \\ & \text { Attachment } 4 \text { - Assumptions and Limiting Conditions }\end{array}$


Attachment 2

| Tree No | Common Name | Scientific Name | DBH $^{\mathbf{1}}$ | C-Rad $^{\mathbf{2}}$ | Condition $^{\mathbf{3}}$ | Structure | Comments | Treatment |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 13421 | Douglas-fir | Pseudotsuga menziesii | 34 | 20 | good | fair | swelling at lower trunk, previously lost top with <br> new top at 15' | retain |
| 13423 | Douglas-fir | Pseudotsuga menziesii | 42 | 20 | good | fair | moderately one sided | retain |
| 13438 | Douglas-fir | Pseudotsuga menziesii | 46 | 20 | good | fair | moderately one sided | remove |
| 13439 | Douglas-fir | Pseudotsuga menziesii | 10 | 10 | good | fair | overtopped by adjacent trees, one sided | retain |
| 13440 | Douglas-fir | Pseudotsuga menziesii | 38 | 20 | good | fair | moderately one sided | retain |
| 13441 | Douglas-fir | Pseudotsuga menziesii | 15 | 15 | fair | fair | overtopped by adjacent trees, marginal trunk <br> taper, small Porodaedalea conks at lower trunk | retain |

${ }^{1}$ DBH is the trunk diameter in inches measured in accordance with International Society of Arboriculture standards.
${ }^{2} \mathbf{C}$-Rad is the approximate crown radius in feet
${ }^{2}$ Condition and Structure ratings range from very poor, poor, fair, to good.

## Attachment 3

## Additional Tree Protection Recommendations

The following recommendations meet or exceed City of Sandy Code requirements:

## Before Construction Begins

1. Notify all contractors of tree protection procedures. For successful tree protection on a construction site, all contractors must know and understand the goals of tree protection.
a. Hold a tree protection meeting with all contractors to explain the goals of tree protection.
c. Have all contractors sign memoranda of understanding regarding the goals of tree protection. The memoranda should include a penalty for violating the tree protection plan. The penalty should equal the resulting fines issued by the local jurisdiction plus the appraised value of the tree(s) within the violated tree protection zone per the current Trunk Formula Method as outline in the current edition of the Guide for Plant Appraisal by the Council of Tree \& Landscape Appraisers. The penalty should be paid to the owner of the property.
2. Fencing
a. Trees to remain in the grove should be protected by installation of tree protection fencing as shown in Attachment 1.
b. The fencing should be put in place before the ground is cleared in order to protect the trees and the soil around the trees from disturbances.
c. Fencing should be established by the project arborist based on the needs of the trees to be protected and to facilitate construction.
d. Fencing should consist of 6 -foot high steel fencing on concrete blocks or 6foot metal fencing secured to the ground with 8 -foot metal posts placed no farther than ten feet apart to prevent it from being moved by contractors, sagging, or falling down.
e. Fencing should remain in the position that is established by the project arborist and not be moved without approval from the project arborist until final project approval.
3. Signage
a. All tree protection fencing should have signage as follows so that all contractors understand the purpose of the fencing:

TREE PROTECTION ZONE

## DO NOT REMOVE OR ADJUST THE APPROVED LOCATION OF THIS TREE PROTECTION FENCING.

Please contact the project arborist if alterations to the approved location of the tree protection fencing are necessary.

Todd Prager, Project Arborist - 971-295-4835
b. Signage should be placed every 75 -feet or less.

## During Construction

1. Protection Guidelines Within the Tree Protection Zones:
a. No new buildings; grade change or cut and fill, during or after construction; new impervious surfaces; or utility or drainage field placement should be allowed within the tree protection zones.
b. No traffic should be allowed within the tree protection zones. This includes but is not limited to vehicle, heavy equipment, or even repeated foot traffic.
c. No storage of materials including but not limiting to soil, construction material, or waste from the site should be permitted within the tree protection zones. Waste includes but is not limited to concrete wash out, gasoline, diesel, paint, cleaner, thinners, etc.
d. Construction trailers should not to be parked/placed within the tree protection zones.
e. No vehicles should be allowed to park within the tree protection zones.
f. No other activities should be allowed that will cause soil compaction within the tree protection zones.
2. The trees should be protected from any cutting, skinning or breaking of branches, trunks or woody roots.
3. The project arborist should be notified prior to the cutting of woody roots from trees that are to be retained to evaluate and oversee the proper cutting of roots with sharp cutting tools. Cut roots should be immediately covered with soil or mulch to prevent them from drying out.
4. Trees that have roots cut should be provided supplemental water during the summer months.
5. Any necessary passage of utilities through the tree protection zones should be by means of tunneling under woody roots by hand digging or boring with oversight by the project arborist.
6. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

## After Construction

1. Carefully landscape the areas within the tree protection zones. Do not allow trenching for irrigation or other utilities within the tree protection zones.
2. Carefully plant new plants within the tree protection zones. Avoid cutting the woody roots of trees that are retained.
3. Do not install permanent irrigation within the tree protection zones unless it is drip irrigation to support a specific planting or the irrigation is approved by the project arborist.
4. Provide adequate drainage within the tree protection zones and do not alter soil hydrology significantly from existing conditions for the trees to be retained.
5. Provide for the ongoing inspection and treatment of insect and disease populations that are capable of damaging the retained trees and plants.
6. The retained trees may need to be fertilized if recommended by the project arborist.
7. Any deviation from the recommendations in this section should receive prior approval from the project arborist.
[^9]
## Attachment 4 Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. The site plans and other information provided by Roll Tide Corporation and their consultants was the basis of the information provided in this report.
2. It is assumed that this property is not in violation of any codes, statutes, ordinances, or other governmental regulations.
3. The consultant is not responsible for information gathered from others involved in various activities pertaining to this project. Care has been taken to obtain information from reliable sources.
4. Loss or alteration of any part of this delivered report invalidates the entire report.
5. Drawings and information contained in this report may not be to scale and are intended to be used as display points of reference only.
6. The consultant's role is only to make recommendations. Inaction on the part of those receiving the report is not the responsibility of the consultant.
7. The purpose of this report is to review and provide recommendations regarding the preservation of additional trees along the west property line of the site.

## MEMORANDUM

DATE: August 19, 2020<br>TO: Alex Reverman (Roll Tide Corporation)<br>FROM: Todd Prager, RCA \#597, ISA Board Certified Master Arborist<br>RE: $\quad$ Tree Removal Plan for the Dubarko Road Project

Our firm provided tree removal, preservation, and protection recommendations dated December 14, 2019 for the proposed Dubarko Road Subdivision and Condominiums in Sandy, Oregon. As a follow up to the report, you requested that I submit a proposal for removal of the trees adjacent to the retention trees. This memorandum includes the tree removal proposal.

- Tree Removal: The selected tree service shall coordinate with the project arborist to determine the specific methods that will be used to protect the retention trees during tree removal. The following options will be considered:
- Directional Felling: If there is a clear path to fell the trees away from the trees to be retained without contacting their crowns or trunks, the trees may be free-felled away from the retained trees.
- Piece Removal: If the trees cannot be directionally felled, they will need to be climbed, with branches and trunk sections cut off individually in pieces from the top down. If necessary, the pieces will be secured with ropes so they do not contact the crowns or trunks of the retained trees.
- Crane Removal: The use of a crane may be needed in some cases to remove certain trees where access is limited.
No heavy equipment is permitted within the critical root zones of the retention trees during tree removal operations.
- Stump Removal: The stumps of the trees to be removed from within the critical root zones of the retention trees shall be retained or carefully surface ground.

Please contact me if you have questions, concerns, or need any additional information.

Sincerely,


Todd Prager
ASCA Registered Consulting Arborist \#597
ISA Board Certified Master Arborist, WE-6723B
ISA Qualified Tree Risk Assessor
AICP, American Planning Association



# EXHIBIT R <br> ARD <br> LTu ENGINEERING 

# Bull Run Terrace <br> Traffic Impact Study 

SANDY, OREGON



## 

# Bull Run Terrace Subdivision Traffic Impact Study 

SANDY, OREGON



Prepared For:
Alex Reverman

## Prepared By:

Michael Ard, PE
Ard Engineering
DATE:
September 28, 2020

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## ExECUTIVE Summary

1. A property located on the south side of US Highway 26 opposite SE Vista Loop Drive in Sandy, Oregon is proposed for a subdivision which will support up to 147 apartment units and 4 singlefamily homes, along with future commercial uses. The site will take access via an extension of Dubarko Road through the property, connecting the existing stub to Highway 26 opposite SE Vista Loop Drive.
2. Upon completion of residential development within the R1, R2, and R-3 zones, the subject property is projected to generate 71 new site trips during the morning peak hour, 86 trips during the evening peak hour, and 1,114 new daily site trips.
3. Based on the operational analysis, the study intersections currently operate acceptably and are projected to continue to operate acceptably under year 2022 background conditions without residential development of the subject property or connection of Dubarko Road to Highway 26.
4. All study intersections are projected to operate within capacity under year 2022 traffic conditions either with or without the addition of site trips from the proposed development. However, upon completion of the residential development within the proposed subdivision and the connection of Dubarko Road to Highway 26, it is projected that the intersection of Highway 26 at Dubarko Road will operate with very high delays for the northeast-bound Dubarko Road approach. Since vehicles exiting the site to the west can also travel west on Dubarko Road to Langensand Road prior to turning west on Highway 26, it is expected that some vehicles will divert and the actual delays will be lower than those reported. An additional analysis showing operation of the study intersections with the new Dubarko Road at Highway 26 intersection restricted to right-in, rightout only demonstrates that there is sufficient capacity for such diversions even if all northeastbound left-turning vehicles diverted to alternative travel paths.
5. Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. It is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety improvements are recommended for the study area intersections at this time.
6. Based on the warrant analysis, a northwest-bound left-turn lane and a southeast-bound right-turn lane are projected to be warranted at the intersection of Highway 26 at Dubarko Road with completion of the Dubarko Road extension. The northbound left-turn lane would not be needed at the time of project completion if the intersection is limited to right-in, right-out only. No other turn lanes or traffic signals are recommended in conjunction with the proposed subdivision.
7. Intersection sight distance was evaluated for the new intersection of Highway 26 at Dubarko Road. The proposed intersection was found to have adequate sight distance in both directions.
8. Based on the transportation planning rule analysis for the proposed zone change, it is recommended that a trip cap of 340 PM net new peak hour trips be applied to the subject property as a condition of approval for the proposed zone change. No other mitigations are necessary or recommended in conjunction with the proposed zone change.

## Project Description \& Location

## INTRODUCTION

A property located on the south side of US Highway 26 opposite SE Vista Loop Drive is proposed for development with up to 147 apartment units and 4 single-family homes. The site will take access via an extension of Dubarko Road which will connect the existing stub (east of Meadow Avenue) to Highway 26 opposite SE Vista Loop Drive.

This report addresses the impacts of the proposed development on the surrounding street system. Based on discussions with the City of Sandy and ODOT staff, an operational and safety analysis was conducted for the proposed site access as well as the intersections of:

- Highway 26 at SE Ten Eyck Road;
- Highway 26 at SE Langensand Road;
- Highway 26 at SE Vista Loop Drive;
- Highway 211 at Dubarko Road; and
- Dubarko Road at SE Langensand Road.

The purpose of this analysis is to determine whether the surrounding transportation system is capable of safely and efficiently supporting the proposed use and to identify any necessary improvements and mitigations.

## Site Location and Study area Description

The project site has an area of approximately 16 acres, which is currently undeveloped. The property is surrounded by a mixture of residential development, agricultural uses and undeveloped forested land.

The proposed development will include an extension of Dubarko Road from its existing eastern terminus through the subject property to Highway 26 opposite SE Vista Loop Drive. The proposed development will take access via this newly extended segment of Dubarko Road.

US Highway 26 (Mt. Hood Highway) is classified by the Oregon Department of Transportation as a Statewide Highway and a Freight Route. It has two through lanes in each direction and added turn lanes at intersections. Between SE Langensand Road and SE Vista Loop Drive it has a center two-way left-turn lane. It has a posted speed limit of 25 mph at SE Ten Eyck Road, 40 mph at SE Langensand Road, and 55 mph at SE Vista Loop Drive. West of SE Ten Eyck Road the highway divides into a couplet, with westbound traffic traveling on Proctor Boulevard and eastbound traffic traveling on Pioneer Boulevard.

SE Ten Eyck Road has one through lane in each direction and is striped to prohibit passing in the site vicinity. It has a basic rule speed limit of 55 mph and is classified by the City of Sandy as a Minor Arterial.


SE Langensand Road is also classified by the City of Sandy as a Minor Arterial. It has a two-lane cross-section with one through lane in each direction and a posted speed limit of 25 mph . Partial sidewalks are in place on both sides of the roadway, and on-street parking is available where sufficient paved width is provided.

SE Vista Loop Drive is a narrow street without centerline striping and with a posted residential speed limit of 25 mph . It is classified by the City of Sandy as a collector roadway.

Oregon Highway 211 (Eagle Creek Sandy Highway) is classified by the Oregon Department of Transportation as a District Highway. It has a two-lane cross-section with one through lane in each direction and added turn lanes at major intersections. It has a posted speed limit of 45 mph in the vicinity of Dubarko Road.

Dubarko Road is classified by the City of Sandy as a Minor Arterial. It generally has a two-lane crosssection with some added turn lanes at major intersections and bike lanes on each side of the roadway. Partial sidewalks are in place on each side of the roadway adjacent to developed properties. It has a posted residential speed limit of 25 mph .

## Existing Conditions

The intersection of US Highway 26 at SE Ten Eyck Road/Wolf Drive is controlled by a traffic signal. The northbound and southbound approaches each have a single, shared lane for all turning movements. The westbound approach has a left-turn lane, two through lanes, and a short right-turn pocket. The eastbound approach has a left-turn lane, a dedicated through lane and a shared through/right lane. The northbound and southbound approaches operate with concurrent signal phasing. Protected phasing is provided for the eastbound and westbound left-turn movements. Bike lanes are provided along Highway 26 to the right of the through lanes.

The intersection of US Highway 26 at SE Langensand Road is a T- intersection controlled by a stop sign on the northbound Langensand Road approach. Through traffic traveling along Highway 26 does not stop. The northbound approach has a left-turn lane and a right-turn lane. The eastbound approach has two through lanes and a right-turn lane. The westbound approach has a left-turn lane and two through lanes. Bike lanes are provided along Highway 26 to the right of the through lanes.

The intersection of US Highway 26 at SE Vista Loop Drive is currently a T- intersection controlled by a stop sign on the southwest-bound Vista Loop Drive approach. Through traffic traveling along Highway 26 does not stop. The southwest-bound approach has a single, shared lane for all turning movements. The southeast-bound approach has a left-turn lane and two through lanes. The northwestbound approach has a dedicated through lane and a shared through/right lane. Bike lanes are provided along Highway 26 to the right of the through lanes.

The intersection of Oregon Highway 211 at Dubarko Road is a four-way intersection controlled by stop signs on the eastbound and westbound Dubarko Road approaches. The southbound, eastbound and westbound approaches each have a shared through/left lane, a bike lane, and a dedicated right-turn lane. The northbound approach has a single, shared lane for all motorized turning movements and a bike lane.

The intersection of Dubarko Road at SE Langensand Road is a four-way intersection currently controlled by stop signs on the eastbound and westbound Dubarko Road approaches. Through traffic traveling along SE Langensand Road does not stop. The northbound and southbound approaches each have a single, shared lane for all turning movements. The westbound approach has a single, shared lane for all motor vehicle turning movements and a bike lane. The eastbound approach has a left-turn lane, a shared through/right lane and a bike lane.

A vicinity map displaying the project site, vicinity streets, and the study intersections including lane configurations is provided in Figure 1 on page 7.


## Traffic Count Data

Traffic counts were conducted at the study intersections on Tuesday March $19^{\text {th }}, 2019$ from 4:00 to 6:00 PM and on Wednesday March 20 ${ }^{\text {th }}, 2019$ from 7:00 to 9:00 AM. Data was used from the highestvolume hour during each analysis period.

Since the count data was collected during a non-peak period of the year, the observed traffic volumes were adjusted to account for seasonal traffic variations in order to represent the $30^{\text {th }}$-highest hour design volumes.

US Highway 26 serves local and commuter traffic as well as trips to and from Mt. Hood and beyond. These trip types would be expected to exhibit very different seasonal variations in travel demands over the course of the year, since local and commuter traffic volumes are relatively stable regardless of season, while travel volumes to and from Mt. Hood vary significantly based on the season.

In order to determine the portion of traffic attributable to each of the two primary travel types, data from ODOT's 2017 Highway Volume Tables was utilized. Specifically, the data used was collected at ODOT's Automatic Count Data station 03-006, located 0.30 miles east of Camp Creek Road in Rhododendron, Oregon. This site is located on Highway 26 approximately 21 miles east of SE Vista Loop Drive. Although the distance to the ATR station means the data cannot be used directly, the ATR data provides useful information regarding the variation in traffic volumes traveling to Mt. Hood and beyond during the time of the count data collection as well as during the peak season of the year. Accordingly, this data allows determination of the likely portion of highway traffic that falls into each of the two seasonal variation categories ("commuter" and "recreational summer/winter"), as well as providing information regarding the most appropriate seasonal adjustment factor for the recreational summer/winter traffic.

Based on the data, 6,763 vehicles per day (approximately 676 per hour during the peak hour) travel along Highway 26 to and from Mt. Hood at the Rhododendron permanent count station location during the month of March. This volume represents 45.3 percent of the through traffic volumes measured on Highway 26 east of SE Vista Loop Drive. Accordingly, it is expected that no more than 45.3 percent of the trips traveling along Highway 26 in the project vicinity are traveling to and from destinations beyond the Rhododendron count station. Since the remaining 54.7 percent of through traffic volumes on the Highway 26 at the study intersections never reach Mt. Hood, it was assumed that these traffic volumes represent more typical commuter and local trips.

The ODOT data also showed that 11,738 vehicles were measured per day (approximately 1174 per hour during the peak hour) during the peak-season month of August at the ATR station near Rhododendron. This indicates that the seasonal recreational traffic volumes along the Highway 26 corridor increased by no more than 4,975 vehicles per day ( 11,738 vehicles per day in August $-6,763$ vehicles per day in March). This equates to roughly 498 additional vehicles per hour during the peak hour of the peak recreational season. It is expected that the increased recreational traffic flows will be somewhat directional, with approximately $55 \%$ traveling westbound during the evening peak hour.

In order to seasonally adjust the local and commuter traffic volumes, the through traffic volumes were reduced by the amount of the assumed seasonal traffic ( 676 vehicles per hour during the evening peak hour, and a seasonal adjustment of 1.08 was applied to the remaining local and commuter traffic
volumes. Following this adjustment, the 676 March recreational trips and the 498 peak-season through trips were added to determine the total peak-season traffic volumes. These calculated through traffic volumes represent the anticipated traffic levels for the intersections along Highway 26 during the $30^{\text {th }}$ highest hour in August. The morning peak hour traffic volumes along the highway were then increased by the same overall percentage as the evening peak hour volumes.

The observed traffic volumes along Highway 211 also had a seasonal adjustment of 1.08 applied to represent peak-season traffic volumes.

Following application of the seasonal adjustments, one year of growth was added to the year 2019 traffic count data in order to represent the expected year 2020 seasonal peak traffic conditions absent the impacts of the current COVID-19 pandemic. Based on data from ODOT's Future Volume Tables, the growth rate for traffic volumes on Highway 26 in the site vicinity was calculated to be 1.93 percent per year. The growth rate for traffic volumes on Highway 211 was calculated to be 3.16 percent per year. These growth rates were applied to the through traffic volumes on the highways. All other turning movements had a growth factor of 2 percent per year applied. The respective growth rates were applied over a period of one year to generate the year 2020 seasonal peak traffic volumes.

Figure 2 on page 10 shows the existing year $202030^{\text {th }}$-highest hour traffic volumes for the morning and evening peak hours at the study intersections.
(

## OPERATIONAL ANALYSIS

An operational analysis was conducted for the study intersections using Synchro 10 software, with outputs calculated based on the HIGHWAY CAPACITY MANUAL, $6^{\text {th }}$ Edition. The analysis was conducted for the weekday morning and evening peak hours.

The purpose of the existing conditions analysis is to establish how the study area intersections operate currently and allow for calibration of the operational analysis if required.

The results of the operational analysis are reported based on delay, Level of Service (LOS), and volume-to-capacity ratio (v/c). Delays are reported in seconds. Level of service is reported as a letter grade and can range from $A$ to $F$, with level of service A representing nearly free-flow conditions and level of service F representing high delays and severe congestion. A report of level of service D generally indicates moderately high but tolerable delays, and typically occurs prior to reaching intersection capacity. For unsignalized intersections, the $\mathrm{v} / \mathrm{c}$ represents the portion of the available intersection capacity that is being utilized on the worst intersection approach. For signalized intersections, it indicates the portion of the overall intersection's capacity that is being used. A v/c ratio of 1.0 would indicate that the intersection is operating at capacity.

The Oregon Department of Transportation requires that the signalized intersection of Highway 26 at SE Ten Eyck Road operate with a v/c ratio of 0.85 or less during the peak hours. The intersections of Highway 26 at SE Langensand Road and Highway 26 at SE Vista Loop Drive are required to operate with a $\mathrm{v} / \mathrm{c}$ ratio of 0.80 or less on the major-street approaches and a $\mathrm{v} / \mathrm{c}$ ratio of 0.90 or less on the minor-street approaches. The intersection of Highway 211 at Dubarko Road is required to operate with a v/c ratio of 0.90 or less on all approaches.

Intersections operating under the jurisdiction of the City of Sandy are required to operate at level of service D or better. This operational standard applies to the intersection of Dubarko Road at Langensand Road.

A summary of the existing conditions operational analysis is provided in Table 1 on the following page. For the unsignalized intersections the reported delays and levels-of-service represent the approach lane which experiences the highest delays. The reported $\mathrm{v} / \mathrm{c}$ ratios represent the highest ratio for the major-street and minor-street movements. For the signalized intersection of Highway 26 at SE Ten Eyck Road, the reported delays, levels-of-service and v/c ratios represent the operation of the overall intersection.

Based on the analysis, the study intersections are currently operating acceptably per the respective ODOT and City of Sandy standards. Detailed capacity analysis worksheets are provided in the technical appendix.

Table 1 - Operational Analysis Summary: Year 2020 30th-Highest Hour Conditions

| Intersection | AM Peak Hour |  |  | PM Peak Hour |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Delay | LOS | v/c* | Delay | LOS | v/c* |
| Highway 26 at Ten Eyck Road | 23.4 | C | 0.62 | 26.2 | C | 0.70 |
| Highway 26 at Langensand Road | 54.8 | F | $0.28 / 0.50$ | 88.9 | F | $0.35 / 0.47$ |
| Highway 26 at Vista Loop Drive | 12.7 | B | $0.28 / 0.08$ | 13.0 | B | $0.32 / 0.06$ |
| Highway 211 at Dubarko Road | 18.3 | C | $0.22 / 0.27$ | 25.7 | D | $0.24 / 0.32$ |
| Dubarko Road at Langensand Road | 9.3 | A | 0.05 | 9.8 | A | 0.04 |

*(major street $\mathrm{v} / \mathrm{c}$ ) / (minor-street $\mathrm{v} / \mathrm{c}$ ) is shown for unsignalized ODOT intersections.

## Site Trips

## Proposed Development

The proposed subdivision will support development of up to 147 apartment units and 4 single-family homes. Although some commercial development is expected to occur in the longer-range future, a separate application and analysis will be prepared for the future commercial development. To estimate the number of trips that will be generated by residential development within the proposed subdivision, trip rates from the TRIP GENERATION MANUAL, $10^{\text {th }}$ EDITION were used. Data from land-use code 210, Single-Family Detached Housing, and 220, Multi-Family Housing, were used. The trip estimates are based on the number of dwelling units.

A summary of the trip generation calculations is provided in Table 2 below. Detailed trip generation worksheets are also included in the technical appendix.

Table 2 - Proposed Development Trip Generation Summary

|  | AM Peak Hour |  |  | PM Peak Hour |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |
|  | In | Out | Total | In | Out | Total | Total |
| 147 Apartment Units | 16 | 52 | 68 | 52 | 30 | 82 | 1076 |
| 4 Single-Family Homes | 1 | 2 | 3 | 3 | 1 | 4 | 38 |
| Total Site Trips | 17 | 54 | 71 | 55 | 31 | 86 | 1,114 |

## Zone Change

In addition to evaluation of the increase in site trips expected upon completion of residential development within the proposed subdivision, trip generation calculations were prepared to examine the potential change in site trips based on the "reasonable worst-case development scenario" for the existing and proposed zoning. This second analysis was conducted to determine whether the proposed zone change would significantly affect any transportation facilities as defined by Oregon's Transportation Planning Rule.

After accounting for anticipated dedication of 2.232 acres of public right-of-way, the subject property is currently zoned with a mix of 6.628 acres of $\mathrm{R}-1,4.439$ acres of $\mathrm{R}-2$ and 2.611 acres of $\mathrm{C}-3$ zoning. Under the proposed subdivision plan, again 2.232 acres will be dedicated as public right-of-way, 0.906 acres will be zoned R-1, 1.233 acres will be zoned R-2, 6.504 acres will be zoned R-3, 3.609 acres will be zoned C-3, and 1.426 acres will be zoned POS (Parks \& Open Space).

Trip generation for the $\mathrm{R}-1$ zone was calculated assuming single-family residential development with 80 percent lot coverage and a minimum lot size of 5,000 square feet. For the R-2 zoning, trip generation was calculated assuming single-family residential development with 14 dwelling units per acre and 80 percent lot coverage. For the R-3 zoning, trip generation was calculated based on low-rise multi-family residential development with 20 dwelling units per acre and 100 percent lot coverage.

Under the C-3 (Village Commercial) zoning, the Sandy development code allows development with auto sales and repair facilities, convenience stores, restaurants (excluding drive-through facilities), grocery stores, athletic clubs, day care facilities, schools, banks (excluding drive-through facilities),
medical clinics, offices, hotels, residential facilities, and manufacturing facilities that do not produce significant levels of noise or odor beyond the boundaries of the site. Since the highest trip generators have limited floor areas, and no more than one convenience store, one day care center and two fast food restaurants can reasonably be expected within a commercial site with a gross land area of less than five acres, the "reasonable worst case" development scenario includes a mix of these uses with the remainder of the site consisting of general retail uses (evaluated as a shopping center).

A summary of the trip generation calculations for the reasonable worst-case development scenarios based on allowable development levels under the existing and proposed City of Sandy zoning is provided in Table 3 below. Detailed trip generation calculations are also included in the technical appendix.

Table 3 - Zone Change Trip Generation Summary

|  | AM Peak Hour |  |  | PM Peak Hour |  |  | Daily <br> Total |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total |  |
| Existing R1, R2 and C3 Zoning |  |  |  |  |  |  |  |
| 6.628 Acres R-1 (46 Homes) | 9 | 25 | 34 | 29 | 17 | 46 | 434 |
| 4.439 Acres R-2 (50 Homes) | 9 | 28 | 37 | 32 | 18 | 50 | 472 |
| 2.611 Acres C-3 (28,433 sf) |  |  |  |  |  |  |  |
| Fast Food w/o Drive Thru (5,000 sf) | 64 | 62 | 126 | 74 | 68 | 142 | 1732 |
| -Pass-by Trips (43\%) | -27 | -27 | -54 | -31 | -31 | -62 | -744 |
| Day Care Center (5,000 sf) | 30 | 25 | 55 | 27 | 29 | 56 | 238 |
| Supermarket (18,433 sf) | 41 | 29 | 70 | 85 | 85 | 170 | 1968 |
| -Pass-by Trips (36\%) | -13 | -13 | -26 | -31 | -31 | -62 | -708 |
| Net Trips (Existing Zoning) | 113 | 129 | $\mathbf{2 4 2}$ | 185 | 155 | 340 | 3392 |
| Proposed Zoning |  |  |  |  |  |  |  |
| 0.906 Acres R-1 (6 Homes) | 1 | 3 | 4 | 4 | 2 | 6 | 56 |
| 1.233 Acres R-2 (14 Homes) | 3 | 7 | 10 | 9 | 5 | 14 | 132 |
| 6.504 Acres R-3 (130 Apartments) | 14 | 46 | 60 | 46 | 27 | 73 | 952 |
| 3.609 Acres C-3 (39,300 sf Retail) |  |  |  |  |  |  |  |
| Fast Food w/o Drive Thru (5,000 sf) | 64 | 62 | 126 | 74 | 68 | 142 | 1732 |
| -Pass-by Trips (43\%) | -27 | -27 | -54 | -31 | -31 | -62 | -744 |
| Day Care Center (5,000 sf) | 30 | 25 | 55 | 27 | 29 | 56 | 238 |
| Supermarket (29,300 sf) | 65 | 47 | 112 | 136 | 135 | 271 | 3128 |
| -Pass-by Trips (36\%) | -20 | -20 | -40 | -49 | -49 | -98 | -1126 |
| 1.43 Acres POS (Public Park) | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| Net Trips (Proposed Zoning) | $\mathbf{1 3 0}$ | $\mathbf{1 4 3}$ | $\mathbf{2 7 3}$ | $\mathbf{2 1 6}$ | $\mathbf{1 8 6}$ | $\mathbf{4 0 2}$ | 4370 |
| Net Change In Site Trips | $\mathbf{1 7}$ | $\mathbf{1 4}$ | $\mathbf{3 1}$ | $\mathbf{3 1}$ | $\mathbf{3 1}$ | $\mathbf{6 2}$ | 978 |

Based on the zone change analysis, the proposed zone change could result in a net increase of up to 31 site trips during the morning peak hour, a net increase of 62 trips during the evening peak hour, and a net increase of 978 daily trips. Based on the projected daily increase in site trips, the zone change may result in a significant increase in site traffic as measured at the planning horizon under the "reasonable

worst case" development scenario. Accordingly, some form of mitigation is necessary to meet the requirements of Oregon's Transportation Planning Rule. A detailed analysis based on the requirements of Oregon's Transportation Planning Rule including a recommended condition of approval which is be sufficient to ensure that the zone change does not result in a significant effect is provided in the "Transportation Planning Rule Analysis" section found on page 27 of this report.

## TRIP DISTRIBUTION

The directional distribution of site trips to and from the project site was estimated based the existing travel patterns in the site vicinity, as well as the locations of likely trip destinations and major transportation routes. Overall, 65 percent of the anticipated site trips are projected to travel to and from the northwest on Highway 26, 20 percent are projected to travel to and from the southeast on Highway 26 , and the remaining 15 percent of site trips are projected to travel to and from the west on Dubarko Road.

The trip distribution percentages and trip assignment for residential development within the proposed subdivision are shown in Figure 3 on page 16.
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## Future Conditions Analysis

## BACKGROUND VOLUMES

In order to determine the expected impact of site trips on the study area intersections, it is necessary to compare traffic conditions both with and without the addition of the projected traffic from the proposed development. This comparison is made for future traffic conditions at the time of project completion. It is anticipated that the proposed use will be completed and occupied within two years. Accordingly, the analysis was conducted for year 2022 traffic conditions.

Prior to adding the projected site trips to the study intersections, the existing traffic volumes were adjusted to account for background traffic growth over time. Based on data from ODOT's Future Volume Tables, the growth rate for traffic volumes on Highway 26 in the site vicinity was calculated to be 1.93 percent per year (linear). The growth rate for traffic volumes on Highway 211 was calculated to be 3.16 percent per year (linear). These growth rates were applied to the through traffic volumes on the highways. All other turning movements had a growth factor of 2 percent per year (exponential) applied.

In addition to the background growth, anticipated site trips from the "The Views" residential development were added to the background traffic volumes. The projected site trips for this residential development are shown in Figure 8 in the attached technical appendix.

Figure 4 on page 18 shows the projected year 2022 background traffic volumes at the study intersections during the morning and evening peak hours.

## BaCkground Volumes plus Site Trips

Peak hour trips calculated to be generated by the proposed development were added to the projected year 2022 background traffic volumes to obtain the year 2022 total traffic volumes following completion of the proposed residential development.

In addition to the addition of anticipated site trips, some existing traffic is expected to divert upon completion of the Dubarko Road connection to Highway 26. Drivers traveling between locations east of the city on Highway 26 and locations south of the city on Highway 211 will have an alternative travel route available that will serve as a shorter travel route and bypass some congestion within the City of Sandy. The new road connection will also serve as an alternative travel route for residents living in areas to the west of the subject property traveling to and from destinations to the east on Highway 26. A diagram showing the projected trip diversions associated with completion of the Dubarko Road connection to Highway 26 is provided as Figure 7 in the attached technical appendix.

Figure 5 on page 19 shows the projected year 2022 peak hour volumes including background growth, site trips from the proposed development, and diverted trips associated with the proposed connection of Dubarko Road to Highway 26 for the morning and evening peak hours. Figure 6 on page 20 shows the year 2022 turning movement volumes for the morning and evening peak hour with full site development if the Dubarko Road connection to Highway 26 is limited to right-in, right-out only.
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## OPERATIONAL ANALYSIS

The operational analysis for future traffic conditions was again conducted using Synchro analysis software, with outputs based on the analysis methodologies contained in the HIGHWAY CAPACITY $M A N U A L$. The analysis was prepared for the intersections' morning and evening peak hours.

The results of the operational analysis are summarized in Table 4 below. Detailed analysis worksheets are also included in the technical appendix.

Table 4 - Operational Analysis Summary: Year 2022 Future Conditions

| Intersection | AM Peak Hour |  |  | PM Peak Hour |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Delay | LOS | v/c* | Delay | LOS | v/c* |
| Highway 26 at Ten Eyck Road |  |  |  |  |  |  |
| 2022 Background Conditions | 24.4 | C | 0.67 | 28.0 | C | 0.75 |
| 2022 Background plus Site | 24.1 | C | 0.66 | 28.1 | C | 0.72 |
| 2022 Background plus Site RIRO | 25.3 | C | 0.69 | 28.6 | C | 0.75 |
| Highway 26 at Langensand Road |  |  |  |  |  |  |
| 2022 Background Conditions | 77.4 | F | 0.31 / 0.62 | 137.4 | F | 0.39 / 0.62 |
| 2022 Background plus Site | 56.8 | F | 0.30 / 0.52 | 129.9 | F | 0.36/0.71 |
| 2022 Background plus Site RIRO | 107.2 | F | 0.31 / 0.85 | 168.9 | F | 0.36 / 0.83 |
| Highway 26 at Vista Loop Drive |  |  |  |  |  |  |
| 2022 Background Conditions | 11.4 | B | 0.30 / 0.05 | 13.9 | B | 0.34/0.09 |
| 2022 Background plus Site | 157.0 | F | $0.28 / 0.75$ | 412.7 | F | 0.32 / 0.75 |
| 2022 Background plus Site RIRO | 14.0 | B | 0.30 / 0.16 | 15.2 | C | 0.32 / 0.25 |
| Highway 211 at Dubarko Road |  |  |  |  |  |  |
| 2022 Background Conditions | 19.6 | C | 0.23 / 0.30 | 28.8 | D | 0.26 / 0.36 |
| 2022 Background plus Site | 21.0 | C | 0.23 / 0.47 | 54.3 | F | 0.26 / 0.79 |
| 2022 Background plus Site RIRO | 20.0 | C | 0.23 / 0.35 | 28.6 | D | 0.27 / 0.37 |
| Dubarko Road at Langensand Road |  |  |  |  |  |  |
| 2022 Background Conditions | 9.4 | A | 0.05 | 9.8 | A | 0.04 |
| 2022 Background plus Site | 10.3 | B | 0.17 | 11.1 | B | 0.22 |
| 2022 Background plus Site RIRO | 10.3 | B | 0.15 | 11.1 | B | 0.22 |

*(major street $\mathrm{v} / \mathrm{c}$ ) / (minor-street $\mathrm{v} / \mathrm{c}$ ) is shown for unsignalized ODOT intersections.

Based on the results of the operational analysis, the study intersections are projected to operate acceptably through year 2021 either with or without the addition of site trips from the proposed development and the diversion of through trips between Highway 26 and Highway 211 onto Dubarko Road.

Although the intersection of Highway 26 at SE Vista Loop Drive is shown to operate acceptably during the morning and evening peak hours, the average delays for the northeast-bound left/through lane are projected to be 157 seconds during the morning peak hour and 413 seconds during the evening peak hour. These long delays indicate that the northeast-bound left/through lane is unlikely to accommodate

any meaningful traffic volumes as vehicles are likely to divert to alternative (lower-delay) travel routes. As shown by the right-in, right-out analysis, even if all site trips diverted to avoid these delays the remaining study intersections would continue to operate acceptably.

## Queuing analysis

In addition to the operational analysis, a queuing analysis was conducted to determine an appropriate storage length for a northwest-bound left-turn lane on Highway 26 at Dubarko Road.

The storage length provided for the northwest-bound left-turn lane on Highway 26 should be sufficient to accommodate the $95^{\text {th }}$ percentile queue length for this movement. The $95^{\text {th }}$ percentile queue is the length which is exceeded during five percent or less of the peak hour. Queue lengths in excess of the $95^{\text {th }}$ percentile occur do not occur with sufficient frequency to allow for cost-effective design.

The queuing analysis was conducted for year 2022 background plus site trips conditions during the morning and evening peak hours. Based on the analysis, the projected $95^{\text {th }}$ percentile queue lengths were 38 feet during the morning peak hour and 80 feet during the evening peak hour. Accordingly, it is recommended that if a new turn lane is provided it should have a storage length of at least 100 feet.

The queuing analysis also showed a projected northeast-bound $95^{\text {th }}$-percentile queue length on Dubarko Road approaching Highway 26 of up to 277 feet.

## Site Circulation Considerations

The proposed subdivision includes a new four-leg intersection on Dubarko Road. "Street A" will connect to Fawn Street to the north, providing for local-street connectivity within the development and extending connectivity for the existing residential homes west of the site. "Street B" will extend south from Dubarko Road stubbing at the property line to provide future connectivity to the south in conformance with the city's Transportation System Plan.

It is anticipated that there may also be private access driveways on Dubarko Road within the subject property. Future access driveways should be located outside the standing queue for the intersection of Highway 26 at Dubarko Road or be restricted to right-in, right-out access only in order to ensure that they can operate safely and efficiently.

## Safety Analysis

## CRASH DATA ANALYSIS

Using data obtained from the Oregon Department of Transportation, a review of the five most recent years of available crash history (from January 2013 through December 2017) was performed for the study intersections. The crash data was evaluated based on the number, type, and severity of collisions, as well as the intersection crash rate. Crash rates allow comparison of relative safety risks at intersections with different lane configurations, volumes, and traffic control devices by accounting for both the number of crashes that occur during the study period and the number of vehicles that traveled through the intersection during that period. Crash rates are calculated using the standard assumption that evening peak hour volumes are approximately 10 percent of the average daily traffic volume at an intersection. The crash rates were compared to statewide crash rates for similar intersection types in order to identify any locations with crash rates in excess of the $90^{\text {th }}$ percentile.

The intersection of Highway 26 at SE Ten Eyck Road had seven reported collisions during the fiveyear analysis period. These included six rear-end collisions and one turning-movement collision. The crashes resulted in no serious injuries or fatalities and four reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.18 crashes per million entering vehicles. This is well below the $90^{\text {th }}$ percentile crash rate of 0.86 crashes per million entering vehicles for signalized, four-way urban intersections in Oregon.

The intersection of Highway 26 at SE Langensand Road had six reported collisions during the fiveyear analysis period. These included three turning-movement collisions, one angle collision, one backing collision and one pedestrian collision. The pedestrian collision occurred when a pedestrian walking along the south side of Highway 26 crossing Langensand Road was struck by a driver making an eastbound right turn from the highway onto Langensand Road. The collision resulted in a report of a "possible injury/complaint of pain" by the pedestrian. Overall, the crashes resulted in one nonincapacitating injury and five reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.20 crashes per million entering vehicles. This is well below the $90^{\text {th }}$ percentile crash rate of 0.29 crashes per million entering vehicles for stop-controlled, three-way urban intersections in Oregon.

The intersection of Highway 26 at SE Vista Loop Drive had no reported crashes during the five-year analysis period.

The intersection of Highway 211 at Dubarko Road had 27 reported crashes during the five-year analysis period. These included 15 angle collisions, 5 turning-movement collisions, 5 rear-end collisions, 1 backing collision, and 1 sideswipe-overtaking collision. The crashes resulted in no incapacitating injuries or fatalities. There were six "non-incapacitating" injuries reported and 18 reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 1.72 crashes per million entering vehicles. This is above the $90^{\text {th }}$ percentile crash rate of 1.08 crashes per million entering vehicles for rural unsignalized four-way intersections in the state of Oregon. The Oregon Department of Transportation recently undertook safety improvements at this intersection, including re-alignment of the minor-street approaches to intersect at a 90-degree angle and the addition of some striping along the major-street to increase driver awareness of speed. However, the crash data for subsequent years showed no significant improvement in the crash frequency at this intersection.

An examination of the current intersection configuration revealed no significant apparent hazards and adequate sight distance from the minor-street approaches, allowing drivers approaching the highway to select safe gaps when turning onto or crossing the highway. As described in the Warrant Analysis section of this report below, the intersection currently meets all-way stop control warrants based on crash history and is projected to meet all-way stop control warrants based on vehicular volume under year 2022 conditions with completion of the Dubarko Road connection to Highway 26. Accordingly, it is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety mitigations are recommended at this time.

The intersection of Dubarko Road at SE Langensand Road had one reported collision during the fiveyear analysis period. It was an angle collision that resulted in property damage only. The crash rate for the intersection was calculated to be 0.35 crashes per million entering vehicles. This is well below the $90^{\text {th }}$ percentile crash rate of 0.408 crashes per million entering vehicles for stop-controlled, four-way urban intersections in Oregon.

Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. It is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety improvements are recommended for the study area intersections at this time.

## Traffic Signal Warrant analysis

Traffic signal warrants were examined for the unsignalized study intersections.
Based on the projected traffic volumes, traffic signal warrants are projected to be marginally met at for the intersection of Highway 211 at Dubarko Road under year $202230^{\text {th }}$-highest hour conditions with completion of the proposed development, the nearby "The Views" development, and completion of a full-movement connection between Highway 26 and Dubarko Road. Traffic signal warrants are not projected to be met for any of the other unsignalized study intersections for any of the analysis scenarios.

An additional traffic signal warrant analysis was prepared for the intersection of Highway 211 at Dubarko Road assuming that traffic is restricted to right-in, right-out only for the intersection of Highway 26 at Dubarko Road. Under this scenario, the side-street volumes are significantly reduced for the Dubarko Road approach to Highway 211 and traffic signal warrants are not projected to be met. This analysis also demonstrates that the triggering event that causes signal warrants to be marginally met at this intersection upon project completion is not the Bull Run Terrace Development. Rather, it is the completion of the city's planned connection of Dubarko Road to Highway 26. Accordingly, a request to construct a traffic signal at this intersection would be disproportionate to the actual impacts of the proposed development.

Since traffic volumes for Highway 211 at Dubarko Road are only projected to marginally meet signal warrants for $30^{\text {th }}$-highest hour conditions if all proposed developments are constructed, all-way stopcontrol warrants were also examined for the intersection. Based on the analysis, all-way stop control warrants are currently met for Criterion B (crash history) and are projected to be met upon completion
of the proposed development for Criterion C (minimum volumes). Accordingly, all-way stop control can be installed at this intersection. Upon installation of all-way stop control, the intersection would be projected to operate at level of service C during the morning and evening peak hours, with an average delay of 24 seconds or less for the highest-delay (northbound) approach and a maximum v/c ratio of 0.74 .

Alternatively, consideration was given to installing a roundabout at the intersection of Highway 211 and Dubarko Road. Based on the operational analysis, installation of a roundabout would result in operation well within capacity and at level of service A. However, according to Roundabouts: An Informational Guide, published by the Federal Highway Administration, "It is generally not desirable to locate roundabouts in locations where grades through the intersection are greater than four percent. The installation of roundabouts on roadways with grades lower than three percent is generally not problematic." In this instance, Highway 211 has a constant grade of approximately 6 percent through its intersection with Dubarko Road. Accordingly, installation of a roundabout would not be recommended absent significant re-grading of the approach roadways. The potential for snow and ice at the intersection compound this concern.

## TURN LANE WARRANT ANALYSIS

Turn lane warrants were also examined for the major-street approaches to the unsignalized study intersections. Left-turn lane warrants are intended to evaluate whether a meaningful safety benefit may be expected if the turning vehicles are provided with turn lane within the street, allowing left-turning drivers to move out of the through travel lane so that following vehicles may pass without conflicts.

The intersection of Highway 26 at Langensand Road already has left and right turn lanes in place.
The intersection of Highway 26 at Dubarko Road is projected to meet warrants for a northwest-bound left-turn lane and a southeast-bound right turn lane upon completion of the proposed development.

The intersection of Highway 211 at Dubarko Road currently meets warrants for a northbound left-turn lane and a northbound right-turn lane. However, the need for these turn lanes is not related to the proposed development. Further, the turn lane warrants would not be applicable and added lanes may not be needed if all-way stop control is installed at the intersection as recommended based on the safety analysis, or if a traffic signal is installed at the intersection.

The intersection of Dubarko Road at Langensand Road is not projected to meet turn lane warrants under any analysis scenarios. However, it was noted that the existing two-way stop control is currently oriented in a way that favors through traffic on Langensand Road. Upon completion of the Dubarko Road connection to Highway 26 the major street is projected to be Dubarko Road. Accordingly, consideration should be given to revising the traffic control at this intersection to remove the stop signs on the eastbound and westbound Dubarko Road approaches and install stop signs on the northbound and southbound Langensand Road approaches.

## Intersection Sight Distance Analysis

Intersection sight distance was evaluated for the proposed new Dubarko Road approach to Highway 26. The posted speed limit along Highway 26 is 55 mph . Using a design speed of 65 mph and designing for combination trucks, the minimum required intersection sight distance was calculated to be 1,195 feet in each direction.

The available intersection sight distances were measured from a position 14.5 feet behind the edge of the traveled way with a driver's eye height 3.5 feet above the driveway surface to an oncoming driver's eye height of 3.5 feet above the surface of the oncoming travel lane.

From the location of the proposed Dubarko Road approach to Highway 26, the available intersection sight distance was measured to be in excess of 1,200 feet in each direction. Since the available intersection sight distance is in excess of the minimum required, intersection sight distance was determined to be acceptable at this intersection. No sight distance mitigations are necessary or recommended.

## Transportation Planning Rule Analysis

In order to allow the proposed zone change on the subject property, the City of Sandy must find that the requirements of Oregon's Transportation Planning Rule (OAR 660-012-0060) are met. This rule provides guidance regarding whether and how the potential transportation impacts of a plan amendment must be mitigated. The relevant portions of the Transportation Planning Rule are quoted below, along with responses specific to the proposed comprehensive plan amendment and zone change.

## 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);

No changes are proposed to the functional classification of existing or planned transportation facilities.
(b) Change standards implementing a functional classification system; or

No changes are proposed to the standards implementing the functional classification system.
(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.

Under the reasonable worst case development scenario, the proposed zone change would result in no significant change in trips during the morning peak hour, a net increase of 18 trips during the evening peak hour, and an increase of 484 daily trips. This represents an increase of 9 percent during the PM peak hour and 11 percent during the evening peak hour. It is anticipated that these increases may result in a significant effect as measured at the planning horizon. Accordingly, some form of mitigation is required in order to approve the zone change application. Acceptable mitigation measures are described in OAR 660-012-0060(2).
(2) If a local government determines that there would be a significant effect, then the local government must ensure that allowed land uses are consistent with the identified function, capacity, and performance standards of the facility measured at the end of the planning period identified in the adopted TSP through one or a combination of the remedies listed in (a) through (e) below, unless the amendment meets the balancing test in subsection (2)(e) of this section or qualifies for partial mitigation in section (11) of this rule. A local government using subsection (2)(e), section (3), section (10) or section (11) to approve an amendment recognizes that additional motor vehicle traffic congestion may result and that other facility providers would not be expected to provide additional capacity for motor vehicles in response to this congestion.

It is anticipated that the increases in trip generation resulting from the proposed zone change may result in a significant effect as measured at the planning horizon. Accordingly, some form of mitigation as described in OAR 660-012-0060(2) is required. In this instance, mitigation would be provided pursuant to sub-section (d), which reads:
(d) Providing other measures as a condition of development or through a development agreement or similar funding method, including, but not limited to, transportation system management measures or minor transportation improvements. Local governments shall, as part of the amendment, specify when measures or improvements provided pursuant to this subsection will be provided.

One mechanism to ensure that future development under the proposed zoning does not result in a significant impact on surrounding transportation facilities is to apply a trip cap to the subject property.

Under the existing zoning, the reasonable worst case development scenario was calculated to result in 242 net new morning peak hour trips, 340 net evening peak hour trips, and 3,392 net new daily trips. Since the operational analysis demonstrated that the evening peak hour was the critical design hour for all intersections, an appropriate trip cap can be created by limiting the number of net new PM peak hour trips to a level no greater than that allowed under the existing zoning. Accordingly, a trip cap of 340 net new PM peak hour site trips is recommended for the subject properties in conjunction with the proposed zone change.

It is anticipated that the R-1, R-2 and R-3 portions of the subject property will be developed in the near term in conformance with the development plan previously analyzed in this report. As such, it is expected that following completion of the proposed residential development the undeveloped C-3 portion of the site will be subject to a cap of no more than 248 additional new PM peak hour trips ( 340 trip cap - 92 residential trips within the R-1, R-2 and R-3 zones).

Based on the transportation planning rule analysis for the proposed zone change, it is recommended that a trip cap of 340 PM net new peak hour trips be applied to the subject property as a condition of approval for the proposed zone change. No other mitigations are necessary or recommended in conjunction with the proposed zone change.

## Conclusions

All study intersections are projected to operate within capacity under year 2022 traffic conditions either with or without the addition of site trips from the proposed development. However, upon completion of the residential development within the proposed subdivision and the connection of Dubarko Road to Highway 26, it is projected that the intersection of Highway 26 at Dubarko Road will operate with very high delays for the northeast-bound Dubarko Road approach. Since vehicles exiting the site to the west can also travel west on Dubarko Road to Langensand Road prior to turning west on Highway 26, it is expected that some vehicles will divert and the actual delays will be lower than those reported. An additional analysis showing operation of the study intersections with the new Dubarko Road at Highway 26 intersection restricted to right-in, right-out only demonstrates that there is sufficient capacity for such diversions even if all northeast-bound left-turning vehicles diverted to alternative travel paths.

Based on the crash data, the majority of the study intersections are currently operating acceptably with respect to safety. The intersection of Highway 211 at Dubarko Road has a high historical crash rate which recent safety improvements have not significantly improved. It is recommended that ODOT consider allowing installation of all-way stop control at this intersection. No other safety improvements are recommended for the study area intersections at this time.

Based on the warrant analysis, a northwest-bound left-turn lane and a southeast-bound right-turn lane are projected to be warranted at the intersection of Highway 26 at Dubarko Road with completion of the Dubarko Road extension. The northbound left-turn lane would not be needed at the time of project completion if the intersection is limited to right-in, right-out only. No other turn lanes or traffic signals are recommended in conjunction with the proposed subdivision.

Intersection sight distance was evaluated for the new intersection of Highway 26 at Dubarko Road. The proposed intersection was found to have adequate sight distance in both directions.

A zone change is proposed for the subject property from the existing mix of $\mathrm{R}-1, \mathrm{R}-2$ and $\mathrm{C}-3$ zoning to R-1, R-2, R-3, C-3 and POS zoning. It is recommended that the proposed zone change be approved with a condition of approval limiting the maximum development within the C-3 portion of the site to 250 net new PM peak hour trips and 2,650 net new daily trips. With this condition of approval, the proposed zone change will not result in a significant effect on the transportation system and will meet the requirements of Oregon's Transportation Planning Rule.


## APPENDIX


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5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 16 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 5 | 26 | 2 | 0 | 0 | 74 | 0 | 0 | 140 |
| 7:05 AM | 10 | 0 | 1 | 0 | 1 | 0 | 10 | 0 | 2 | 18 | 3 | 0 | 1 | 65 | 2 | 0 | 113 |
| 7:10 AM | 17 | 1 | 0 | 0 | 2 | 0 | 11 | 0 | 7 | 36 | 2 | 0 | 2 | 74 | 1 | 0 | 153 |
| 7:15 AM | 12 | 0 | 0 | 0 | 1 | 2 | 9 | 0 | 9 | 40 | 2 | 0 | 1 | 84 | 1 | 0 | 161 |
| 7:20 AM | 15 | 0 | 0 | 0 | 3 | 0 | 11 | 0 | 3 | 40 | 1 | 0 | 0 | 68 | 0 | 0 | 141 |
| 7:25 AM | 14 | 1 | 0 | 0 | 1 | 1 | 16 | 0 | 2 | 40 | 4 | 0 | 0 | 70 | 1 | 0 | 150 |
| 7:30 AM | 7 | 1 | 1 | 0 | 0 | 0 | 16 | 0 | 8 | 43 | 2 | 0 | 0 | 67 | 0 | 0 | 145 |
| 7:35 AM | 12 | 2 | 0 | 0 | 3 | 0 | 12 | 0 | 0 | 56 | 5 | 0 | 0 | 57 | 1 | 0 | 148 |
| 7:40 AM | 8 | 2 | 0 | 0 | 0 | 0 | 11 | 0 | 4 | 59 | 3 | 0 | 0 | 53 | 0 | 0 | 140 |
| 7:45 AM | 12 | 1 | 1 | 0 | 2 | 0 | 11 | 0 | 4 | 53 | 3 | 0 | 0 | 45 | 2 | 0 | 134 |
| 7:50 AM | 4 | 2 | 0 | 0 | 1 | 0 | 10 | 0 | 9 | 47 | 4 | 0 | 0 | 62 | 0 | 0 | 139 |
| 7:55 AM | 4 | 1 | 0 | 0 | 1 | 1 | 8 | 0 | 3 | 62 | 5 | 0 | 0 | 42 | 2 | 0 | 129 |
| 8:00 AM | 5 | 0 | 1 | 0 | 2 | 1 | 13 | 0 | 2 | 46 | 2 | 0 | 0 | 41 | 0 | 0 | 113 |
| 8:05 AM | 6 | 0 | 0 | 0 | 1 | 1 | 5 | 0 | 8 | 50 | 2 | 0 | 0 | 42 | 2 | 0 | 117 |
| 8:10 AM | 3 | 0 | 0 | 0 | 2 | 1 | 10 | 0 | 5 | 45 | 4 | 0 | 0 | 53 | 1 | 0 | 124 |
| 8:15 AM | 12 | 0 | 0 | 0 | 2 | 0 | 7 | 0 | 3 | 38 | 1 | 0 | 0 | 34 | 1 | 0 | 98 |
| 8:20 AM | 6 | 2 | 0 | 0 | 2 | 0 | 9 | 0 | 5 | 38 | 1 | 0 | 1 | 49 | 0 | 0 | 113 |
| 8:25 AM | 8 | 0 | 0 | 0 | 1 | 0 | 11 | 0 | 4 | 44 | 3 | 0 | 0 | 39 | 2 | 0 | 112 |
| 8:30 AM | 5 | 0 | 0 | 0 | 2 | 1 | 10 | 0 | 4 | 66 | 2 | 0 | 0 | 47 | 0 | 0 | 137 |
| 8:35 AM | 10 | 0 | 0 | 0 | 3 | 0 | 13 | 0 | 6 | 59 | 5 | 0 | 0 | 45 | 1 | 0 | 142 |
| 8:40 AM | 7 | 0 | 0 | 0 | 5 | 1 | 15 | 0 | 10 | 62 | 3 | 0 | 1 | 43 | 1 | 0 | 148 |
| 8:45 AM | 5 | 0 | 0 | 0 | 1 | 0 | 12 | 0 | 5 | 69 | 5 | 0 | 0 | 63 | 0 | 0 | 160 |
| 8:50 AM | 9 | 2 | 0 | 0 | 3 | 0 | 12 | 0 | 7 | 56 | 8 | 0 | 1 | 46 | 1 | 0 | 145 |
| 8:55 AM | 8 | 1 | 0 | 0 | 2 | 0 | 13 | 0 | 6 | 51 | 8 | 0 | 2 | 44 | 1 | 0 | 136 |
| Total Survey | 215 | 16 | 4 | 0 | 41 | 9 | 272 | 0 | 121 | 1,144 | 80 | 0 | 9 | 1,307 | 20 | 0 | 3,238 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 2 |

## 15-Minute Interval Summary

7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 43 | 1 | 1 | 0 | 3 | 0 | 38 | 0 | 14 | 80 | 7 | 0 | 3 | 213 | 3 | 0 | 406 |
| 7:15 AM | 41 | 1 | 0 | 0 | 5 | 3 | 36 | 0 | 14 | 120 | 7 | 0 | 1 | 222 | 2 | 0 | 452 |
| 7:30 AM | 27 | 5 | 1 | 0 | 3 | 0 | 39 | 0 | 12 | 158 | 10 | 0 | 0 | 177 | 1 | 0 | 433 |
| 7:45 AM | 20 | 4 | 1 | 0 | 4 | 1 | 29 | 0 | 16 | 162 | 12 | 0 | 0 | 149 | 4 | 0 | 402 |
| 8:00 AM | 14 | 0 | 1 | 0 | 5 | 3 | 28 | 0 | 15 | 141 | 8 | 0 | 0 | 136 | 3 | 0 | 354 |
| 8:15 AM | 26 | 2 | 0 | 0 | 5 | 0 | 27 | 0 | 12 | 120 | 5 | 0 | 1 | 122 | 3 | 0 | 323 |
| 8:30 AM | 22 | 0 | 0 | 0 | 10 | 2 | 38 | 0 | 20 | 187 | 10 | 0 | 1 | 135 | 2 | 0 | 427 |
| 8:45 AM | 22 | 3 | 0 | 0 | 6 | 0 | 37 | 0 | 18 | 176 | 21 | 0 | 3 | 153 | 2 | 0 | 441 |
| Total Survey | 215 | 16 | 4 | 0 | 41 | 9 | 272 | 0 | 121 | 1,144 | 80 | 0 | 9 | 1,307 | 20 | 0 | 3,238 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 2 |

Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 145 | 44 | 189 | 0 | 161 | 77 | 238 | 0 | 612 | 1,034 | 1,646 | 0 | 775 | 538 | 1,313 | 0 | 1,693 |
| \%HV | 6.2\% |  |  |  | 3.1\% |  |  |  | 12.1\% |  |  |  | 6.1\% |  |  |  | 8.0\% |
| PHF | 0.81 |  |  |  | 0.82 |  |  |  | 0.81 |  |  |  | 0.84 |  |  |  | 0.93 |
| By <br> Movement | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 131 | 11 | 3 | 145 | 15 | 4 | 142 | 161 | 56 | 520 | 36 | 612 | 4 | 761 | 10 | 775 | 1,693 |
| \%HV | 6.9\% | 0.0\% | 0.0\% | 6.2\% | 13.3\% | 25.0\% | 1.4\% | 3.1\% | 8.9\% | 12.7\% | 8.3\% | 12.1\% | 75.0\% | 5.5\% | 20.0\% | 6.1\% | 8.0\% |
| PHF | 0.74 | 0.55 | 0.75 | 0.81 | 0.63 | 0.33 | 0.81 | 0.82 | 0.74 | 0.77 | 0.75 | 0.81 | 0.25 | 0.84 | 0.63 | 0.84 | 0.93 |



## Rolling Hour Summary

7:00 AM to 9:00 AM

| $\begin{aligned} & \hline \text { Interval } \\ & \text { Start } \\ & \text { Time } \end{aligned}$ | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 131 | 11 | 3 | 0 | 15 | 4 | 142 | 0 | 56 | 520 | 36 | 0 | 4 | 761 | 10 | 0 | 1,693 | 0 | 0 | 0 | 0 |
| 7:15 AM | 102 | 10 | 3 | 0 | 17 | 7 | 132 | 0 | 57 | 581 | 37 | 0 | 1 | 684 | 10 | 0 | 1,641 | 0 | 0 | 0 | 1 |
| 7:30 AM | 87 | 11 | 3 | 0 | 17 | 4 | 123 | 0 | 55 | 581 | 35 | 0 | 1 | 584 | 11 | 0 | 1,512 | 0 | 0 | 0 |  |
| 7:45 AM | 82 | 6 | 2 | 0 | 24 | 6 | 122 | 0 | 63 | 610 | 35 | 0 | 2 | 542 | 12 | 0 | 1,506 | 1 | 0 | 0 | 2 |
| 8:00 AM | 84 | 5 | 1 | 0 | 26 | 5 | 130 | 0 | 65 | 624 | 44 | 0 | 5 | 546 | 10 | 0 | 1,545 | 1 | 0 | 0 |  |

Heavy Vehicle Summary

## All Traffic Data <br> Clay Carney <br> (503) 833-2740

SE Ten Eyck Rd \& Hwy 26
Wednesday, March 20, 2019
7:00 AM to 9:00 AM
Out 53
In 74


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 6 | 1 | 8 | 0 | 6 | 0 | 6 | 15 |
| 7:05 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 0 | 5 | 0 | 5 | 10 |
| 7:10 AM | 3 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 2 | 2 | 1 | 5 | 11 |
| 7:15 AM | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 6 | 0 | 8 | 1 | 1 | 0 | 2 | 12 |
| 7:20 AM | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 5 | 0 | 5 | 0 | 1 | 0 | 1 | 9 |
| 7:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 7 | 0 | 1 | 0 | 1 | 8 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 | 0 | 7 | 0 | 7 | 14 |
| 7:35 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 7 | 0 | 7 | 0 | 6 | 0 | 6 | 14 |
| 7:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 9 | 0 | 1 | 0 | 1 | 10 |
| 7:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 6 | 0 | 6 | 0 | 4 | 0 | 4 | 11 |
| 7:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 3 | 0 | 7 | 0 | 7 | 11 |
| 7:55 AM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 6 | 0 | 1 | 1 | 2 | 10 |
| 8:00 AM | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 10 | 1 | 11 | 0 | 2 | 0 | 2 | 15 |
| 8:05 AM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 9 | 0 | 9 | 0 | 7 | 1 | 8 | 19 |
| 8:10 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 6 | 0 | 6 | 8 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 3 | 0 | 3 | 7 |
| 8:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 0 | 5 | 1 | 2 | 0 | 3 | 9 |
| 8:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 | 7 | 0 | 3 | 0 | 3 | 10 |
| 8:30 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 6 | 0 | 8 | 0 | 3 | 0 | 3 | 12 |
| 8:35 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 5 | 0 | 6 | 0 | 8 | 0 | 8 | 14 |
| 8:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 0 | 5 | 0 | 1 | 0 | 1 | 7 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 9 | 0 | 3 | 0 | 3 | 12 |
| 8:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 5 | 1 | 8 | 0 | 9 | 14 |
| 8:55 AM | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 2 | 2 | 0 | 3 | 0 | 3 | 8 |
| Total Survey | 10 | 0 | 0 | 10 | 4 | 1 | 9 | 14 | 9 | 131 | 7 | 147 | 5 | 91 | 3 | 99 | 270 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 1 | 14 | 1 | 16 | 2 | 13 | 1 | 16 | 36 |
| 7:15 AM | 3 | 0 | 0 | 3 | 1 | 1 | 0 | 2 | 2 | 17 | 1 | 20 | 1 | 3 | 0 | 4 | 29 |
| 7:30 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 22 | 0 | 23 | 0 | 14 | 0 | 14 | 38 |
| 7:45 AM | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 2 | 1 | 13 | 1 | 15 | 0 | 12 | 1 | 13 | 32 |
| 8:00 AM | 1 | 0 | 0 | 1 | 1 | 0 | 2 | 3 | 0 | 21 | 1 | 22 | 0 | 15 | 1 | 16 | 42 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 15 | 1 | 16 | 1 | 8 | 0 | 9 | 26 |
| 8:30 AM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 3 | 16 | 0 | 19 | 0 | 12 | 0 | 12 | 33 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 | 13 | 2 | 16 | 1 | 14 | 0 | 15 | 34 |
| Total Survey | 10 | 0 | 0 | 10 | 4 | 1 | 9 | 14 | 9 | 131 | 7 | 147 | 5 | 91 | 3 | 99 | 270 |

Heavy Vehicle Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | Northbound SE Ten Eyck Rd |  |  | Southbound SE Ten Eyck Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 9 | 7 | 16 | 5 | 7 | 12 | 74 | 53 | 127 | 47 | 68 | 115 | 135 |
| PHF | 0.38 |  |  | 0.63 |  |  | 0.80 |  |  | 0.73 |  |  | 0.89 |


| By Movement | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 9 | 0 | 0 | 9 | 2 | 1 | 2 | 5 | 5 | 66 | 3 | 74 | 3 | 42 | 2 | 47 | 135 |
| PHF | 0.38 | 0.00 | 0.00 | 0.38 | 0.50 | 0.25 | 0.25 | 0.63 | 0.63 | 0.75 | 0.75 | 0.80 | 0.25 | 0.75 | 0.50 | 0.73 | 0.89 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 9 | 0 | 0 | 9 | 2 | 1 | 2 | 5 | 5 | 66 | 3 | 74 | 3 | 42 | 2 | 47 | 135 |
| 7:15 AM | 6 | 0 | 0 | 6 | 3 | 1 | 4 | 8 | 4 | 73 | 3 | 80 | 1 | 44 | 2 | 47 | 141 |
| 7:30 AM | 3 | 0 | 0 | 3 | 2 | 0 | 5 | 7 | 2 | 71 | 3 | 76 | 1 | 49 | 2 | 52 | 138 |
| 7:45 AM | 3 | 0 | 0 | 3 | 2 | 0 | 6 | 8 | 4 | 65 | 3 | 72 | 1 | 47 | 2 | 50 | 133 |
| 8:00 AM | 1 | 0 | 0 | 1 | 2 | 0 | 7 | 9 | 4 | 65 | 4 | 73 | 2 | 49 | 1 | 52 | 135 |



SE Ten Eyck Rd \& Hwy 26
Tuesday, March 19, 2019
4:00 PM to 6:00 PM


5-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 4 | 0 | 2 | 0 | 4 | 3 | 11 | 0 | 8 | 58 | 12 | 0 | 1 | 49 | 2 | 0 | 154 | 0 | 1 | 0 | 0 |
| 4:05 PM | 10 | 1 | 0 | 0 | 7 | 1 | 5 | 0 | 12 | 63 | 8 | 0 | 1 | 53 | 3 | 0 | 164 | 0 | 0 | 0 | 0 |
| 4:10 PM | 7 | 2 | 3 | 0 | 1 | 0 | 17 | 0 | 12 | 76 | 11 | 0 | 0 | 65 | 1 | 0 | 195 | 0 | 0 | 0 | 0 |
| 4:15 PM | 14 | 0 | 1 | 0 | 7 | 1 | 9 | 0 | 18 | 71 | 15 | 0 | 0 | 62 | 1 | 0 | 199 | 0 | 0 | 0 | 0 |
| 4:20 PM | 9 | 0 | 1 | 0 | 4 | 1 | 11 | 0 | 9 | 75 | 10 | 0 | 0 | 62 | 7 | 0 | 189 | 0 | 0 | 0 | 0 |
| 4:25 PM | 12 | 2 | 0 | 0 | 5 | 0 | 10 | 0 | 12 | 61 | 14 | 0 | 0 | 52 | 0 | 0 | 168 | 0 | 0 | 0 | 0 |
| 4:30 PM | 11 | 1 | 4 | 0 | 3 | 2 | 12 | 0 | 17 | 87 | 16 | 1 | 1 | 58 | 1 | 0 | 213 | 0 | 0 | 0 | 0 |
| 4:35 PM | 15 | 0 | 0 | 0 | 2 | 2 | 6 | 0 | 6 | 59 | 14 | 0 | 0 | 65 | 3 | 0 | 172 | 0 | 0 | 0 | 0 |
| 4:40 PM | 7 | 1 | 1 | 0 | 3 | 0 | 7 | 0 | 7 | 54 | 9 | 0 | 1 | 57 | 0 | 0 | 147 | 1 | 0 | 0 | 0 |
| 4:45 PM | 8 | 1 | 0 | 0 | 4 | 1 | 3 | 0 | 13 | 71 | 15 | 1 | 3 | 51 | 3 | 0 | 173 | 0 | 0 | 0 | 0 |
| 4:50 PM | 13 | 2 | 1 | 0 | 1 | 1 | 6 | 0 | 19 | 74 | 8 | 0 | 0 | 56 | 0 | 0 | 181 | 0 | 0 | 0 | 0 |
| 4:55 PM | 7 | 1 | 0 | 0 | 1 | 0 | 12 | 0 | 10 | 67 | 14 | 0 | 3 | 57 | 1 | 0 | 173 | 1 | 0 | 0 | 0 |
| 5:00 PM | 13 | 3 | 1 | 0 | 2 | 2 | 14 | 0 | 12 | 81 | 12 | 0 | 0 | 49 | 1 | 0 | 190 | 2 | 0 | 0 | 0 |
| 5:05 PM | 12 | 2 | 1 | 0 | 4 | 3 | 4 | 0 | 14 | 66 | 11 | 0 | 0 | 68 | 3 | 1 | 188 | 0 | 0 | 0 | 0 |
| 5:10 PM | 8 | 0 | 0 | 0 | 6 | 2 | 10 | 0 | 13 | 60 | 12 | 0 | 0 | 68 | 2 | 0 | 181 | 2 | 0 | 0 | 0 |
| 5:15 PM | 8 | 2 | 1 | 0 | 6 | 2 | 8 | 0 | 9 | 70 | 11 | 0 | 0 | 57 | 1 | 0 | 175 | 0 | 0 | 0 | 0 |
| 5:20 PM | 8 | 1 | 1 | 1 | 1 | 4 | 10 | 0 | 15 | 73 | 10 | 0 | 0 | 43 | 1 | 0 | 167 | 0 | 1 | 0 | 0 |
| 5:25 PM | 9 | 1 | 0 | 0 | 4 | 2 | 8 | 0 | 14 | 74 | 11 | 0 | 0 | 43 | 0 | 0 | 166 | 0 | 0 | 0 | 0 |
| 5:30 PM | 5 | 0 | 1 | 0 | 4 | 0 | 5 | 0 | 15 | 64 | 10 | 0 | 0 | 44 | 0 | 0 | 148 | 1 | 0 | 0 | 0 |
| 5:35 PM | 5 | 1 | 0 | 0 | 7 | 0 | 9 | 0 | 17 | 50 | 4 | 1 | 0 | 39 | 0 | 0 | 132 | 0 | 0 | 0 | 0 |
| 5:40 PM | 4 | 0 | 0 | 0 | 2 | 1 | 5 | 0 | 11 | 56 | 7 | 0 | 0 | 30 | 1 | 0 | 117 | 2 | 0 | 0 | 2 |
| 5:45 PM | 4 | 1 | 0 | 0 | 3 | 2 | 8 | 0 | 14 | 76 | 6 | 0 | 3 | 41 | 1 | 0 | 159 | 0 | 0 | 0 | 0 |
| 5:50 PM | 7 | 1 | 0 | 0 | 0 | 1 | 6 | 0 | 14 | 69 | 8 | 0 | 0 | 42 | 0 | 0 | 148 | 0 | 0 | 0 | 0 |
| 5:55 PM | 10 | 1 | 0 | 0 | 0 | 2 | 3 | 0 | 16 | 65 | 10 | 0 | 0 | 51 | 1 | 0 | 159 | 0 | 0 | 0 | 0 |
| Total Survey | 210 | 24 | 18 | 1 | 81 | 33 | 199 | 0 | 307 | 1,620 | 258 | 3 | 13 | 1,262 | 33 | 1 | 4,058 | 9 | 2 | 0 | 2 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 4:00 PM | 21 | 3 | 5 | 0 | 12 | 4 | 33 | 0 | 32 | 197 | 31 | 0 | 2 | 167 | 6 | 0 | 513 |
| 4:15 PM | 35 | 2 | 2 | 0 | 16 | 2 | 30 | 0 | 39 | 207 | 39 | 0 | 0 | 176 | 8 | 0 | 556 |
| 4:30 PM | 33 | 2 | 5 | 0 | 8 | 4 | 25 | 0 | 30 | 200 | 39 | 1 | 2 | 180 | 4 | 0 | 532 |
| 4:45 PM | 28 | 4 | 1 | 0 | 6 | 2 | 21 | 0 | 42 | 212 | 37 | 1 | 6 | 164 | 4 | 0 | 527 |
| 5:00 PM | 33 | 5 | 2 | 0 | 12 | 7 | 28 | 0 | 39 | 207 | 35 | 0 | 0 | 185 | 6 | 1 | 559 |
| 5:15 PM | 25 | 4 | 2 | 1 | 11 | 8 | 26 | 0 | 38 | 217 | 32 | 0 | 0 | 143 | 2 | 0 | 508 |
| 5:30 PM | 14 | 1 | 1 | 0 | 13 | 1 | 19 | 0 | 43 | 170 | 21 | 1 | 0 | 113 | 1 | 0 | 397 |
| 5:45 PM | 21 | 3 | 0 | 0 | 3 | 5 | 17 | 0 | 44 | 210 | 24 | 0 | 3 | 134 | 2 | 0 | 466 |
| Total Survey | 210 | 24 | 18 | 1 | 81 | 33 | 199 | 0 | 307 | 1,620 | 258 | 3 | 13 | 1,262 | 33 | 1 | 4,058 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 |
| 3 | 0 | 0 | 2 |
| 0 | 0 | 0 | 0 |
| 9 | 2 | 0 | 2 |

Peak Hour Summary
4:10 PM to 5:10 PM

| By | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  | North | South | East | West |
| Volume | 156 | 170 | 326 | 0 | 161 | 185 | 346 | 0 | 1,140 | 941 | 2,081 | 2 | 731 | 892 | 1,623 | 1 | 2,188 | 4 | 0 | 0 | 0 |
| \%HV | 1.3\% |  |  |  | 5.6\% |  |  |  | 3.0\% |  |  |  | 6.6\% |  |  |  | 4.3\% |  |  |  |  |
| PHF | 0.87 |  |  |  | 0.79 |  |  |  | 0.95 |  |  |  | 0.92 |  |  |  | 0.94 |  |  |  |  |
| ByMovement | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  |  |  |  |  |  |
|  |  |  |  |  | Total |  |  |  |  |  |  |  |  |  |
|  | L | T | R | Total |  | L | T | R | Total | L | T | R |  |  |  |  | Total | L | T | R | Total |  |  |  |  |
| Volume | 128 | 15 | 13 | 156 | 37 | 13 | 111 | 161 | 149 | 842 | 149 | 1,140 | 8 | 702 | 21 | 731 | 2,188 |  |  |  |  |
| \%HV | 1.6\% | 0.0\% | 0.0\% | 1.3\% | 0.0\% | 0.0\% | 8.1\% | 5.6\% | 4.0\% | 3.0\% | 2.0\% | 3.0\% | 0.0\% | 6.7\% | 4.8\% | 6.6\% | 4.3\% |  |  |  |  |
| PHF | 0.84 | 0.63 | 0.65 | 0.87 | 0.58 | 0.65 | 0.75 | 0.79 | 0.89 | 0.94 | 0.85 | 0.95 | 0.33 | 0.93 | 0.58 | 0.92 | 0.94 |  |  |  |  |

## Rolling Hour Summary

4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 117 | 11 | 13 | 0 | 42 | 12 | 109 | 0 | 143 | 816 | 146 | 2 | 10 | 687 | 22 | 0 | 2,128 | 2 | 1 | 0 | 0 |
| 4:15 PM | 129 | 13 | 10 | 0 | 42 | 15 | 104 | 0 | 150 | 826 | 150 | 2 | 8 | 705 | 22 | 1 | 2,174 | 6 | 0 | 0 | 0 |
| 4:30 PM | 119 | 15 | 10 | 1 | 37 | 21 | 100 | 0 | 149 | 836 | 143 | 2 | 8 | 672 | 16 | 1 | 2,126 | 6 | 1 | 0 | 0 |
| 4:45 PM | 100 | 14 | 6 | 1 | 42 | 18 | 94 | 0 | 162 | 806 | 125 | 2 | 6 | 605 | 13 | 1 | 1,991 | 8 | 1 | 0 | 2 |
| 5:00 PM | 93 | 13 | 5 | 1 | 39 | 21 | 90 | 0 | 164 | 804 | 112 | 1 | 3 | 575 | 11 | 1 | 1,930 | 7 | 1 | 0 | 2 |

Out 58
In 34


## SE Ten Eyck Rd \& Hwy 26

Tuesday, March 19, 2019
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Ten Eyck Rd |  |  |  | SouthboundSE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 10 | 1 | 11 | 15 |
| 4:05 PM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 6 | 0 | 6 | 0 | 3 | 1 | 4 | 11 |
| 4:10 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 8 | 0 | 8 | 10 |
| 4:15 PM | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 2 | 2 | 3 | 0 | 5 | 0 | 3 | 0 | 3 | 12 |
| 4:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 3 | 0 | 4 | 0 | 5 | 1 | 6 | 12 |
| 4:25 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 5 | 1 | 6 | 0 | 4 | 0 | 4 | 11 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 3 | 6 |
| 4:35 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 5 | 5 |
| 4:40 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 3 | 0 | 2 | 0 | 2 | 6 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 4 | 0 | 4 | 6 |
| 4:50 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 7 | 7 |
| 4:55 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 4 | 0 | 0 | 0 | 0 | 5 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | 5 | 0 | 1 | 0 | 1 | 6 |
| 5:05 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 5 | 0 | 5 | 7 |
| 5:10 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 4 | 0 | 4 | 0 | 4 | 8 |
| 5:15 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 2 | 0 | 2 | 4 |
| 5:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 5 | 0 | 5 | 6 |
| 5:25 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 3 |
| 5:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 4 | 0 | 3 | 0 | 3 | 7 |
| 5:35 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 4 | 0 | 4 | 6 |
| 5:40 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 2 |
| 5:45 PM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 3 | 6 |
| 5:50 PM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 4 | 0 | 4 | 7 |
| 5:55 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 3 | 0 | 5 | 0 | 5 | 8 |
| Total Survey | 4 | 0 | 0 | 4 | 1 | 0 | 9 | 10 | 10 | 53 | 5 | 68 | 0 | 91 | 3 | 94 | 176 |

Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \end{gathered}$ | Northbound SE Ten Eyck Rd |  |  |  | SouthboundSE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 12 | 0 | 12 | 0 | 21 | 2 | 23 | 36 |
| 4:15 PM | 2 | 0 | 0 | 2 | 0 | 0 | 5 | 5 | 3 | 11 | 1 | 15 | 0 | 12 | 1 | 13 | 35 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 1 | 3 | 0 | 4 | 0 | 10 | 0 | 10 | 17 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 1 | 6 | 0 | 11 | 0 | 11 | 18 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 9 | 1 | 11 | 0 | 10 | 0 | 10 | 21 |
| 5:15 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 5 | 0 | 8 | 0 | 8 | 13 |
| 5:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | 1 | 8 | 0 | 7 | 0 | 7 | 15 |
| 5:45 PM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 5 | 1 | 7 | 0 | 12 | 0 | 12 | 21 |
| Total Survey | 4 | 0 | 0 | 4 | 1 | 0 | 9 | 10 | 10 | 53 | 5 | 68 | 0 | 91 | 3 | 94 | 176 |

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Ten Eyck Rd |  |  | Southbound SE Ten Eyck Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 3 | 5 | 9 | 7 | 16 | 34 | 58 | 92 | 48 | 25 | 73 | 93 |
| PHF | 0.25 |  |  | 0.45 |  |  | 0.57 |  |  | 0.71 |  |  | 0.66 |


| By Movement | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 2 | 0 | 0 | 2 | 0 | 0 | 9 | 9 | 6 | 25 | 3 | 34 | 0 | 47 | 1 | 48 | 93 |
| PHF | 0.25 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.45 | 0.45 | 0.50 | 0.57 | 0.38 | 0.57 | 0.00 | 0.73 | 0.25 | 0.71 | 0.66 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \end{gathered}$ | Northbound SE Ten Eyck Rd |  |  |  | Southbound SE Ten Eyck Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 2 | 0 | 0 | 2 | 1 | 0 | 9 | 10 | 6 | 29 | 2 | 37 | 0 | 54 | 3 | 57 | 106 |
| 4:15 PM | 2 | 0 | 0 | 2 | 0 | 0 | 9 | 9 | 7 | 26 | 3 | 36 | 0 | 43 | 1 | 44 | 91 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 5 | 19 | 2 | 26 | 0 | 39 | 0 | 39 | 69 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 5 | 22 | 3 | 30 | 0 | 36 | 0 | 36 | 67 |
| 5:00 PM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 4 | 24 | 3 | 31 | 0 | 37 | 0 | 37 | 70 |




5-Minute Interval Summary
7:00 AM to 9:00 AM


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 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 |
| 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 |

15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | $\begin{gathered} \text { Northbound } \\ \text { SE Langensand Rd } \\ \hline \end{gathered}$ |  |  | SouthboundSE Langensand Rd |  | EastboundHwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  |
| 7:00 AM | 16 | 0 | 0 |  | 0 | 71 | 5 | 0 | 4 | 201 | 0 | 297 |
| 7:15 AM | 17 | 5 | 0 |  | 0 | 116 | 7 | 0 | 5 | 209 | 0 | 359 |
| 7:30 AM | 17 | 3 | 0 |  | 0 | 147 | 9 | 0 | 4 | 155 | 0 | 335 |
| 7:45 AM | 12 | 5 | 0 |  | 0 | 164 | 12 | 0 | 4 | 139 | 0 | 336 |
| 8:00 AM | 9 | 6 | 0 |  | 0 | 139 | 6 | 0 | 1 | 128 | 0 | 289 |
| 8:15 AM | 10 | 4 | 0 |  | 0 | 125 | 5 | 0 | 3 | 119 | 0 | 266 |
| 8:30 AM | 8 | 9 | 0 |  | 0 | 162 | 10 | 0 | 3 | 137 | 0 | 329 |
| 8:45 AM | 15 | 6 | 0 |  | 0 | 189 | 7 | 0 | 6 | 155 | 0 | 378 |
| Total Survey | 104 | 38 | 0 |  | 0 | 1,113 | 61 | 0 | 30 | 1,243 | 0 | 2,589 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 78 | 49 | 127 | 0 | 0 | 0 | 0 | 0 | 561 | 743 | 1,304 | 0 | 695 | 542 | 1,237 | 0 | 1,334 |
| \%HV | 3.8\% |  |  |  | 0.0\% |  |  |  | 13.0\% |  |  |  | 6.8\% |  |  |  | 9.2\% |
| PHF | 0.85 |  |  |  | 0.00 |  |  |  | 0.80 |  |  |  | 0.80 |  |  |  | 0.93 |
| By <br> Movement | NorthboundSE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L |  | R | Total |  |  |  | Total |  | T | R | Total | L | T |  | Total |  |
| Volume | 63 |  | 15 | 78 |  |  |  | 0 |  | 527 | 34 | 561 | 15 | 680 |  | 695 | 1,334 |
| \%HV | 3.2\% | NA | 6.7\% | 3.8\% | NA | NA | NA | 0.0\% | NA | 13.1\% | 11.8\% | 13.0\% | 20.0\% | 6.5\% | NA | 6.8\% | 9.2\% |
| PHF | 0.88 |  | 0.75 | 0.85 |  |  |  | 0.00 |  | 0.78 | 0.65 | 0.80 | 0.54 | 0.79 |  | 0.80 | 0.93 |



## Rolling Hour Summary

7:00 AM to 9:00 AM


Heavy Vehicle Summary

## All Traffic Data <br> Clay Carney <br> (503) 833-2740

Out 46
In 73


SE Langensand Rd \& Hwy 26
Wednesday, March 20, 2019
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 7:00 AM | 0 | - | 0 |  | 0 | 6 | 1 | 7 | 0 | 6 | 6 | 13 |
| 7:05 AM | 0 | 0 | 0 |  | 0 | 4 | 1 | 5 | 0 | 6 | 6 | 11 |
| 7:10 AM | 0 | 0 | 0 |  | 0 | 2 | 0 | 2 | 0 | 3 | 3 | 5 |
| 7:15 AM | 0 | 0 | 0 |  | 0 | 6 | 0 | 6 | 0 | 3 | 3 | 9 |
| 7:20 AM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 7 |
| 7:25 AM | 0 | 0 | 0 |  | 0 | 5 | 1 | 6 | 1 | 2 | 3 | 9 |
| 7:30 AM | 0 | 0 | 0 |  | 0 | 6 | 0 | 6 | 0 | 6 | 6 | 12 |
| 7:35 AM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 1 | 7 | 8 | 13 |
| 7:40 AM | 1 | 0 | 1 |  | 0 | 7 | 0 | 7 | 0 | 2 | 2 | 10 |
| 7:45 AM | 0 | 0 | 0 |  | 0 | 11 |  | 12 | 1 | 3 | 4 | 16 |
| 7:50 AM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 5 | 5 | 11 |
| 7:55 AM | 1 | 0 | 1 |  | 0 | 3 | 0 | 3 | 0 | 5 | 5 | 9 |
| 8:00 AM | 0 | 0 | 0 |  | 0 | 9 | 0 | 9 | 0 | 2 | 2 | 11 |
| 8:05 AM | , |  | 1 |  | 0 | 11 | 1 | 12 | 0 | 7 | 7 | 20 |
| 8:10 AM | 0 | 0 | 0 |  | 0 | 2 |  | 2 | 0 | 5 | 5 | 7 |
| 8:15 AM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 4 | 4 | 7 |
| 8:20 AM | 0 | 0 | 0 |  | 0 | 4 | 1 | 5 | 0 | 2 | 2 | 7 |
| 8:25 AM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 3 | 3 | 9 |
| 8:30 AM | 0 | 2 | 2 |  | 0 | 9 | 0 | 9 | 1 | 3 | 4 | 15 |
| 8:35 AM | 1 | 1 | 2 |  | 0 | 5 | 0 | 5 | 0 | 6 | 6 | 13 |
| 8:40 AM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 0 | 3 | 3 | 8 |
| 8:45 AM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 |  | 1 | 8 |
| 8:50 AM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 9 | 9 | 12 |
| 8:55 AM | 0 | 0 | 0 |  | 0 | 4 | 0 | 4 | 0 | 4 | 4 | 8 |
| Total Survey | 4 | 5 | 9 |  | 0 | 132 | 8 | 140 | 4 | 97 | 101 | 250 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 7:00 AM | 0 | 0 | 0 |  | 0 | 12 | 2 | 14 | 0 | 15 | 15 | 29 |
| 7:15 AM | 0 | 0 | 0 |  | 0 | 18 | 1 | 19 | 1 | 5 | 6 | 25 |
| 7:30 AM | 1 | 0 | 1 |  | 0 | 18 | 0 | 18 | 1 | 15 | 16 | 35 |
| 7:45 AM | 1 | 1 | 2 |  | 0 | 18 | 2 | 20 | 1 | 13 | 14 | 36 |
| 8:00 AM | 1 | 0 | 1 |  | 0 | 22 | 1 | 23 | 0 | 14 | 14 | 38 |
| 8:15 AM | 0 | 1 | 1 |  | 0 | 11 | 2 | 13 | 0 | 9 | 9 | 23 |
| 8:30 AM | 1 | 3 | 4 |  | 0 | 19 | 0 | 19 | 1 | 12 | 13 | 36 |
| 8:45 AM | 0 | 0 | 0 |  | 0 | 14 | 0 | 14 | 0 | 14 | 14 | 28 |
| Total Survey | 4 | 5 | 9 |  | 0 | 132 | 8 | 140 | 4 | 97 | 101 | 250 |

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 3 | 7 | 10 | 0 | 0 | 0 | 73 | 46 | 119 | 47 | 70 | 117 | 123 |
| PHF | 0.38 |  |  | 0.00 |  |  | 0.76 |  |  | 0.69 |  |  | 0.79 |


| By <br> Movement | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| Volume | 2 | 1 | 3 |  | 0 | 69 | 4 | 73 | 3 | 44 | 47 | 123 |
| PHF | 0.50 | 0.25 | 0.38 |  | 0.00 | 0.75 | 0.50 | 0.76 | 0.38 | 0.73 | 0.69 | 0.79 |

## Heavy Vehicle Rolling Hour Summary

7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 7:00 AM | 2 | 1 | 3 |  | 0 | 66 | 5 | 71 | 3 | 48 | 51 | 125 |
| 7:15 AM | 3 | 1 | 4 |  | 0 | 76 | 4 | 80 | 3 | 47 | 50 | 134 |
| 7:30 AM | 3 | 2 | 5 |  | 0 | 69 | 5 | 74 | 2 | 51 | 53 | 132 |
| 7:45 AM | 3 | 5 | 8 |  | 0 | 70 | 5 | 75 | 2 | 48 | 50 | 133 |
| 8:00 AM | 2 | 4 | 6 |  | 0 | 66 | 3 | 69 | 1 | 49 | 50 | 125 |

## Peak Hour Summary

All Traffic Data

## - 11 N1F

Clay Carney
(503) 833-2740

## SE Langensand Rd \& Hwy 26

7:05 AM to 8:05 AM
Wednesday, March 20, 2019

Bikes


| Approach | PHF | HV\% | Volume |
| :---: | :---: | :---: | :---: |
| EB | 0.80 | $13.0 \%$ | 561 |
| WB | 0.80 | $6.8 \%$ | 695 |
| NB | 0.85 | $3.8 \%$ | 78 |
| SB | 0.00 | $0.0 \%$ | 0 |
| Intersection | 0.93 | $9.2 \%$ | 1,334 |

Count Period: 7:00 AM to 9:00 AM


5-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes | Bikes | T | R | Bikes | L | T | Bikes |  | North | South | East | West |
| 4:00 PM | 2 | 4 | 0 | 0 | 62 | 9 | 0 | 5 | 50 | 0 | 132 | 0 | 0 | 0 | 0 |
| 4:05 PM | 1 | 2 | 0 | 0 | 69 | 6 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:10 PM | 1 | 3 | 0 | 0 | 61 | 3 | 0 | 1 | 74 | 0 | 143 | 0 | 0 | 0 | 0 |
| 4:15 PM | 6 | 1 | 0 | 0 | 76 | 5 | 0 | 1 | 50 | 0 | 139 | 0 | 0 | 0 | 0 |
| 4:20 PM | 5 | 5 | 0 | 0 | 79 | 9 | 0 | 1 | 70 | 0 | 169 | 0 | 0 | 0 | 0 |
| 4:25 PM | 6 | 0 | 1 | 0 | 58 | 8 | 0 | 1 | 49 | 0 | 122 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 3 | 0 | 0 | 75 | 12 | 0 | 1 | 56 | 0 | 147 | 0 | 0 | 0 | 0 |
| 4:35 PM | 2 | 5 | 0 | 0 | 61 | 7 | 0 | 1 | 64 | 0 | 140 | 0 | 0 | 0 | 0 |
| 4:40 PM | 0 | 1 | 0 | 0 | 59 | 1 | 0 | 1 | 55 | 0 | 117 | 0 | 0 | 0 | 0 |
| 4:45 PM | 1 | 1 | 0 | 0 | 64 | 3 | 0 | 2 | 63 | 0 | 134 | 0 | 0 | 0 | 0 |
| 4:50 PM | 6 | 5 | 0 | 0 | 62 | 6 | 0 | 0 | 54 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:55 PM | 3 | 0 | 0 | 0 | 72 | 5 | 0 | 2 | 56 | 0 | 138 | 0 | 0 | 0 | 0 |
| 5:00 PM | 1 | 5 | 0 | 0 | 62 | 10 | 0 | 1 | 55 | 0 | 134 | 0 | 0 | 0 | 0 |
| 5:05 PM | 2 | 3 | 0 | 0 | 72 | 11 | 0 | 4 | 76 | 0 | 168 | 0 | 0 | 0 | 0 |
| 5:10 PM | 2 | 3 | 0 | 0 | 58 | 14 | 0 | 1 | 65 | 0 | 143 | 0 | 0 | 0 | 0 |
| 5:15 PM | 1 | 2 | 0 | 0 | 51 | 8 | 0 | 2 | 59 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:20 PM | 2 | 4 | 0 | 0 | 78 | 7 | 0 | 2 | 43 | 0 | 136 | 0 | 0 | 0 | 0 |
| 5:25 PM | 3 | 1 | 0 | 0 | 71 | 5 | 0 | 1 | 42 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:30 PM | 2 | 2 | 0 | 0 | 67 | 7 | 0 | 3 | 38 | 0 | 119 | 0 | 0 | 0 | 0 |
| 5:35 PM | 1 | 1 | 0 | 0 | 60 | 5 | 0 | 1 | 38 | 0 | 106 | 0 | 0 | 0 | 0 |
| 5:40 PM | 0 | 4 | 0 | 0 | 49 | 7 | 0 | 0 | 34 | 0 | 94 | 0 | 0 | 0 | 0 |
| 5:45 PM | 2 | 1 | 0 | 0 | 69 | 7 | 0 | 1 | 45 | 0 | 125 | 0 | 0 | 0 | 0 |
| 5:50 PM | , | 3 | 0 | 0 | 60 | 4 | 0 | 0 | 43 | 0 | 110 | 0 | 0 | 0 | 0 |
| 5:55 PM | 4 | 1 | 0 | 0 | 65 | 8 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| Total Survey | 53 | 60 | 1 | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 | 0 | 0 | 0 | 0 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  |
| 4:00 PM | 4 | 9 | 0 |  | 0 | 192 | 18 | 0 | 9 | 176 | 0 | 408 |
| 4:15 PM | 17 | 6 | 1 |  | 0 | 213 | 22 | 0 | 3 | 169 | 0 | 430 |
| 4:30 PM | 2 | 9 | 0 |  | 0 | 195 | 20 | 0 | 3 | 175 | 0 | 404 |
| 4:45 PM | 10 | 6 | 0 |  | 0 | 198 | 14 | 0 | 4 | 173 | 0 | 405 |
| 5:00 PM | 5 | 11 | 0 |  | 0 | 192 | 35 | 0 | 6 | 196 | 0 | 445 |
| 5:15 PM | 6 | 7 | 0 |  | 0 | 200 | 20 | 0 | 5 | 144 | 0 | 382 |
| 5:30 PM | 3 | 7 | 0 |  | 0 | 176 | 19 | 0 | 4 | 110 | 0 | 319 |
| 5:45 PM | 6 | 5 | 0 |  | 0 | 194 | 19 | 0 | 4 | 140 | 0 | 368 |
| Total Survey | 53 | 60 | 1 |  | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 65 | 96 | 161 | 1 | 0 | 0 | 0 | 0 | 881 | 755 | 1,636 | 0 | 738 | 833 | 1,571 | 0 | 1,684 |
| \%HV | 3.1\% |  |  |  | 0.0\% |  |  |  | 3.3\% |  |  |  | 6.6\% |  |  |  | 4.8\% |
| PHF | 0.71 |  |  |  | 0.00 |  |  |  | 0.91 |  |  |  | 0.94 |  |  |  | 0.93 |
| By <br> Movement  <br>  SE Langensand Rd |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | Southbound <br> SE Langensand Rd |  |  |  | Eastbound <br> Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L |  | R | Total |  |  |  | Total |  | T | R | Total | L | T |  | Total |  |
| Volume | 33 |  | 32 | 65 |  |  |  | 0 |  | 801 | 80 | 881 | 16 | 722 |  | 738 | 1,684 |
| \%HV | 3.0\% | NA | 3.1\% | 3.1\% | NA | NA | NA | 0.0\% | NA | 3.4\% | 2.5\% | 3.3\% | 0.0\% | 6.8\% | NA | 6.6\% | 4.8\% |
| PHF | 0.49 |  | 0.80 | 0.71 |  |  |  | 0.00 |  | 0.93 | 0.69 | 0.91 | 0.57 | 0.93 |  | 0.94 | 0.93 |



Rolling Hour Summary
4:00 PM to 6:00 PM

| IntervalStart Time | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  | North | South | East | West |
| 4:00 PM | 33 | 30 | 1 |  | 0 | 798 | 74 | 0 | 19 | 693 | 0 | 1,647 | 0 | 0 | 0 | 0 |
| 4:15 PM | 34 | 32 | 1 |  | 0 | 798 | 91 | 0 | 16 | 713 | 0 | 1,684 | 0 | 0 | 0 | 0 |
| 4:30 PM | 23 | 33 | 0 |  | 0 | 785 | 89 | 0 | 18 | 688 | 0 | 1,636 | 0 | 0 | 0 | 0 |
| 4:45 PM | 24 | 31 | 0 |  | 0 | 766 | 88 | 0 | 19 | 623 | 0 | 1,551 | 0 | 0 | 0 | 0 |
| 5:00 PM | 20 | 30 | 0 |  | 0 | 762 | 93 | 0 | 19 | 590 | 0 | 1,514 | 0 | 0 | 0 | 0 |

SE Langensand Rd \& Hwy 26
Tuesday, March 19, 2019
4:00 PM to 6:00 PM
Out 50
In 29


Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM


Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \end{gathered}$ | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 4:00 PM | 0 | 0 | 0 |  | 0 | 13 | 0 | 13 | 0 | 23 | 23 | 36 |
| 4:15 PM | 1 | 0 | 1 |  | 0 | 12 | 1 | 13 | 0 | 13 | 13 | 27 |
| 4:30 PM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 10 | 10 | 16 |
| 4:45 PM | 0 | 0 | 0 |  | 0 | 4 | 0 | 4 | 0 | 12 | 12 | 16 |
| 5:00 PM | 0 | 0 | 0 |  | 0 | 5 | 1 | 6 | 0 | 11 | 11 | 17 |
| 5:15 PM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 9 | 9 | 12 |
| 5:30 PM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 1 | 7 | 8 | 13 |
| 5:45 PM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 | 12 | 12 | 19 |
| Total Survey | 1 | 1 | 2 |  | 0 | 53 | 3 | 56 | 1 | 97 | 98 | 156 |

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 2 | 4 | 0 | 0 | 0 | 29 | 50 | 79 | 49 | 28 | 77 | 80 |
| PHF | 0.25 |  |  | 0.00 |  |  | 0.56 |  |  | 0.82 |  |  | 0.71 |


| By <br> Movement | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| Volume | 1 | 1 | 2 |  | 0 | 27 | 2 | 29 | 0 | 49 | 49 | 80 |
| PHF | 0.25 | 0.25 | 0.25 |  | 0.00 | 0.56 | 0.25 | 0.56 | 0.00 | 0.82 | 0.82 | 0.71 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start | NorthboundSE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | R | Total | Total | T | R | Total | L | T | Total | Total |
| 4:00 PM | 1 | 1 | 2 | 0 | 33 | 2 | 35 | 0 | 58 | 58 | 95 |
| 4:15 PM | 1 | 1 | 2 | 0 | 25 | 3 | 28 | 0 | 46 | 46 | 76 |
| 4:30 PM | 0 | 1 | 1 | 0 | 16 | 2 | 18 | 0 | 42 | 42 | 61 |
| 4:45 PM | 0 | 0 | 0 | 0 | 17 | 1 | 18 | 1 | 39 | 40 | 58 |
| 5:00 PM | 0 | 0 | 0 | 0 | 20 | 1 | 21 | 1 | 39 | 40 | 61 |

## Peak Hour Summary

All Traffic Data

## $\square$ Services Inc1010110

- 11 N1F

Clay Carney
(503) 833-2740

## SE Langensand Rd \& Hwy 26

## 4:10 PM to 5:10 PM

Tuesday, March 19, 2019


| Approach | PHF | HV\% | Volume |
| :---: | :---: | :---: | :---: |
| EB | 0.91 | $3.3 \%$ | 881 |
| WB | 0.94 | $6.6 \%$ | 738 |
| NB | 0.71 | $3.1 \%$ | 65 |
| SB | 0.00 | $0.0 \%$ | 0 |
| Intersection | 0.93 | $4.8 \%$ | 1,684 |

Count Period: 4:00 PM to 6:00 PM


5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Bikes | L | R | Bikes | L |  | Bikes | T | R | Bikes |  |
| 7:00 AM |  | 0 | 0 | 6 | 0 | 1 | 25 | 0 | 68 | 0 | 0 | 100 |
| 7:05 AM |  | 0 | 0 | 2 | 0 | 0 | 25 | 0 | 54 | 0 | 0 | 81 |
| 7:10 AM |  | 0 | 0 | 4 | 0 | 1 | 24 | 0 | 80 | 0 | 0 | 109 |
| 7:15 AM |  | 0 | 0 | 2 | 0 | 2 | 32 | 0 | 71 | 0 | 0 | 107 |
| 7:20 AM |  | 0 | 0 | 2 | 0 | 2 | 51 | 0 | 63 | 0 | 0 | 118 |
| 7:25 AM |  | 0 | 0 | 4 | 0 | 1 | 31 | 0 | 62 | 0 | 0 | 98 |
| 7:30 AM |  | 0 | 0 | 1 | 0 | 2 | 46 | 0 | 62 | 1 | 0 | 112 |
| 7:35 AM |  | 0 | 0 | 4 | 0 | 0 | 43 | 0 | 49 | 0 | 0 | 96 |
| 7:40 AM |  | 0 | 0 | 4 | 0 | 3 | 54 | 0 | 45 | 0 | 0 | 106 |
| 7:45 AM |  | 0 | 0 | 4 | 0 | 0 | 54 | 0 | 44 | 0 | 0 | 102 |
| 7:50 AM |  | 0 | 0 | 0 | 0 | 2 | 53 | 0 | 57 | 0 | 0 | 112 |
| 7:55 AM |  | 0 | 0 | 2 | 0 | 2 | 58 | 0 | 36 | 0 | 0 | 98 |
| 8:00 AM |  | 0 | 0 | 3 | 0 | 1 | 52 | 0 | 31 | 0 | 0 | 87 |
| 8:05 AM |  | 0 | 0 | 2 | 0 | 3 | 44 | 0 | 40 | 0 | 0 | 89 |
| 8:10 AM |  | 0 | 1 | 1 | 0 | 0 | 42 | 0 | 50 | 0 | 0 | 94 |
| 8:15 AM |  | 0 | 0 | 0 | 0 | 1 | 46 | 0 | 32 | 0 | 0 | 79 |
| 8:20 AM |  | 0 | 0 | 1 | 0 | 2 | 38 | 0 | 46 | 0 | 0 | 87 |
| 8:25 AM |  | 0 | 0 | 0 | 0 | 3 | 39 | 0 | 42 | 0 | 0 | 84 |
| 8:30 AM |  | 0 | 0 | 2 | 0 | 0 | 61 | 0 | 42 | 0 | 0 | 105 |
| 8:35 AM |  | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 44 | 0 | 0 | 100 |
| 8:40 AM |  | 0 | 1 | 2 | 0 | 0 | 64 | 0 | 52 | 0 | 0 | 119 |
| 8:45 AM |  | 0 | 0 | 1 | 0 | 0 | 66 | 0 | 56 | 0 | 0 | 123 |
| 8:50 AM |  | 0 | 0 | 0 | 0 | 2 | 56 | 0 | 49 | 0 | 0 | 107 |
| 8:55 AM |  | 0 | 0 | 2 | 0 | 2 | 61 | 0 | 42 | 0 | 0 | 107 |
| Total Survey |  | 0 | 2 | 49 | 0 | 30 | 1,121 | 0 | 1,217 | 1 | 0 | 2,420 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 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 |
| 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 |

## 15-Minute Interval Summary

7:00 AM to 9:00 AM

| Interval Start | NorthboundSE Vista Loop Dr |  | Southbound SE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time |  | Bikes | L | R | Bikes | L | T | Bikes | T | R | Bikes |  |
| 7:00 AM |  | 0 | 0 | 12 | 0 | 2 | 74 | 0 | 202 | 0 | 0 | 290 |
| 7:15 AM |  | 0 | 0 | 8 | 0 | 5 | 114 | 0 | 196 | 0 | 0 | 323 |
| 7:30 AM |  | 0 | 0 | 9 | 0 | 5 | 143 | 0 | 156 | 1 | 0 | 314 |
| 7:45 AM |  | 0 | 0 | 6 | 0 | 4 | 165 | 0 | 137 | 0 | 0 | 312 |
| 8:00 AM |  | 0 | 1 | 6 | 0 | 4 | 138 | 0 | 121 | 0 | 0 | 270 |
| 8:15 AM |  | 0 | 0 | 1 | 0 | 6 | 123 | 0 | 120 | 0 | 0 | 250 |
| 8:30 AM |  | 0 | 1 | 4 | 0 | 0 | 181 | 0 | 138 | 0 | 0 | 324 |
| 8:45 AM |  | 0 | 0 | 3 | 0 | 4 | 183 | 0 | 147 | 0 | 0 | 337 |
| Total Survey |  | 0 | 2 | 49 | 0 | 30 | 1,121 | 0 | 1,217 | 1 | 0 | 2,420 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | Northbound SE Vista Loop Dr |  |  |  | SouthboundSE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 0 | 0 | 0 | 0 | 35 | 17 | 52 | 0 | 512 | 726 | 1,238 | 0 | 692 | 496 | 1,188 | 0 | 1,239 |
| \%HV | 0.0\% |  |  |  | 8.6\% |  |  |  | 12.5\% |  |  |  | 6.4\% |  |  |  | 9.0\% |
| PHF | 0.00 |  |  |  | 0.73 |  |  |  | 0.76 |  |  |  | 0.81 |  |  |  | 0.93 |
| By <br> Movement | NorthboundSE Vista Loop Dr |  |  |  | Southbound SE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  |  |  |  | Total | L |  | R | Total | L | T |  | Total |  | T | R | Total |  |
| Volume |  |  |  | 0 | 0 |  | 35 | 35 | 16 | 496 |  | 512 |  | 691 | 1 | 692 | 1,239 |
| \%HV | NA | NA | NA | 0.0\% | 0.0\% | NA | 8.6\% | 8.6\% | 6.3\% | 12.7\% | NA | 12.5\% | NA | 6.4\% | 0.0\% | 6.4\% | 9.0\% |
| PHF |  |  |  | 0.00 | 0.00 |  | 0.73 | 0.73 | 0.80 | 0.75 |  | 0.76 |  | 0.81 | 0.25 | 0.81 | 0.93 |



Rolling Hour Summary

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | $\begin{aligned} & \text { Northbound } \\ & \text { SE Vista Loop Dr } \end{aligned}$ |  | Southbound SE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Bikes | L | R | Bikes | L | T | Bikes | T | R | Bikes |  | North | South | East | West |
| 7:00 AM |  | 0 | 0 | 35 | 0 | 16 | 496 | 0 | 691 | 1 | 0 | 1,239 | 0 | 0 | 0 | 0 |
| 7:15 AM |  | 0 | 1 | 29 | 0 | 18 | 560 | 0 | 610 | 1 | 0 | 1,219 | 0 | 0 | 0 | 0 |
| 7:30 AM |  | 0 | 1 | 22 | 0 | 19 | 569 | 0 | 534 | 1 | 0 | 1,146 | 0 | 0 | 0 | 0 |
| 7:45 AM |  | 0 | 2 | 17 | 0 | 14 | 607 | 0 | 516 | 0 | 0 | 1,156 | 0 | 0 | 0 | 0 |
| 8:00 AM |  | 0 | 2 | 14 | 0 | 14 | 625 | 0 | 526 | 0 | 0 | 1,181 | 0 | 0 | 0 | 0 |

Heavy Vehicle Summary

Out 47
In 64

SE Vista Loop Dr \& Hwy 26
Wednesday, March 20, 2019
7:00 AM to 9:00 AM


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM


Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start | Northbound SE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| 7:00 AM |  | 0 | 0 | 1 | 1 | 0 | 12 | 12 | 12 | 0 | 12 | 25 |
| 7:15 AM |  | 0 | 0 | 0 | 0 | 0 | 15 | 15 | 6 | 0 | 6 | 21 |
| 7:30 AM |  | 0 | 0 | 2 | 2 | 1 | 21 | 22 | 14 | 0 | 14 | 38 |
| 7:45 AM |  | 0 | 0 | 0 | 0 | 0 | 15 | 15 | 12 | 0 | 12 | 27 |
| 8:00 AM |  | 0 | 0 | 2 | 2 | 2 | 21 | 23 | 14 | 0 | 14 | 39 |
| 8:15 AM |  | 0 | 0 | 0 | 0 | 2 | 13 | 15 | 8 | 0 | 8 | 23 |
| 8:30 AM |  | 0 | 1 | 0 | 1 | 0 | 23 | 23 | 15 | 0 | 15 | 39 |
| 8:45 AM |  | 0 | 0 | 0 | 0 | 1 | 14 | 15 | 13 | 0 | 13 | 28 |
| Total Survey |  | 0 | 1 | 5 | 6 | 6 | 134 | 140 | 94 | 0 | 94 | 240 |

Heavy Vehicle Peak Hour Summary
7:00 AM to 8:00 AM

| By <br> Approach | NorthboundSE Vista Loop Dr |  |  | SouthboundSE Vista Loop Dr |  |  | Eastbound <br> Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 0 | 0 | 0 | 3 | 1 | 4 | 64 | 47 | 111 | 44 | 63 | 107 | 111 |
| PHF | 0.00 |  |  | 0.38 |  |  | 0.73 |  |  | 0.79 |  |  | 0.73 |


| By <br> Movement | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| Volume |  | 0 | 0 | 3 | 3 | 1 | 63 | 64 | 44 | 0 | 44 | 111 |
| PHF |  | 0.00 | 0.00 | 0.38 | 0.38 | 0.25 | 0.75 | 0.73 | 0.79 | 0.00 | 0.79 | 0.73 |

## Heavy Vehicle Rolling Hour Summary

7:00 AM to 9:00 AM

| Interval Start <br> Time | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval <br> Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| 7:00 AM |  | 0 | 0 | 3 | 3 | 1 | 63 | 64 | 44 | 0 | 44 | 111 |
| 7:15 AM |  | 0 | 0 | 4 | 4 | 3 | 72 | 75 | 46 | 0 | 46 | 125 |
| 7:30 AM |  | 0 | 0 | 4 | 4 | 5 | 70 | 75 | 48 | 0 | 48 | 127 |
| 7:45 AM |  | 0 | 1 | 2 | 3 | 4 | 72 | 76 | 49 | 0 | 49 | 128 |
| 8:00 AM |  | 0 | 1 | 2 | 3 | 5 | 71 | 76 | 50 | 0 | 50 | 129 |




SE Vista Loop Dr \& Hwy 26
Tuesday, March 19, 2019
4:00 PM to 6:00 PM
Minute Interval Summary
4:00 PM to 6:00 PM


15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time |  | Bikes | L | R | Bikes | L | T | Bikes | T | R | Bikes |  |
| 4:00 PM |  | 0 | 1 | 5 | 0 | 8 | 179 | 0 | 177 | 0 | 0 | 370 |
| 4:15 PM |  | 0 | 0 | 6 | 0 | 10 | 204 | 0 | 165 | 0 | 0 | 385 |
| 4:30 PM |  | 0 | 0 | 3 | 0 | 9 | 196 | 2 | 185 | 0 | 0 | 393 |
| 4:45 PM |  | 0 | 0 | 2 | 1 | 7 | 193 | 0 | 176 | 0 | 0 | 378 |
| 5:00 PM |  | 0 | 0 | 4 | 0 | 10 | 194 | 0 | 181 | 0 | 0 | 389 |
| 5:15 PM |  | 0 | 0 | 4 | 0 | 3 | 191 | 0 | 124 | 0 | 0 | 322 |
| 5:30 PM |  | 0 | 0 | 5 | 0 | 5 | 194 | 0 | 107 | 0 | 0 | 311 |
| 5:45 PM |  | 0 | 0 | 3 | 0 | 4 | 209 | 0 | 133 | 0 | 0 | 349 |
| Total Survey |  | 0 | 1 | 32 | 1 | 56 | 1,560 | 2 | 1,248 | 0 | 0 | 2,897 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |

Peak Hour Summary
4:15 PM to 5:15 PM

| By <br> Approach | Northbound SE Vista Loop Dr |  |  |  | SouthboundSE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 0 | 0 | 0 | 0 | 15 | 36 | 51 | 1 | 823 | 722 | 1,545 | 2 | 707 | 787 | 1,494 | 0 | 1,545 |
| \%HV | 0.0\% |  |  |  | 13.3\% |  |  |  | 3.2\% |  |  |  | 6.6\% |  |  |  | 4.9\% |
| PHF | 0.00 |  |  |  | 0.54 |  |  |  | 0.94 |  |  |  | 0.95 |  |  |  | 0.97 |
| By <br> Movement | NorthboundSE Vista Loop Dr |  |  |  | SouthboundSE Vista Loop Dr |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  |  |  |  | Total | L |  | R | Total | L | T |  | Total |  | T | R | Total |  |
| Volume |  |  |  | 0 | 0 |  | 15 | 15 | 36 | 787 |  | 823 |  | 707 | 0 | 707 | 1,545 |
| \%HV | NA | NA | NA | 0.0\% | 0.0\% | NA | 13.3\% | 13.3\% | 0.0\% | 3.3\% | NA | 3.2\% | NA | 6.6\% | 0.0\% | 6.6\% | 4.9\% |
| PHF |  |  |  | 0.00 | 0.00 |  | 0.54 | 0.54 | 0.90 | 0.93 |  | 0.94 |  | 0.95 | 0.00 | 0.95 | 0.97 |



Rolling Hour Summary
4:00 PM to 6:00 PM


## Heavy Vehicle Summary

Out 49
In 26

## SE Vista Loop Dr \& Hwy 26



Tuesday, March 19, 2019
4:00 PM to 6:00 PM


Heavy Vehicle 5-Minute Interval Summary 4:00 PM to 6:00 PM


Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM


Heavy Vehicle Peak Hour Summary
4:15 PM to 5:15 PM

| By <br> Approach | NorthboundSE Vista Loop Dr |  |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 0 | 0 | 0 | 2 | 0 | 2 | 26 | 49 | 75 | 47 | 26 | 73 | 75 |
| PHF | 0.00 |  |  | 0.25 |  |  | 0.54 |  |  | 0.73 |  |  | 0.78 |


| By <br> Movement | NorthboundSE Vista Loop Dr |  | SouthboundSE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Total | L | R | Total | L | T | Total | T | R | Total |  |
| Volume |  | 0 | 0 | 2 | 2 | 0 | 26 | 26 | 47 | 0 | 47 | 75 |
| PHF |  | 0.00 | 0.00 | 0.25 | 0.25 | 0.00 | 0.54 | 0.54 | 0.73 | 0.00 | 0.73 | 0.78 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start | Northbound SE Vista Loop Dr | Southbound SE Vista Loop Dr |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | Total | L | R | Total | L | T | Total | T | R | Total |  |
| 4:00 PM | 0 | 1 | 4 | 5 | 2 | 30 | 32 | 50 | 0 | 50 | 87 |
| 4:15 PM | 0 | 0 | 2 | 2 | 0 | 26 | 26 | 47 | 0 | 47 | 75 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 16 | 16 | 44 | 0 | 44 | 60 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 16 | 16 | 43 | 0 | 43 | 59 |
| 5:00 PM | 0 | 0 | 0 | 0 | 0 | 16 | 16 | 37 | 0 | 37 | 53 |




5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 2 | 18 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 5 | 0 | 0 | 38 |
| 7:05 AM | 3 | 20 | 1 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 5 | 0 | 45 |
| 7:10 AM | 5 | 23 | 0 | 0 | 0 | 12 | 0 | 0 | 2 | 2 | 4 | 0 | 4 | 3 | 9 | 0 | 64 |
| 7:15 AM | 5 | 32 | 0 | 0 | 0 | 9 | 0 | 0 | 1 | 0 | 2 | 0 | 4 | 2 | 2 | 0 | 57 |
| 7:20 AM | 8 | 13 | 0 | 0 | 2 | 13 | 1 | 0 | 0 | 0 | 2 | 0 | 5 | 3 | 5 | 0 | 52 |
| 7:25 AM | 1 | 23 | 2 | 0 | 0 | 13 | 0 | 0 | 1 | 1 | 5 | 0 | 4 | 3 | 3 | 0 | 56 |
| 7:30 AM | 3 | 17 | 0 | 0 | 1 | 12 | 0 | 0 | 0 | 0 | 3 | 0 | 4 | 9 | 1 | 0 | 50 |
| 7:35 AM | 2 | 23 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 7 | 0 | 6 | 5 | 1 | 0 | 61 |
| 7:40 AM | 2 | 23 | 1 | 0 | 0 | 6 | 1 | 0 | 1 | 2 | 4 | 0 | 6 | 4 | 1 | 0 | 51 |
| 7:45 AM | 4 | 20 | 3 | 0 | 0 | 14 | 0 | 0 | 0 | 1 | 0 | 0 | 3 | 1 | 0 | 0 | 46 |
| 7:50 AM | 5 | 15 | 3 | 0 | 0 | 10 | 0 | 0 | 1 | 1 | 1 | 0 | 5 | 4 | 2 | 0 | 47 |
| 7:55 AM | 1 | 21 | 2 | 0 | 1 | 15 | 0 | 0 | 1 | 0 | 3 | 0 | 3 | 1 | 1 | 0 | 49 |
| 8:00 AM | 3 | 16 | 1 | 0 | 0 | 12 | 0 | 0 | 1 | 1 | 1 | 0 | 5 | 1 | 2 | 0 | 43 |
| 8:05 AM | 2 | 15 | 0 | 0 | 0 | 7 | 0 | 0 | 1 | 1 | 2 | 0 | 4 | 0 | 3 | 0 | 35 |
| 8:10 AM | 2 | 19 | 1 | 0 | 1 | 8 | 0 | 0 | 3 | 1 | 2 | 0 | 3 | 4 | 1 | 0 | 45 |
| 8:15 AM | 3 | 27 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 2 | 0 | 46 |
| 8:20 AM | 0 | 19 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | 34 |
| 8:25 AM | 6 | 8 | 1 | 0 | 0 | 8 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 29 |
| 8:30 AM | 3 | 27 | 2 | 0 | 0 | 10 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 2 | 5 | 0 | 53 |
| 8:35 AM | 1 | 14 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 36 |
| 8:40 AM | 0 | 19 | 1 | 0 | 0 | 15 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 3 | 1 | 0 | 42 |
| 8:45 AM | 1 | 21 | 1 | 0 | 0 | 15 | 1 | 0 | 0 | 2 | 3 | 0 | 1 | 2 | 4 | 0 | 51 |
| 8:50 AM | 0 | 21 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 3 | 2 | 0 | 40 |
| 8:55 AM | 4 | 20 | 1 | 0 | 1 | 10 | 0 | 0 | 1 | 3 | 2 | 0 | 3 | 3 | 3 | 0 | 51 |
| Total Survey | 66 | 474 | 22 | 0 | 6 | 269 | 3 | 0 | 13 | 22 | 45 | 0 | 78 | 68 | 55 | 0 | 1,121 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 0 | 1 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 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 | 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 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 3 | 1 | 0 | 0 |

## 15-Minute Interval Summary

7:00 AM to 9:00 AM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 10 | 61 | 2 | 0 | 0 | 32 | 0 | 0 | 2 | 2 | 4 | 0 | 11 | 9 | 14 | 0 | 147 |
| 7:15 AM | 14 | 68 | 2 | 0 | 2 | 35 | 1 | 0 | 2 | 1 | 9 | 0 | 13 | 8 | 10 | 0 | 165 |
| 7:30 AM | 7 | 63 | 1 | 0 | 1 | 35 | 1 | 0 | 1 | 2 | 14 | 0 | 16 | 18 | 3 | 0 | 162 |
| 7:45 AM | 10 | 56 | 8 | 0 | 1 | 39 | 0 | 0 | 2 | 2 | 4 | 0 | 11 | 6 | 3 | 0 | 142 |
| 8:00 AM | 7 | 50 | 2 | 0 | 1 | 27 | 0 | 0 | 5 | 3 | 5 | 0 | 12 | 5 | 6 | 0 | 123 |
| 8:15 AM | 9 | 54 | 2 | 0 | 0 | 26 | 0 | 0 | 0 | 2 | 2 | 0 | 3 | 7 | 4 | 0 | 109 |
| 8:30 AM | 4 | 60 | 3 | 0 | 0 | 41 | 0 | 0 | 0 | 3 | 2 | 0 | 5 | 7 | 6 | 0 | 131 |
| 8:45 AM | 5 | 62 | 2 | 0 | 1 | 34 | 1 | 0 | 1 | 7 | 5 | 0 | 7 | 8 | 9 | 0 | 142 |
| Total Survey | 66 | 474 | 22 | 0 | 6 | 269 | 3 | 0 | 13 | 22 | 45 | 0 | 78 | 68 | 55 | 0 | 1,121 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 3 | 1 | 0 | 0 |

Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 301 | 229 | 530 | 0 | 151 | 286 | 437 | 0 | 48 | 81 | 129 | 0 | 121 | 25 | 146 | 0 | 621 |
| \%HV | 5.3\% |  |  |  | 9.9\% |  |  |  | 6.3\% |  |  |  | 4.1\% |  |  |  | 6.3\% |
| PHF | 0.85 |  |  |  | 0.88 |  |  |  | 0.71 |  |  |  | 0.82 |  |  |  | 0.90 |
| By <br> Movement | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 42 | 246 | 13 | 301 | 4 | 145 | 2 | 151 | 8 | 8 | 32 | 48 | 52 | 37 | 32 | 121 | 621 |
| \%HV | 2.4\% | 5.7\% | 7.7\% | 5.3\% | 25.0\% | 9.7\% | 0.0\% | 9.9\% | 12.5\% | 0.0\% | 6.3\% | 6.3\% | 1.9\% | 0.0\% | 12.5\% | 4.1\% | 6.3\% |
| PHF | 0.58 | 0.82 | 0.41 | 0.85 | 0.33 | 0.86 | 0.50 | 0.88 | 0.67 | 0.50 | 0.53 | 0.71 | 0.81 | 0.51 | 0.50 | 0.82 | 0.90 |



Rolling Hour Summary
7:00 AM to 9:00 AM

| $\begin{aligned} & \hline \text { Interval } \\ & \text { Start } \\ & \text { Time } \end{aligned}$ | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound <br> Dubarko Rd |  |  |  | $\begin{gathered} \text { Interval } \\ \text { Total } \end{gathered}$ | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 41 | 248 | 13 | 0 | 4 | 141 | 2 | 0 | 7 | 7 | 31 | 0 | 51 | 41 | 30 | 0 | 616 | 2 | 1 | 0 | 0 |
| 7:15 AM | 38 | 237 | 13 | 0 | 5 | 136 | 2 | 0 | 10 | 8 | 32 | 0 | 52 | 37 | 22 | 0 | 592 | 3 | 0 | 0 | 0 |
| 7:30 AM | 33 | 223 | 13 | 0 | 3 | 127 | 1 | 0 | 8 | 9 | 25 | 0 | 42 | 36 | 16 | 0 | 536 | 2 | 0 | 0 | 0 |
| 7:45 AM | 30 | 220 | 15 | 0 | 2 | 133 | 0 | 0 | 7 | 10 | 13 | 0 | 31 | 25 | 19 | 0 | 505 | 1 | 0 | 0 | 0 |
| 8:00 AM | 25 | 226 | 9 | 0 | 2 | 128 | 1 | 0 | 6 | 15 | 14 | 0 | 27 | 27 | 25 | 0 | 505 | 1 | 0 | 0 | 0 |

Out 1
In 3

Hwy 211 \& Dubarko Rd
Wednesday, March 20, 2019
7:00 AM to 9:00 AM


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 7:05 AM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 7:10 AM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 3 |
| 7:15 AM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 2 |
| 7:20 AM | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 3 |
| 7:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 3 |
| 7:30 AM | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 7:35 AM | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 7:40 AM | 0 | 3 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 5 |
| 7:45 AM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 7:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:55 AM | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 8:00 AM | 0 | 6 | 0 | 6 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 8:05 AM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 4 |
| 8:10 AM | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 4 |
| 8:15 AM | 1 | 2 | 0 | 3 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 8:20 AM | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 |
| 8:25 AM | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 8:30 AM | 0 | 3 | 0 | 3 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 8:35 AM | 0 | 3 | 0 | 3 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8:40 AM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 8:45 AM | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 8:50 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8:55 AM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 3 |
| Total Survey | 2 | 31 | 1 | 34 | 1 | 31 | 0 | 32 | 1 | 1 | 2 | 4 | 3 | 3 | 4 | 10 | 80 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 6 |
| 7:15 AM | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 2 | 3 | 8 |
| 7:30 AM | 0 | 5 | 1 | 6 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 11 |
| 7:45 AM | 1 | 0 | 0 | 1 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| 8:00 AM | 0 | 8 | 0 | 8 | 0 | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | 16 |
| 8:15 AM | 1 | 6 | 0 | 7 | 0 | 4 | 0 | 4 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 12 |
| 8:30 AM | 0 | 7 | 0 | 7 | 0 | 7 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 8:45 AM | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 6 |
| Total Survey | 2 | 31 | 1 | 34 | 1 | 31 | 0 | 32 | 1 | 1 | 2 | 4 | 3 | 3 | 4 | 10 | 80 |

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | Northbound Hwy 211 |  |  | Southbound Hwy 211 |  |  | Eastbound Dubarko Rd |  |  | Westbound Dubarko Rd |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 16 | 17 | 33 | 15 | 19 | 34 | 3 | 1 | 4 | 5 | 2 | 7 | 39 |
| PHF | 0.57 |  |  | 0.63 |  |  | 0.38 |  |  | 0.42 |  |  | 0.81 |


| By Movement | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 1 | 14 | 1 | 16 | 1 | 14 | 0 | 15 | 1 | 0 | 2 | 3 | 1 | 0 | 4 | 5 | 39 |
| PHF | 0.25 | 0.58 | 0.25 | 0.57 | 0.25 | 0.58 | 0.00 | 0.63 | 0.25 | 0.00 | 0.25 | 0.38 | 0.25 | 0.00 | 0.50 | 0.42 | 0.81 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 1 | 8 | 1 | 10 | 1 | 12 | 0 | 13 | 1 | 0 | 2 | 3 | 1 | 1 | 4 | 6 | 32 |
| 7:15 AM | 1 | 14 | 1 | 16 | 1 | 16 | 0 | 17 | 1 | 0 | 1 | 2 | 3 | 1 | 3 | 7 | 42 |
| 7:30 AM | 2 | 19 | 1 | 22 | 0 | 19 | 0 | 19 | 0 | 1 | 0 | 1 | 2 | 1 | 1 | 4 | 46 |
| 7:45 AM | 2 | 21 | 0 | 23 | 0 | 22 | 0 | 22 | 0 | 1 | 0 | 1 | 2 | 1 | 0 | 3 | 49 |
| 8:00 AM | 1 | 23 | 0 | 24 | 0 | 19 | 0 | 19 | 0 | 1 | 0 | 1 | 2 | 2 | 0 | 4 | 48 |




5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 4 | 14 | 0 | 0 | 2 | 25 | 1 | 0 | 0 | 3 | 3 | 0 | 2 | 3 | 3 | 0 | 60 | 0 | 0 | 1 | 0 |
| 4:05 PM | 4 | 28 | 3 | 0 | 1 | 31 | 0 | 0 | 1 | 7 | 6 | 0 | 2 | 6 | 2 | 0 | 91 | 0 | 0 | 0 | 0 |
| 4:10 PM | 10 | 17 | 2 | 0 | 1 | 19 | 0 | 0 | 0 | 4 | 3 | 0 | 3 | 4 | 3 | 0 | 66 | 0 | 0 | 0 | 0 |
| 4:15 PM | 4 | 20 | 6 | 0 | 2 | 20 | 1 | 0 | 2 | 7 | 3 | 1 | 1 | 5 | 1 | 0 | 72 | 0 | 0 | 0 | 0 |
| 4:20 PM | 6 | 12 | 1 | 0 | 1 | 14 | 1 | 0 | 2 | 3 | 4 | 0 | 5 | 7 | 4 | 0 | 60 | 1 | 0 | 0 | 0 |
| 4:25 PM | 5 | 16 | 4 | 0 | 1 | 21 | 1 | 0 | 3 | 3 | 4 | 0 | 2 | 4 | 1 | 0 | 65 | 0 | 0 | 0 | 0 |
| 4:30 PM | 4 | 22 | 3 | 0 | 0 | 19 | 3 | 0 | 1 | 2 | 2 | 0 | 5 | 5 | 1 | 0 | 67 | 1 | 0 | 0 | 0 |
| 4:35 PM | 2 | 23 | 7 | 0 | 0 | 29 | 1 | 0 | 1 | 2 | 1 | 0 | 0 | 1 | 3 | 0 | 70 | 0 | 0 | 0 | 0 |
| 4:40 PM | 2 | 17 | 4 | 0 | 0 | 22 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 3 | 3 | 0 | 55 | 0 | 0 | 0 | 0 |
| 4:45 PM | 10 | 23 | 7 | 0 | 2 | 29 | 1 | 0 | 0 | 6 | 8 | 0 | 3 | 2 | 0 | 0 | 91 | 0 | 0 | 0 | 0 |
| 4:50 PM | 3 | 22 | 6 | 0 | 1 | 19 | 1 | 0 | 1 | 0 | 4 | 0 | 1 | 1 | 2 | 0 | 61 | 0 | 0 | 0 | 0 |
| 4:55 PM | 4 | 20 | 3 | 0 | 0 | 20 | 2 | 0 | 0 | 6 | 2 | 0 | 1 | 6 | 1 | 0 | 65 | 0 | 0 | 0 | 0 |
| 5:00 PM | 4 | 17 | 6 | 0 | 1 | 42 | 0 | 0 | 0 | 3 | 14 | 0 | 1 | 4 | 4 | 0 | 96 | 0 | 0 | 0 | 0 |
| 5:05 PM | 2 | 24 | 5 | 0 | 0 | 20 | 0 | 0 | 0 | 4 | 5 | 0 | 1 | 2 | 3 | 0 | 66 | 0 | 0 | 0 | 0 |
| 5:10 PM | 8 | 24 | 4 | 0 | 1 | 13 | 1 | 0 | 1 | 8 | 2 | 0 | 2 | 1 | 3 | 0 | 68 | 0 | 0 | 0 | 0 |
| 5:15 PM | 4 | 13 | 4 | 0 | 1 | 19 | 1 | 0 | 0 | 4 | 3 | 0 | 5 | 3 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 5:20 PM | 1 | 19 | 6 | 0 | 1 | 29 | 1 | 0 | 1 | 2 | 2 | 0 | 1 | 4 | 0 | 0 | 67 | 0 | 0 | 0 | 0 |
| 5:25 PM | 5 | 14 | 6 | 0 | 0 | 17 | 1 | 0 | 1 | 3 | 9 | 0 | 2 | 4 | 3 | 0 | 65 | 0 | 0 | 0 | 0 |
| 5:30 PM | 5 | 19 | 6 | 0 | 0 | 19 | 1 | 0 | 1 | 5 | 5 | 0 | 0 | 2 | 3 | 0 | 66 | 0 | 0 | 0 | 0 |
| 5:35 PM | 5 | 15 | 1 | 0 | 2 | 24 | 0 | 0 | 1 | 5 | 6 | 0 | 1 | 2 | 1 | 0 | 63 | 0 | 0 | 0 | 0 |
| 5:40 PM | 5 | 19 | 7 | 0 | 0 | 29 | 1 | 0 | 0 | 8 | 3 | 0 | 1 | 2 | 0 | 1 | 75 | 0 | 0 | 0 | 0 |
| 5:45 PM | 4 | 15 | 8 | 0 | 0 | 16 | 1 | 0 | 0 | 7 | 3 | 0 | 3 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 5:50 PM | 4 | 13 | 2 | 0 | 0 | 20 | 3 | 0 | 2 | 5 | 3 | 0 | 0 | 5 | 3 | 0 | 60 | 0 | 0 | 0 | 0 |
| 5:55 PM | 5 | 13 | 2 | 0 | 1 | 18 | 0 | 0 | 0 | 2 | 3 | 0 | 2 | 1 | 1 | 0 | 48 | 0 | 0 | 0 | 0 |
| Total Survey | 110 | 439 | 103 | 0 | 18 | 534 | 22 | 0 | 18 | 101 | 99 | 1 | 45 | 77 | 45 | 1 | 1,611 | 2 | 0 | 1 | 0 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interva Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 18 | 59 | 5 | 0 | 4 | 75 | 1 | 0 | 1 | 14 | 12 | 0 | 7 | 13 | 8 | 0 | 217 | 0 | 0 | 1 | 0 |
| 4:15 PM | 15 | 48 | 11 | 0 | 4 | 55 | 3 | 0 | 7 | 13 | 11 | 1 | 8 | 16 | 6 | 0 | 197 | 1 | 0 | 0 | 0 |
| 4:30 PM | 8 | 62 | 14 | 0 | 0 | 70 | 4 | 0 | 2 | 6 | 4 | 0 | 6 | 9 | 7 | 0 | 192 | 1 | 0 | 0 | 0 |
| 4:45 PM | 17 | 65 | 16 | 0 | 3 | 68 | 4 | 0 | 1 | 12 | 14 | 0 | 5 | 9 | 3 | 0 | 217 | 0 | 0 | 0 | 0 |
| 5:00 PM | 14 | 65 | 15 | 0 | 2 | 75 | 1 | 0 | 1 | 15 | 21 | 0 | 4 | 7 | 10 | 0 | 230 | 0 | 0 | 0 | 0 |
| 5:15 PM | 10 | 46 | 16 | 0 | 2 | 65 | 3 | 0 | 2 | 9 | 14 | 0 | 8 | 11 | 3 | 0 | 189 | 0 | 0 | 0 | 0 |
| 5:30 PM | 15 | 53 | 14 | 0 | 2 | 72 | 2 | 0 | 2 | 18 | 14 | 0 | 2 | 6 | 4 | 1 | 204 | 0 | 0 | 0 | 0 |
| 5:45 PM | 13 | 41 | 12 | 0 | 1 | 54 | 4 | 0 | 2 | 14 | 9 | 0 | 5 | 6 | 4 | 0 | 165 | 0 | 0 | 0 | 0 |
| Total Survey | 110 | 439 | 103 | 0 | 18 | 534 | 22 | 0 | 18 | 101 | 99 | 1 | 45 | 77 | 45 | 1 | 1,611 | 2 | 0 | 1 | 0 |

Peak Hour Summary
4:05 PM to 5:05 PM

| By <br> Approach | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 347 | 362 | 709 | 0 | 306 | 273 | 579 | 0 | 108 | 117 | 225 | 1 | 98 | 107 | 205 | 0 | 859 |
| \%HV | 2.0\% |  |  |  | 4.6\% |  |  |  | 0.9\% |  |  |  | 5.1\% |  |  |  | 3.1\% |
| PHF | 0.89 |  |  |  | 0.89 |  |  |  | 0.82 |  |  |  | 0.72 |  |  |  | 0.94 |
| By <br> Movement | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 58 | 237 | 52 | 347 | 10 | 285 | 11 | 306 | 11 | 45 | 52 | 108 | 25 | 48 | 25 | 98 | 859 |
| \%HV | 3.4\% | 1.7\% | 1.9\% | 2.0\% | 0.0\% | 4.9\% | 0.0\% | 4.6\% | 0.0\% | 0.0\% | 1.9\% | 0.9\% | 4.0\% | 2.1\% | 12.0\% | 5.1\% | 3.1\% |
| PHF | 0.73 | 0.91 | 0.72 | 0.89 | 0.63 | 0.88 | 0.55 | 0.89 | 0.39 | 0.63 | 0.65 | 0.82 | 0.52 | 0.75 | 0.78 | 0.72 | 0.94 |



Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 4:00 PM | 58 | 234 | 46 | 0 | 11 | 268 | 12 | 0 | 11 | 45 | 41 | 1 | 26 | 47 | 24 | 0 | 823 | 2 | 0 | 1 | 0 |
| 4:15 PM | 54 | 240 | 56 | 0 | 9 | 268 | 12 | 0 | 11 | 46 | 50 | 1 | 23 | 41 | 26 | 0 | 836 | 2 | 0 | 0 | 0 |
| 4:30 PM | 49 | 238 | 61 | 0 | 7 | 278 | 12 | 0 | 6 | 42 | 53 | 0 | 23 | 36 | 23 | 0 | 828 | 1 | 0 | 0 | 0 |
| 4:45 PM | 56 | 229 | 61 | 0 | 9 | 280 | 10 | 0 | 6 | 54 | 63 | 0 | 19 | 33 | 20 | 1 | 840 | 0 | 0 | 0 | 0 |
| 5:00 PM | 52 | 205 | 57 | 0 | 7 | 266 | 10 | 0 | 7 | 56 | 58 | 0 | 19 | 30 | 21 | 1 | 788 | 0 | 0 | 0 | 0 |

Out 3
In

Hwy 211 \& Dubarko Rd
Tuesday, March 19, 2019
4:00 PM to 6:00 PM


Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 7 |
| 4:05 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 4:10 PM | 2 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 4:15 PM | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 4:20 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 2 |
| 4:25 PM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 4:30 PM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 4:35 PM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 4:40 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 4:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 4:50 PM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 4:55 PM | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5:00 PM | 0 | 1 | 0 | 1 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 5:05 PM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:10 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:15 PM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:20 PM | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:25 PM | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5:30 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5:35 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:40 PM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:45 PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5:50 PM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 5:55 PM | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 4 |
| Total Survey | 3 | 9 | 2 | 14 | 0 | 23 | 0 | 23 | 0 | 0 | 3 | 3 | 3 | 1 | 3 | 7 | 47 |

Heavy Vehicle 15-Minute Interval Summary 4:00 PM to 6:00 PM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 2 | 1 | 0 | 3 | 0 | 5 | 0 | 5 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 11 |
| 4:15 PM | 0 | 1 | 0 | 1 | 0 | 6 | 0 | 6 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 2 | 9 |
| 4:30 PM | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 7 |
| 4:45 PM | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 4 |
| 5:00 PM | 0 | 2 | 0 | 2 | 0 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 5:15 PM | 1 | 2 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 5:30 PM | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5:45 PM | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 5 |
| Total Survey | 3 | 9 | 2 | 14 | 0 | 23 | 0 | 23 | 0 | 0 | 3 | 3 | 3 | 1 | 3 | 7 | 47 |

Heavy Vehicle Peak Hour Summary
4:05 PM to 5:05 PM

| By <br> Approach | Northbound Hwy 211 |  |  | Southbound Hwy 211 |  |  | Eastbound Dubarko Rd |  |  | Westbound Dubarko Rd |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 7 | 16 | 23 | 14 | 7 | 21 | 1 | 3 | 4 | 5 | 1 | 6 | 27 |
| PHF | 0.58 |  |  | 0.58 |  |  | 0.25 |  |  | 0.42 |  |  | 0.68 |


| By Movement | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 2 | 4 | 1 | 7 | 0 | 14 | 0 | 14 | 0 | 0 | 1 | 1 | 1 | 1 | 3 | 5 | 27 |
| PHF | 0.25 | 0.50 | 0.25 | 0.58 | 0.00 | 0.58 | 0.00 | 0.58 | 0.00 | 0.00 | 0.25 | 0.25 | 0.25 | 0.25 | 0.38 | 0.42 | 0.68 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound Hwy 211 |  |  |  | Southbound Hwy 211 |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 4:00 PM | 2 | 4 | 1 | 7 | 0 | 16 | 0 | 16 | 0 | 0 | 2 | 2 | 2 | 1 | 3 | 6 | 31 |
| 4:15 PM | 0 | 5 | 1 | 6 | 0 | 14 | 0 | 14 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 4 | 25 |
| 4:30 PM | 1 | 6 | 2 | 9 | 0 | 8 | 0 | 8 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 2 | 20 |
| 4:45 PM | 1 | 6 | 2 | 9 | 0 | 5 | 0 | 5 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 15 |
| 5:00 PM | 1 | 5 | 1 | 7 | 0 | 7 | 0 | 7 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 16 |



Out 35

SE Langensand Rd \& Dubarko Rd
Wednesday, March 20, 2019
7:00 AM to 9:00 AM
In 20


5-Minute Interval Summary
7:00 AM to 9:00 AM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  |
| 7:00 AM | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 6 |
| 7:05 AM | 2 | 1 | 0 | 0 | 1 | 0 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 3 | 0 | 14 |
| 7:10 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 5 |
| 7:15 AM | 0 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 8 |
| 7:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 1 | 3 | 2 | 0 | 9 |
| 7:25 AM | 0 | 0 | 0 | 0 | 2 | 2 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 11 |
| 7:30 AM | 0 | 6 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 11 |
| 7:35 AM | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 6 |
| 7:40 AM | 0 | 0 | 1 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 11 |
| 7:45 AM | 0 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 9 |
| 7:50 AM | 1 | 1 | 0 | 0 | 1 | 0 | 2 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 12 |
| 7:55 AM | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 9 |
| 8:00 AM | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 9 |
| 8:05 AM | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 10 |
| 8:10 AM | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 8:15 AM | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 8 |
| 8:20 AM | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| 8:25 AM | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 8 |
| 8:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 2 | 1 | 0 | 8 |
| 8:35 AM | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 2 | 0 | 0 | 8 |
| 8:40 AM | 1 | 1 | 0 | 0 | 0 | 3 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 9 |
| 8:45 AM | 1 | 3 | 0 | 0 | 0 | 1 | 2 | 0 | 3 | 0 | 2 | 0 | 1 | 2 | 1 | 0 | 16 |
| 8:50 AM | 1 | 4 | 1 | 0 | 0 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | 3 | 0 | 15 |
| 8:55 AM | 1 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 9 |
| Total Survey | 12 | 35 | 4 | 0 | 11 | 14 | 29 | 0 | 38 | 5 | 5 | 0 | 4 | 31 | 31 | 0 | 219 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 |
| 0 | 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 | 1 | 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 |
| 1 | 0 | 1 | 0 |

15-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 3 | 2 | 0 | 0 | 2 | 1 | 4 | 0 | 2 | 1 | 0 | 0 | 0 | 5 | 5 | 0 | 25 | 0 | 0 | 0 | 0 |
| 7:15 AM | 0 | 2 | 1 | 0 | 2 | 3 | 4 | 0 | 6 | 0 | 0 | 0 | 1 | 4 | 5 | 0 | 28 | 0 | 0 | 0 | 0 |
| 7:30 AM | 1 | 8 | 1 | 0 | 2 | 1 | 6 | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 3 | 0 | 28 | 0 | 0 | 0 | 0 |
| 7:45 AM | 1 | 6 | 0 | 0 | 3 | 0 | 3 | 0 | 8 | 0 | 0 | 0 | 0 | 1 | 8 | 0 | 30 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 5 | 0 | 0 | 1 | 2 | 2 | 0 | 5 | 0 | 0 | 0 | 0 | 5 | 2 | 0 | 22 | 1 | 0 | 0 | 0 |
| 8:15 AM | 2 | 2 | 0 | 0 | 0 | 2 | 3 | 0 | 7 | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 21 | 0 | 0 | 1 | 0 |
| 8:30 AM | 2 | 1 | 0 | 0 | 1 | 3 | 2 | 0 | 4 | 3 | 1 | 0 | 2 | 5 | 1 | 0 | 25 | 0 | 0 | 0 | 0 |
| 8:45 AM | 3 | 9 | 2 | 0 | 0 | 2 | 5 | 0 | 6 | 0 | 2 | 0 | 1 | 5 | 5 | 0 | 40 | 0 | 0 | 0 | 0 |
| Total Survey | 12 | 35 | 4 | 0 | 11 | 14 | 29 | 0 | 38 | 5 | 5 | 0 | 4 | 31 | 31 | 0 | 219 | 1 | 0 | 1 | 0 |

Peak Hour Summary
7:05 AM to 8:05 AM


## Rolling Hour Summary

7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes | L | T | R | Bikes |  | North | South | East | West |
| 7:00 AM | 5 | 18 | 2 | 0 | 9 | 5 | 17 | 0 | 16 | 1 | 1 | 0 | 1 | 15 | 21 | 0 | 111 | 0 | 0 | 0 | 0 |
| 7:15 AM | 2 | 21 | 2 | 0 | 8 | 6 | 15 | 0 | 19 | 0 | 1 | 0 | 1 | 15 | 18 | 0 | 108 | 1 | 0 | 0 | 0 |
| 7:30 AM | 4 | 21 | 1 | 0 | 6 | 5 | 14 | 0 | 20 | 1 | 2 | 0 | 0 | 12 | 15 | 0 | 101 | 1 | 0 | 1 | 0 |
| 7:45 AM | 5 | 14 | 0 | 0 | 5 | 7 | 10 | 0 | 24 | 4 | 2 | 0 | 2 | 12 | 13 | 0 | 98 | 1 | 0 | 1 | 0 |
| 8:00 AM | 7 | 17 | 2 | 0 | 2 | 9 | 12 | 0 | 22 | 4 | 4 | 0 | 3 | 16 | 10 | 0 | 108 | 1 | 0 | 1 | 0 |

Out 9
In 1

SE Langensand Rd \& Dubarko Rd
Wednesday, March 20, 2019
7:00 AM to 9:00 AM


Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

| Interval Start Time | NorthboundSE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:05 AM | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 7:10 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 7:15 AM | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 2 |
| 7:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |  | 0 | 0 | 1 | 0 | 1 | 2 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7:35 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:45 AM | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 7:50 AM | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 4 |
| 7:55 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:00 AM | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 |
| 8:05 AM | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8:10 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:20 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:25 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 8:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 8:35 AM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 3 |
| 8:40 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:50 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:55 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Survey | 2 | 1 | 1 | 4 | 2 | 1 | 5 | 8 | 3 | 0 | 0 | 3 | 2 | 4 | 3 | 9 | 24 |

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | Northbound SE Langensand Rd |  |  |  | Southbound SE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 1 | 0 | 0 | 1 | 0 | 0 |  | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 |
| 7:15 AM | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 5 |
| 7:30 AM | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 7:45 AM | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 3 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 6 |
| 8:00 AM | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 4 |
| 8:15 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 8:30 AM | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 2 | 0 | 0 | 2 | 4 |
| 8:45 AM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 2 | 1 | 1 | 4 | 2 | 1 | 5 | 8 | 3 | 0 | 0 | 3 | 2 | 4 | 3 | 9 | 24 |

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

| By <br> Approach | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Dubarko Rd |  |  | Westbound Dubarko Rd |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 1 | 3 | 7 | 4 | 11 | 1 | 9 | 10 | 7 | 3 | 10 | 17 |
| PHF | 0.25 |  |  | 0.58 |  |  | 0.25 |  |  | 0.58 |  |  | 0.71 |


| By <br> Movement | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| Volume | 1 | 0 | 1 | 2 | 2 | 1 | 4 | 7 | 1 | 0 | 0 | 1 | 0 | 4 | 3 | 7 | 17 |
| PHF | 0.25 | 0.00 | 0.25 | 0.25 | 0.25 | 0.25 | 0.50 | 0.58 | 0.25 | 0.00 | 0.00 | 0.25 | 0.00 | 0.33 | 0.38 | 0.58 | 0.71 |

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

| Interval Start <br> Time | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Dubarko Rd |  |  |  | Westbound Dubarko Rd |  |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | T | R | Total | L | T | R | Total | L | T | R | Total | L | T | R | Total |  |
| 7:00 AM | 1 | 0 | 1 | 2 | 2 | 0 | 4 | 6 | 1 | 0 | 0 | 1 | 0 | 4 | 2 | 6 | 15 |
| 7:15 AM | 0 | 1 | 1 | 2 | 2 | 1 | 4 | 7 | 1 | 0 | 0 | 1 | 0 | 4 | 2 | 6 | 16 |
| 7:30 AM | 0 | 1 | 0 | 1 | 2 | 1 | 3 | 6 | 2 | 0 | 0 | 2 | 0 | 1 | 2 | 3 | 12 |
| 7:45 AM | 1 | 1 | 0 | 2 | 2 | 1 | 2 | 5 | 3 | 0 | 0 | 3 | 2 | 1 | 2 | 5 | 15 |
| 8:00 AM | 1 | 1 | 0 | 2 | 0 | 1 | 1 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 1 | 3 | 9 |




5-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \\ \hline \end{gathered}$ | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes | Bikes | T | R | Bikes | L | T | Bikes |  | North | South | East | West |
| 4:00 PM | 2 | 4 | 0 | 0 | 62 | 9 | 0 | 5 | 50 | 0 | 132 | 0 | 0 | 0 | 0 |
| 4:05 PM | 1 | 2 | 0 | 0 | 69 | 6 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:10 PM | 1 | 3 | 0 | 0 | 61 | 3 | 0 | 1 | 74 | 0 | 143 | 0 | 0 | 0 | 0 |
| 4:15 PM | 6 | 1 | 0 | 0 | 76 | 5 | 0 | 1 | 50 | 0 | 139 | 0 | 0 | 0 | 0 |
| 4:20 PM | 5 | 5 | 0 | 0 | 79 | 9 | 0 | 1 | 70 | 0 | 169 | 0 | 0 | 0 | 0 |
| 4:25 PM | 6 | 0 | 1 | 0 | 58 | 8 | 0 | 1 | 49 | 0 | 122 | 0 | 0 | 0 | 0 |
| 4:30 PM | 0 | 3 | 0 | 0 | 75 | 12 | 0 | 1 | 56 | 0 | 147 | 0 | 0 | 0 | 0 |
| 4:35 PM | 2 | 5 | 0 | 0 | 61 | 7 | 0 | 1 | 64 | 0 | 140 | 0 | 0 | 0 | 0 |
| 4:40 PM | 0 | 1 | 0 | 0 | 59 | 1 | 0 | 1 | 55 | 0 | 117 | 0 | 0 | 0 | 0 |
| 4:45 PM | 1 | 1 | 0 | 0 | 64 | 3 | 0 | 2 | 63 | 0 | 134 | 0 | 0 | 0 | 0 |
| 4:50 PM | 6 | 5 | 0 | 0 | 62 | 6 | 0 | 0 | 54 | 0 | 133 | 0 | 0 | 0 | 0 |
| 4:55 PM | 3 | 0 | 0 | 0 | 72 | 5 | 0 | 2 | 56 | 0 | 138 | 0 | 0 | 0 | 0 |
| 5:00 PM | 1 | 5 | 0 | 0 | 62 | 10 | 0 | 1 | 55 | 0 | 134 | 0 | 0 | 0 | 0 |
| 5:05 PM | 2 | 3 | 0 | 0 | 72 | 11 | 0 | 4 | 76 | 0 | 168 | 0 | 0 | 0 | 0 |
| 5:10 PM | 2 | 3 | 0 | 0 | 58 | 14 | 0 | 1 | 65 | 0 | 143 | 0 | 0 | 0 | 0 |
| 5:15 PM | 1 | 2 | 0 | 0 | 51 | 8 | 0 | 2 | 59 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:20 PM | 2 | 4 | 0 | 0 | 78 | 7 | 0 | 2 | 43 | 0 | 136 | 0 | 0 | 0 | 0 |
| 5:25 PM | 3 | 1 | 0 | 0 | 71 | 5 | 0 | 1 | 42 | 0 | 123 | 0 | 0 | 0 | 0 |
| 5:30 PM | 2 | 2 | 0 | 0 | 67 | 7 | 0 | 3 | 38 | 0 | 119 | 0 | 0 | 0 | 0 |
| 5:35 PM | 1 | 1 | 0 | 0 | 60 | 5 | 0 | 1 | 38 | 0 | 106 | 0 | 0 | 0 | 0 |
| 5:40 PM | 0 | 4 | 0 | 0 | 49 | 7 | 0 | 0 | 34 | 0 | 94 | 0 | 0 | 0 | 0 |
| 5:45 PM | 2 | 1 | 0 | 0 | 69 | 7 | 0 | 1 | 45 | 0 | 125 | 0 | 0 | 0 | 0 |
| 5:50 PM | , | 3 | 0 | 0 | 60 | 4 | 0 | 0 | 43 | 0 | 110 | 0 | 0 | 0 | 0 |
| 5:55 PM | 4 | 1 | 0 | 0 | 65 | 8 | 0 | 3 | 52 | 0 | 133 | 0 | 0 | 0 | 0 |
| Total Survey | 53 | 60 | 1 | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 | 0 | 0 | 0 | 0 |

15-Minute Interval Summary
4:00 PM to 6:00 PM

| Interval Start Time | Northbound SE Langensand Rd |  |  | Southbound SE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  |
| 4:00 PM | 4 | 9 | 0 |  | 0 | 192 | 18 | 0 | 9 | 176 | 0 | 408 |
| 4:15 PM | 17 | 6 | 1 |  | 0 | 213 | 22 | 0 | 3 | 169 | 0 | 430 |
| 4:30 PM | 2 | 9 | 0 |  | 0 | 195 | 20 | 0 | 3 | 175 | 0 | 404 |
| 4:45 PM | 10 | 6 | 0 |  | 0 | 198 | 14 | 0 | 4 | 173 | 0 | 405 |
| 5:00 PM | 5 | 11 | 0 |  | 0 | 192 | 35 | 0 | 6 | 196 | 0 | 445 |
| 5:15 PM | 6 | 7 | 0 |  | 0 | 200 | 20 | 0 | 5 | 144 | 0 | 382 |
| 5:30 PM | 3 | 7 | 0 |  | 0 | 176 | 19 | 0 | 4 | 110 | 0 | 319 |
| 5:45 PM | 6 | 5 | 0 |  | 0 | 194 | 19 | 0 | 4 | 140 | 0 | 368 |
| Total Survey | 53 | 60 | 1 |  | 0 | 1,560 | 167 | 0 | 38 | 1,283 | 0 | 3,161 |


| Pedestrians <br> Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: |
| North | South | East | West |
| 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 |

Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  |  | SouthboundSE Langensand Rd |  |  |  | Eastbound Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes | In | Out | Total | Bikes |  |
| Volume | 65 | 96 | 161 | 1 | 0 | 0 | 0 | 0 | 881 | 755 | 1,636 | 0 | 738 | 833 | 1,571 | 0 | 1,684 |
| \%HV | 3.1\% |  |  |  | 0.0\% |  |  |  | 3.3\% |  |  |  | 6.6\% |  |  |  | 4.8\% |
| PHF | 0.71 |  |  |  | 0.00 |  |  |  | 0.91 |  |  |  | 0.94 |  |  |  | 0.93 |
| By <br> Movement  <br>  SE Langensand Rd |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | Southbound <br> SE Langensand Rd |  |  |  | Eastbound <br> Hwy 26 |  |  |  | Westbound Hwy 26 |  |  |  | Total |
|  | L |  | R | Total |  |  |  | Total |  | T | R | Total | L | T |  | Total |  |
| Volume | 33 |  | 32 | 65 |  |  |  | 0 |  | 801 | 80 | 881 | 16 | 722 |  | 738 | 1,684 |
| \%HV | 3.0\% | NA | 3.1\% | 3.1\% | NA | NA | NA | 0.0\% | NA | 3.4\% | 2.5\% | 3.3\% | 0.0\% | 6.8\% | NA | 6.6\% | 4.8\% |
| PHF | 0.49 |  | 0.80 | 0.71 |  |  |  | 0.00 |  | 0.93 | 0.69 | 0.91 | 0.57 | 0.93 |  | 0.94 | 0.93 |



Rolling Hour Summary
4:00 PM to 6:00 PM

| IntervalStart Time | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total | Pedestrians Crosswalk |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Bikes |  | Bikes | T | R | Bikes | L | T | Bikes |  | North | South | East | West |
| 4:00 PM | 33 | 30 | 1 |  | 0 | 798 | 74 | 0 | 19 | 693 | 0 | 1,647 | 0 | 0 | 0 | 0 |
| 4:15 PM | 34 | 32 | 1 |  | 0 | 798 | 91 | 0 | 16 | 713 | 0 | 1,684 | 0 | 0 | 0 | 0 |
| 4:30 PM | 23 | 33 | 0 |  | 0 | 785 | 89 | 0 | 18 | 688 | 0 | 1,636 | 0 | 0 | 0 | 0 |
| 4:45 PM | 24 | 31 | 0 |  | 0 | 766 | 88 | 0 | 19 | 623 | 0 | 1,551 | 0 | 0 | 0 | 0 |
| 5:00 PM | 20 | 30 | 0 |  | 0 | 762 | 93 | 0 | 19 | 590 | 0 | 1,514 | 0 | 0 | 0 | 0 |

SE Langensand Rd \& Hwy 26
Tuesday, March 19, 2019
4:00 PM to 6:00 PM
Out 50
In 29


Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM


Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

| $\begin{gathered} \hline \text { Interval } \\ \text { Start } \\ \text { Time } \end{gathered}$ | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| 4:00 PM | 0 | 0 | 0 |  | 0 | 13 | 0 | 13 | 0 | 23 | 23 | 36 |
| 4:15 PM | 1 | 0 | 1 |  | 0 | 12 | 1 | 13 | 0 | 13 | 13 | 27 |
| 4:30 PM | 0 | 1 | 1 |  | 0 | 4 | 1 | 5 | 0 | 10 | 10 | 16 |
| 4:45 PM | 0 | 0 | 0 |  | 0 | 4 | 0 | 4 | 0 | 12 | 12 | 16 |
| 5:00 PM | 0 | 0 | 0 |  | 0 | 5 | 1 | 6 | 0 | 11 | 11 | 17 |
| 5:15 PM | 0 | 0 | 0 |  | 0 | 3 | 0 | 3 | 0 | 9 | 9 | 12 |
| 5:30 PM | 0 | 0 | 0 |  | 0 | 5 | 0 | 5 | 1 | 7 | 8 | 13 |
| 5:45 PM | 0 | 0 | 0 |  | 0 | 7 | 0 | 7 | 0 | 12 | 12 | 19 |
| Total Survey | 1 | 1 | 2 |  | 0 | 53 | 3 | 56 | 1 | 97 | 98 | 156 |

Heavy Vehicle Peak Hour Summary
4:10 PM to 5:10 PM

| By <br> Approach | Northbound SE Langensand Rd |  |  | SouthboundSE Langensand Rd |  |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | In | Out | Total | In | Out | Total | In | Out | Total | In | Out | Total |  |
| Volume | 2 | 2 | 4 | 0 | 0 | 0 | 29 | 50 | 79 | 49 | 28 | 77 | 80 |
| PHF | 0.25 |  |  | 0.00 |  |  | 0.56 |  |  | 0.82 |  |  | 0.71 |


| By <br> Movement | NorthboundSE Langensand Rd |  |  | SouthboundSE Langensand Rd |  | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Total |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | L | R | Total |  | Total | T | R | Total | L | T | Total |  |
| Volume | 1 | 1 | 2 |  | 0 | 27 | 2 | 29 | 0 | 49 | 49 | 80 |
| PHF | 0.25 | 0.25 | 0.25 |  | 0.00 | 0.56 | 0.25 | 0.56 | 0.00 | 0.82 | 0.82 | 0.71 |

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

| Interval Start | NorthboundSE Langensand Rd |  |  | Southbound SE Langensand Rd | Eastbound Hwy 26 |  |  | Westbound Hwy 26 |  |  | Interval |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Time | L | R | Total | Total | T | R | Total | L | T | Total | Total |
| 4:00 PM | 1 | 1 | 2 | 0 | 33 | 2 | 35 | 0 | 58 | 58 | 95 |
| 4:15 PM | 1 | 1 | 2 | 0 | 25 | 3 | 28 | 0 | 46 | 46 | 76 |
| 4:30 PM | 0 | 1 | 1 | 0 | 16 | 2 | 18 | 0 | 42 | 42 | 61 |
| 4:45 PM | 0 | 0 | 0 | 0 | 17 | 1 | 18 | 1 | 39 | 40 | 58 |
| 5:00 PM | 0 | 0 | 0 | 0 | 20 | 1 | 21 | 1 | 39 | 40 | 61 |

## Peak Hour Summary

All Traffic Data

## $\square$ Services Inc1010110

- 11 N1F

Clay Carney
(503) 833-2740

## SE Langensand Rd \& Hwy 26

## 4:10 PM to 5:10 PM

Tuesday, March 19, 2019


| Approach | PHF | HV\% | Volume |
| :---: | :---: | :---: | :---: |
| EB | 0.91 | $3.3 \%$ | 881 |
| WB | 0.94 | $6.6 \%$ | 738 |
| NB | 0.71 | $3.1 \%$ | 65 |
| SB | 0.00 | $0.0 \%$ | 0 |
| Intersection | 0.93 | $4.8 \%$ | 1,684 |

Count Period: 4:00 PM to 6:00 PM

| Location: | US26; MP 46.38; MT. HOOD HIGHWAY NO. 26; 0.30 mile east of Camp Creek Rd <br> (USFS 28) | Site Name: | Rhododendron (03-006) |
| :--- | :--- | ---: | ---: |

HISTORICAL TRAFFIC DATA

|  |  | Percent of AADT |  |  |  |  |  |
| :---: | ---: | ---: | ---: | ---: | ---: | ---: | :---: |
| Year | AADT | Max <br> Day | Max <br> Hour | 10TH <br> Hour | 20TH <br> Hour | 30TH <br> Hour |  |
| 2008 | 8162 | 233 | 22.9 | 20.1 | 19.1 | 18.2 |  |
| 2009 | 8737 | 197 | 22.3 | 19.6 | 18.4 | 17.8 |  |
| 2010 | 8714 | 207 | 21.6 | 19.8 | 18.9 | 18.5 |  |
| 2011 | 8330 | 214 | 24.7 | 20.0 | 18.6 | 18.1 |  |
| 2012 | 8480 | 227 | 24.0 | 21.0 | 20.2 | 19.4 |  |
| 2013 | 8527 | 213 | 23.4 | 21.1 | 20.3 | 19.1 |  |
| 2014 | 8652 | 216 | 23.2 | 21.1 | 20.3 | 19.2 |  |
| 2015 | 8861 | 242 | 21.4 | 20.3 | 19.4 | 18.7 |  |
| 2016 | 10071 | 208 | 22.9 | 19.6 | 18.8 | 17.9 |  |
| 2017 | 10223 | 200 | 19.9 | 19.1 | 18.1 | 17.5 |  |



2017 TRAFFIC DATA

|  | Average <br> Weekday <br> Traffic | Percent <br> of AADT | Average <br> Daily <br> Traffic | Percent <br> of AADT |
| :--- | ---: | ---: | ---: | ---: |
| January | 6744 | 66 | 9080 | 89 |
| February | 6533 | 64 | 9496 | 93 |
| March | 6763 | 66 | 9337 | 91 |
| April | 6166 | 60 | 8675 | 85 |
| May | 7675 | 75 | 9598 | 94 |
| June | 8568 | 84 | 10695 | 105 |
| July | 11291 | 110 | 13874 | 136 |
| August | 11738 | 115 | 13623 | 133 |
| September | 11300 | 111 | 12734 | 125 |
| October | 6589 | 64 | 8087 | 79 |
| November | 5493 | 54 | 7313 | 72 |
| December | 8753 | 86 | 10161 | 99 |

For Vehicle Classification data near your project, please go to the following web page: https://www.oregon.gov/ODOT/Data /Documents/TVT 2017.xlsx

| Location: | OR35; MP 57.79; MT. HOOD HIGHWAY NO. 26; 0.02 mile east of Warm Springs <br> Highway No. 53 (US26) | Site Name: | Mt. Hood Meadows (03-007) |
| :--- | :--- | ---: | ---: |
|  | Installed: | September, 1995 |  |

HISTORICAL TRAFFIC DATA

|  |  | Percent of AADT |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | AADT | Max <br> Day | Max <br> Hour | $\mathbf{1 0 T H}$ <br> Hour | 20TH <br> Hour | 30TH <br> Hour |  |
| 2008 | 1854 | 398 | 56.8 | 44.2 | 39.9 | 36.1 |  |
| 2009 | 2130 | $* * *$ | $* * *$ | $* * *$ | $* * *$ | $* * *$ |  |
| 2010 | 2145 | 374 | 49.2 | 39.5 | 34.8 | 33.2 |  |
| 2011 | 1976 | 476 | 79.2 | 49.1 | 45.0 | 39.1 |  |
| 2012 | 2023 | 452 | 65.4 | 43.4 | 40.3 | 37.7 |  |
| 2013 | 1868 | 427 | 68.1 | 48.7 | 42.0 | 37.1 |  |
| 2014 | 1908 | 400 | 60.0 | 41.9 | 37.4 | 33.6 |  |
| 2015 | 1931 | 393 | 50.4 | 38.6 | 34.4 | 32.6 |  |
| 2016 | 2455 | 366 | 55.9 | 38.3 | 33.1 | 31.2 |  |
| 2017 | 2565 | 340 | 52.1 | 37.7 | 32.5 | 31.3 |  |



2017 TRAFFIC DATA

|  | Average <br> Weekday <br> Traffic | Percent <br> of AADT | Average <br> Daily <br> Traffic | Percent <br> of AADT |
| :--- | ---: | ---: | ---: | ---: |
| January | 2449 | 95 | 3616 | 141 |
| February | 1978 | 77 | 3362 | 131 |
| March | 1781 | 69 | 2833 | 110 |
| April | 1116 | 44 | 2050 | 80 |
| May | 1202 | 47 | 1609 | 63 |
| June | 1794 | 70 | 2070 | 81 |
| July | 2405 | 94 | 2837 | 111 |
| August | 2302 | 90 | 2614 | 102 |
| September | 3956 | 154 | 3993 | 156 |
| October | 1387 | 54 | 1614 | 63 |
| November | 768 | 30 | 1156 | 45 |
| December | 2499 | 97 | 2966 | 116 |

For Vehicle Classification data near your project, please go to the following web page:
https://www.oregon.gov/ODOT/Data /Documents/TVT_2017.xlsx

| HWY | MP | DIR | HS | Location | 2014 | 2015 | 2016 | 2036 | RSQ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 026 | 22.72 | 1 |  | 0.02 mile northwest of S.E. 362nd Drive, west city limits of Sandy |  | 29500 |  | 41400 | MODEL |
| 026 | 23.85 | 1 |  | 0.02 mile west of Bluff Road |  | 30100 |  | 42600 | MODEL |
| 026 | 23.89 | 1 |  | 0.02 mile east of Bluff Road |  | 15100 |  | 21600 | MODEL |
| 026 | 24.02 | 1 |  | 0.02 mile west of Beers Avenue |  | 15100 |  | 21600 | MODEL |
| 026 | 24.35 | 1 |  | 0.05 mile west of Eagle Creek-Sandy Highway (OR211) |  | 14800 |  | 21600 | MODEL |
| 026 | 24.42 | 1 |  | 0.02 mile east of Eagle Creek-Sandy Highway (OR211) |  | 12000 |  | 17100 | MODEL |
| 026 | 24.59 | 1 |  | 0.02 mile west of Ten Eyck Road |  | 11200 |  | 16000 | MODEL |
| 026 | 23.89 | 2 | W | 0.02 mile east of Bluff Road |  | 15200 |  | 21300 | MODEL |
| 026 | 24.04 | 2 | W | 0.02 mile west of Beers Avenue |  | 15200 |  | 21300 | MODEL |
| 026 | 24.36 | 2 | W | 0.05 mile west of Eagle Creek-Sandy Highway (OR211) |  | 14500 |  | 20700 | MODEL |
| 026 | 24.40 | 2 | W | 0.02 mile east of Eagle Creek-Sandy Highway (OR211) |  | 12100 |  | 16900 | MODEL |
| 026 | 24.61 | 2 | W | 0.02 mile west of Ten Eyck Road |  | 11700 |  | 16400 | MODEL |
| 026 | 25.10 | 1 |  | 0.02 mile west of Langensand Road |  | 18000 |  | 25400 | MODEL |
| 026 | 25.66 | 1 |  | 0.10 mile east of Vista Loop Drive |  | 19700 |  | 27600 | MODEL |




| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \％ | 性 |  | ＊ | 个个 | F＇ |  | \＄ |  |  | \＄ |  |
| Traffic Volume（veh／h） | 57 | 770 | 37 |  | 998 | 10 | 134 | 11 | 3 | 15 | 4 | 145 |
| Future Volume（veh／h） | 57 | 770 | 37 | 4 | 998 | 10 | 134 | 11 | 3 | 15 | 4 | 145 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate，veh／h | 61 | 819 | 39 | 4 | 1062 | 11 | 143 | 12 | 3 | 16 | 4 | 154 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh，\％ | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap，veh／h | 75 | 1693 | 81 | 8 | 1692 | 755 | 326 | 25 | 6 | 55 | 29 | 396 |
| Arrive On Green | 0.05 | 0.58 | 0.58 | 0.01 | 0.53 | 0.53 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Sat Flow，veh／h | 1511 | 2929 | 139 | 1589 | 3169 | 1414 | 884 | 84 | 19 | 75 | 95 | 1303 |
| Grp Volume（v），veh／h | 61 | 421 | 437 | 4 | 1062 | 11 | 158 | 0 | 0 | 174 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1511 | 1507 | 1561 | 1589 | 1585 | 1414 | 986 | 0 | 0 | 1472 | 0 | 0 |
| Q Serve（g＿s），s | 4.8 | 19.7 | 19.7 | 0.3 | 28.2 | 0.4 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 4.8 | 19.7 | 19.7 | 0.3 | 28.2 | 0.4 | 19.0 | 0.0 | 0.0 | 11.2 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.09 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.89 |
| Lane Grp Cap（c），veh／h | 75 | 871 | 903 | 8 | 1692 | 755 | 357 | 0 | 0 | 480 | 0 | 0 |
| V／C Ratio（X） | 0.82 | 0.48 | 0.48 | 0.48 | 0.63 | 0.01 | 0.44 | 0.00 | 0.00 | 0.36 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 146 | 871 | 903 | 73 | 1692 | 755 | 357 | 0 | 0 | 480 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 56.5 | 14.8 | 14.8 | 59.5 | 19.6 | 13.1 | 36.7 | 0.0 | 0.0 | 32.9 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 18.7 | 1.9 | 1.9 | 38.0 | 1.8 | 0.0 | 3.9 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 2.2 | 7.1 | 7.4 | 0.2 | 10.7 | 0.2 | 4.4 | 0.0 | 0.0 | 4.1 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 75.2 | 16.7 | 16.7 | 97.5 | 21.4 | 13.2 | 40.6 | 0.0 | 0.0 | 33.4 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol，veh／h |  | 919 |  |  | 1077 |  |  | 158 |  |  | 174 |  |
| Approach Delay，s／veh |  | 20.6 |  |  | 21.6 |  |  | 40.6 |  |  | 33.4 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration（G＋Y＋Rc），s | 5.1 | 73.9 | 41.0 | 10.4 | 68.6 | 41.0 |
| Change Period（Y＋Rc），s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.5 | 64.5 | 36.5 | 11.6 | 58.4 | 36.5 |
| Max Q Clear Time（g＿c＋11），s | 2.3 | 21.7 | 21.0 | 6.8 | 30.2 | 13.2 |
| Green Ext Time（p＿c），s | 0.0 | 7.1 | 0.8 | 0.0 | 9.6 | 1.1 |

Intersection Summary

| HCM 6th Ctrl Delay | 23.4 |
| :--- | ---: |
| HCM 6th LOS | C |





| Major/Minor | Major1 |  |  |  | Minor2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Conflicting Flow All | 982 | 0 |  | 0 | 1412 | 491 |
| Stage 1 | - | - |  | - | 982 | - |
| Stage 2 | - | - |  | - | 430 | - |
| Critical Hdwy | 4.36 | - |  | - | 6.98 | 7.08 |
| Critical Hdwy Stg 1 | - | - |  | - | 5.98 | - |
| Critical Hdwy Stg 2 | - | - |  | - | 5.98 | - |
| Follow-up Hdwy | 2.33 | - |  | - | 3.59 | 3.39 |
| Pot Cap-1 Maneuver | 636 | - | - | - | 121 | 505 |
| Stage 1 | - | - | - | - | 308 | - |
| Stage 2 | - | - | - | - | 604 | - |
| Platoon blocked, \% |  | - | - | - |  |  |
| Mov Cap-1 Maneuver | 636 | - | - | - | 118 | 505 |
| Mov Cap-2 Maneuver | - | - | - | - | 118 | - |
| Stage 1 | - | - | - | - | 300 | - |
| Stage 2 | - | - | - | - | 604 | - |
|  |  |  |  |  |  |  |
| Approach | SE |  | NW |  | SW |  |
| HCM Control Delay, s | 0.2 |  | 0 |  | 12.7 |  |
| HCM LOS |  |  |  |  | B |  |
|  |  |  |  |  |  |  |
| Minor Lane/Major Mvmt |  | NWT NWR |  | SEL | SETSWLn1 |  |
| Capacity (veh/h) |  | - | - | 636 | - | 505 |
| HCM Lane V/C Ratio |  | - | - | 0.027 | - | 0.076 |
| HCM Control Delay (s) |  | - | - | 10.8 | - | 12.7 |
| HCM Lane LOS |  | - | - | B | - | B |
| HCM 95th \%tile Q(veh) |  | - | - | 0.1 | - | 0.2 |




| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5.5 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{7}$ | $\uparrow$ |  |  | * |  |  | * |  |  | * |  |
| Traffic Vol, veh/h | 18 | 1 | 1 | 1 | 15 | 22 | 4 | 20 | 2 | 9 | 5 | 16 |
| Future Vol, veh/h | 18 | 1 | 1 | 1 | 15 | 22 | 4 | 20 | 2 | 9 | 5 | 16 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| Heavy Vehicles, \% | 5 | 5 | 5 | 18 | 18 | 18 | 8 | 8 | 8 | 23 | 23 | 23 |
| Mvmt Flow | 20 | 1 | 1 | 1 | 17 | 25 | 4 | 22 | 2 | 10 | 6 | 18 |



HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/08/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 性 |  | \% | 性 | F |  | \$ |  |  | \$ |  |
| Traffic Volume (veh/h) | 152 | 1130 | 152 | 8 | 1022 | 21 | 131 | 15 | 13 | 38 | 13 | 113 |
| Future Volume (veh/h) | 152 | 1130 | 152 | 8 | 1022 | 21 | 131 | 15 | 13 | 38 | 13 | 113 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate, veh/h | 160 | 1189 | 160 | 8 | 1076 | 22 | 138 | 16 | 14 | 40 | 14 | 119 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, \% | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap, veh/h | 186 | 1765 | 237 | 15 | 1605 | 698 | 285 | 32 | 24 | 108 | 50 | 267 |
| Arrive On Green | 0.11 | 0.62 | 0.62 | 0.01 | 0.51 | 0.51 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |
| Sat Flow, veh/h | 1628 | 2869 | 385 | 1576 | 3143 | 1368 | 876 | 123 | 91 | 270 | 191 | 1016 |
| Grp Volume(v), veh/h | 160 | 671 | 678 | 8 | 1076 | 22 | 168 | 0 | 0 | 173 | 0 | 0 |
| Grp Sat Flow(s),veh/h/n | 1628 | 1624 | 1630 | 1576 | 1572 | 1368 | 1090 | 0 | 0 | 1477 | 0 | 0 |
| Q Serve(g_s), s | 11.6 | 32.5 | 32.9 | 0.6 | 30.6 | 1.0 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 11.6 | 32.5 | 32.9 | 0.6 | 30.6 | 1.0 | 18.1 | 0.0 | 0.0 | 11.3 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.24 | 1.00 |  | 1.00 | 0.82 |  | 0.08 | 0.23 |  | 0.69 |
| Lane Grp Cap(c), veh/h | 186 | 999 | 1003 | 15 | 1605 | 698 | 341 | 0 | 0 | 425 | 0 | 0 |
| V/C Ratio(X) | 0.86 | 0.67 | 0.68 | 0.52 | 0.67 | 0.03 | 0.49 | 0.00 | 0.00 | 0.41 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 264 | 999 | 1003 | 67 | 1605 | 698 | 341 | 0 | 0 | 425 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 52.2 | 15.1 | 15.2 | 59.1 | 21.8 | 14.6 | 39.9 | 0.0 | 0.0 | 36.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 17.6 | 3.6 | 3.7 | 24.7 | 2.2 | 0.1 | 5.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 5.7 | 12.6 | 12.8 | 0.3 | 11.7 | 0.3 | 4.9 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay (d),s/veh | 69.8 | 18.7 | 18.9 | 83.8 | 24.1 | 14.7 | 44.9 | 0.0 | 0.0 | 37.5 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | D | A | A |
| Approach Vol, veh/h |  | 1509 |  |  | 1106 |  |  | 168 |  |  | 173 |  |
| Approach Delay, s/veh |  | 24.2 |  |  | 24.3 |  |  | 44.9 |  |  | 37.5 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | D |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration $(G+Y+R c)$, s | 5.7 | 78.3 | 36.0 | 18.2 | 65.8 | 36.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 69.9 | 31.5 | 19.5 | 55.5 | 31.5 |
| Max Q Clear Time (g_c+11), s | 2.6 | 34.9 | 20.1 | 13.6 | 32.6 | 13.3 |
| Green Ext Time (p_c), s | 0.0 | 13.4 | 0.7 | 0.2 | 9.0 | 1.0 |

Intersection Summary

| HCM 6th Ctrl Delay | 26.2 |
| :--- | ---: |
| HCM 6th LOS | C |


| Intersection |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh 1.6 |  |  |  |  |  |  |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | 44 | T | ${ }^{*}$ | 44 | ${ }^{*}$ | 「 |
| Traffic Vol, veh/h | 1085 | 82 | 16 | 1043 | 34 | 33 |
| Future Vol, veh/h | 1085 | 82 | 16 | 1043 | 34 | 33 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 160 | 215 | - | 120 | 0 |
| Veh in Median Storage, | \# 0 | - | - | 0 | 0 | - |
| Grade, \% | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, \% | 3 | 3 | 7 | 7 | 3 | 3 |
| Mvmt Flow | 1142 | 86 | 17 | 1098 | 36 | 35 |



| Intersection |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Int Delay, s/veh | 0.3 |  |  |  |  |  |
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | 1 | 4. | 个 |  |  |  |
| Traffic Vol, veh/h | 37 | 1070 | 1027 | 0 | 0 | 15 |
| Future Vol, veh/h | 37 | 1070 | 1027 | 0 | 0 | 15 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 1 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 220 | - | - | - | 0 | - |
| Veh in Median Storage, \# | - | 0 | 0 | - | 0 | - |
| Grade, \% | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, \% | 3 | 3 | 7 | 7 | 13 | 13 |
| Mvmt Flow | 38 | 1103 | 1059 | 0 | 0 | 15 |


| Major/Minor | Major1 |  |  | Minor2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Conflicting Flow All | 1060 | 0 | 0 | 1688 | 532 |
| Stage 1 | - | - | - | 1060 | - |
| Stage 2 | - | - | - | 628 | - |
| Critical Hdwy | 4.16 | - | - | 7.06 | 7.16 |
| Critical Hdwy Stg 1 | - | - | - | 6.06 | - |
| Critical Hdwy Stg 2 | - | - | - | 6.06 | - |
| Follow-up Hdwy | 2.23 | - | - | 3.63 | 3.43 |
| Pot Cap-1 Maneuver | 647 | - | - | 75 | 464 |
| Stage 1 | - | - | - | 271 | - |
| Stage 2 | - | - | - | 465 | - |
| Platoon blocked, \% |  | - | - |  |  |
| Mov Cap-1 Maneuver | 646 | - | - | 70 | 463 |
| Mov Cap-2 Maneuver | - | - | - | 70 | - |
| Stage 1 | - | - | - | 255 | - |
| Stage 2 | - | - | - | 465 | - |
|  |  |  |  |  |  |
| Approach | SE |  |  | SW |  |
| HCM Control Delay, s | 0.4 |  |  | 13 |  |
| HCM LOS |  |  |  | B |  |
|  |  |  |  |  |  |
| Minor Lane/Major Mvmt |  | NWT NWR | SEL SETSWLn1 |  |  |
| Capacity (veh/h) |  | - | 646 |  | 463 |
| HCM Lane V/C Ratio |  | - | 0.059 | - | 0.033 |
| HCM Control Delay (s) |  | - | 10.9 | - | 13 |
| HCM Lane LOS |  | - | B | - | B |
| HCM 95th \%tile Q(veh) |  | - | 0.2 |  | 0.1 |




| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5.2 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{*}$ | $\uparrow$ |  |  | \& |  |  | $\uparrow$ |  |  | \& |  |
| Traffic Vol, veh/h | 23 | 23 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 23 | 27 | 28 |
| Future Vol, veh/h | 23 | 23 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 23 | 27 | 28 |
| Conflicting Peds, \#/hr | 2 | 0 | 1 | 3 | 0 | 4 | 1 | 0 | 3 | 4 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, \% | 2 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 3 | 3 | 3 |
| Mvmt Flow | 25 | 25 | 5 | 2 | 7 | 8 | 4 | 11 | 1 | 25 | 30 | 31 |



## Trip Generation Calculation Worksheet

Land Use Description: Multi-Family Housing (Low-Rise)
ITE Land Use Code: 220
Independent Variable: Dwelling Units
Quantity: 147 Dwelling Units

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.46$ trips per dwelling unit
Directional Distribution: 23\% Entering 77\% Exiting

PM Peak Hour of Adjacent Street Traffic
$\begin{array}{lcc}\text { Trip Rate: } \quad 0.56 \text { trips per dwelling unit } & \\ \text { Directional Distribution: } & 63 \% \text { Entering } & 37 \% \text { Exiting }\end{array}$
Total Weekday Traffic
Trip Rate: $\quad 7.32$ trips per dwelling unit
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

147 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 16 | 52 | 68 |
| PM Peak Hour | 52 | 30 | 82 |
| Weekday | 538 | 538 | 1076 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 4 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

| Trip Rate: 0.74 trips per dwelling unit |  |
| :--- | :---: | :--- |
| Directional Distribution: $\quad 25 \%$ Entering |  |
|  | $75 \%$ Exiting |

PM Peak Hour of Adjacent Street Traffic

| Trip Rate: | 0.99 trips per dwelling unit |  |
| :--- | :---: | ---: |
| Directional Distribution: | $63 \%$ Entering | $37 \%$ Exiting |
|  |  |  |
| Total Weekday Traffic |  |  |
| Trip Rate: | 9.44 trips per dwelling unit |  |
| Directional Distribution: | $50 \%$ Entering | $50 \%$ Exiting |

## Site Trip Generation Calculations

4 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 1 | 2 | 3 |
| PM Peak Hour | 3 | 1 | 4 |
| Weekday | 19 | 19 | 38 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 46 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

| Trip Rate: 0.74 trips per dwelling unit |  |
| :--- | :---: | :--- |
| Directional Distribution: $\quad 25 \%$ Entering |  |
|  | $75 \%$ Exiting |

PM Peak Hour of Adjacent Street Traffic

| Trip Rate: | 0.99 trips per dwelling unit |  |
| :--- | :---: | ---: |
| Directional Distribution: | $63 \%$ Entering | $37 \%$ Exiting |
|  |  |  |
| Total Weekday Traffic |  |  |
| Trip Rate: | 9.44 trips per dwelling unit |  |
| Directional Distribution: | $50 \%$ Entering | $50 \%$ Exiting |

## Site Trip Generation Calculations

46 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 9 | 25 | 34 |
| PM Peak Hour | 29 | 17 | 46 |
| Weekday | 217 | 217 | 434 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 50 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

$\begin{array}{lcl}\text { Trip Rate: } 0.74 \text { trips per dwelling unit } \\ \text { Directional Distribution: } \quad 25 \% \text { Entering } & \\ & 75 \% \text { Exiting }\end{array}$

PM Peak Hour of Adjacent Street Traffic
$\begin{array}{lcc}\text { Trip Rate: } \quad 0.99 \text { trips per dwelling unit } & \\ \text { Directional Distribution: } & 63 \% \text { Entering } & 37 \% \text { Exiting }\end{array}$
Total Weekday Traffic
Trip Rate: $\quad 9.44$ trips per dwelling unit
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

50 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 9 | 28 | 37 |
| PM Peak Hour | 32 | 18 | 50 |
| Weekday | 236 | 236 | 472 |

## Trip Generation Calculation Worksheet

Land Use Description: Fast-Food Restaurant without Drive-Through ITE Land Use Code: 933
Independent Variable: Gross Floor Area
Quantity: 5.000 Thousand Square Feet

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 25.10$ trips per ksf
Directional Distribution: 51\% Entering 49\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 28.34$ trips per ksf
Directional Distribution: 52\% Entering 48\% Exiting

Total Weekday Traffic
$\begin{array}{lcc}\text { Trip Rate: } 346.23 \text { trips per ksf } & \\ \text { Directional Distribution: } & 50 \% \text { Entering } & 50 \% \text { Exiting }\end{array}$

## Site Trip Generation Calculations

5.0 ksf Fast-Food Restaurant w/o Drive Thru

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 64 | 62 | 126 |
| PM Peak Hour | 74 | 68 | 142 |
| Weekday | 866 | 866 | 1732 |

## Trip Generation Calculation Worksheet

Land Use Description: Day Care Center<br>ITE Land Use Code: 565<br>Independent Variable: Gross Floor Area<br>Quantity: 5.00 Thousand Square Feet

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 11.00$ trips per ksf
Directional Distribution: 54\% Entering 46\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 11.12$ trips per ksf
Directional Distribution: 49\% Entering 51\% Exiting

## Total Weekday Traffic

Trip Rate:
47.62 trips per ksf

Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

5.00 ksf Day Care Center

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 30 | 25 | 55 |
| PM Peak Hour | 27 | 29 | 56 |
| Weekday | 119 | 119 | 238 |

## Trip Generation Calculation Worksheet

Land Use Description: Supermarket
ITE Land Use Code: 850
Independent Variable: Gross Floor Area
Quantity: 18.433 Thousand Square Feet

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 3.82$ trips per ksf
Directional Distribution: 58\% Entering 42\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 9.24$ trips per ksf
Directional Distribution: 50\% Entering 50\% Exiting

Total Weekday Traffic
Trip Rate: $\quad 106.78$ trips per ksf
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

18.433 ksf Supermarket

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 41 | 29 | 70 |
| PM Peak Hour | 85 | 85 | 170 |
| Weekday | 984 | 984 | 1968 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 6 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

| Trip Rate: 0.74 trips per dwelling unit |  |
| :--- | :---: | :--- |
| Directional Distribution: $\quad 25 \%$ Entering |  |
|  | $75 \%$ Exiting |

PM Peak Hour of Adjacent Street Traffic

| Trip Rate: $\quad 0.99$ trips per dwelling unit |  |  |
| :--- | :---: | :---: |
| Directional Distribution: | $63 \%$ Entering | $37 \%$ Exiting |

Total Weekday Traffic
Trip Rate: $\quad 9.44$ trips per dwelling unit Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

6 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 1 | 3 | 4 |
| PM Peak Hour | 4 | 2 | 6 |
| Weekday | 28 | 28 | 56 |

## Trip Generation Calculation Worksheet

Land Use Description: Single-Family Detached Housing
ITE Land Use Code: 210
Independent Variable: Dwelling Units
Quantity: 14 Dwelling Units

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

| Trip Rate: 0.74 trips per dwelling unit |  |
| :--- | :---: | :--- |
| Directional Distribution: $\quad 25 \%$ Entering |  |
|  | $75 \%$ Exiting |

PM Peak Hour of Adjacent Street Traffic

| Trip Rate: | 0.99 trips per dwelling unit |  |
| :--- | :---: | ---: |
| Directional Distribution: | $63 \%$ Entering | $37 \%$ Exiting |
|  |  |  |
| Total Weekday Traffic |  |  |
| Trip Rate: | 9.44 trips per dwelling unit |  |
| Directional Distribution: | $50 \%$ Entering | $50 \%$ Exiting |

## Site Trip Generation Calculations

14 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 3 | 7 | 10 |
| PM Peak Hour | 9 | 5 | 14 |
| Weekday | 66 | 66 | 132 |

## Trip Generation Calculation Worksheet

Land Use Description: Multi-Family Housing (Low-Rise)
ITE Land Use Code: 220
Independent Variable: Dwelling Units
Quantity: 130 Dwelling Units

## Summary of ITE Trip Generation Data

AM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.46$ trips per dwelling unit
Directional Distribution: 23\% Entering 77\% Exiting

PM Peak Hour of Adjacent Street Traffic
$\begin{array}{lcc}\text { Trip Rate: } \quad 0.56 \text { trips per dwelling unit } & \\ \text { Directional Distribution: } & 63 \% \text { Entering } & 37 \% \text { Exiting }\end{array}$
Total Weekday Traffic
Trip Rate: $\quad 7.32$ trips per dwelling unit
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

130 Dwelling Units

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 14 | 46 | 60 |
| PM Peak Hour | 46 | 27 | 73 |
| Weekday | 476 | 476 | 952 |

## Trip Generation Calculation Worksheet

Land Use Description: Supermarket
ITE Land Use Code: 850
Independent Variable: Gross Floor Area
Quantity: 29.300 Thousand Square Feet

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

Trip Rate: $\quad 3.82$ trips per ksf
Directional Distribution: 58\% Entering 42\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 9.24$ trips per ksf
Directional Distribution: 50\% Entering 50\% Exiting

Total Weekday Traffic
Trip Rate: $\quad 106.78$ trips per ksf
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

29.300 ksf Supermarket

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 65 | 47 | 112 |
| PM Peak Hour | 136 | 135 | 271 |
| Weekday | 1564 | 1564 | 3128 |

# Trip Generation Calculation Worksheet 

Land Use Description: Public Park
ITE Land Use Code: 411
Independent Variable: Acres
Quantity: 1.43 Acres

## Summary of ITE Trip Generation Data

## AM Peak Hour of Adjacent Street Traffic

Trip Rate: $\quad 0.02$ trips per acre
Directional Distribution: 58\% Entering 42\% Exiting

PM Peak Hour of Adjacent Street Traffic
Trip Rate: $\quad 0.11$ trips per acre
Directional Distribution: 50\% Entering 50\% Exiting

Total Weekday Traffic
Trip Rate: $\quad 0.78$ trips per acre
Directional Distribution: 50\% Entering 50\% Exiting

## Site Trip Generation Calculations

1.43 Acre Park

|  | Entering | Exiting | Total |
| :--- | :---: | :---: | :---: |
| AM Peak Hour | 0 | 0 | 0 |
| PM Peak Hour | 0 | 0 | 0 |
| Weekday | 1 | 1 | 2 |



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 个t |  | \% | 性 | F |  | \$ |  |  | \$ |  |
| Traffic Volume (veh/h) | 59 | 822 | 38 | 4 | 1104 | 10 | 139 | 11 | 3 | 16 | , | 151 |
| Future Volume (veh/h) | 59 | 822 | 38 | 4 | 1104 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate, veh/h | 63 | 874 | 40 | 4 | 1174 | 11 | 148 | 12 | 3 | 17 | 4 | 161 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, \% | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap, veh/h | 77 | 1697 | 78 | 8 | 1687 | 752 | 321 | 24 | 5 | 56 | 28 | 399 |
| Arrive On Green | 0.05 | 0.58 | 0.58 | 0.01 | 0.53 | 0.53 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Sat Flow, veh/h | 1511 | 2935 | 134 | 1589 | 3169 | 1414 | 867 | 79 | 18 | 77 | 94 | 1311 |
| Grp Volume(v), veh/h | 63 | 449 | 465 | 4 | 1174 | 11 | 163 | 0 | 0 | 182 | 0 | 0 |
| Grp Sat Flow(s),veh/h/n | 1511 | 1507 | 1562 | 1589 | 1585 | 1414 | 964 | 0 | 0 | 1482 | 0 | 0 |
| Q Serve(g_s), s | 5.0 | 21.5 | 21.5 | 0.3 | 33.0 | 0.4 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 5.0 | 21.5 | 21.5 | 0.3 | 33.0 | 0.4 | 20.2 | 0.0 | 0.0 | 11.8 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.09 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.88 |
| Lane Grp Cap(c), veh/h | 77 | 871 | 903 | 8 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 0.52 | 0.52 | 0.48 | 0.70 | 0.01 | 0.47 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 145 | 871 | 903 | 68 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 56.4 | 15.2 | 15.2 | 59.5 | 20.9 | 13.2 | 37.3 | 0.0 | 0.0 | 33.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 18.2 | 2.2 | 2.1 | 38.0 | 2.4 | 0.0 | 4.4 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 2.3 | 7.8 | 8.1 | 0.2 | 12.6 | 0.2 | 4.6 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay (d),s/veh | 74.6 | 17.4 | 17.3 | 97.5 | 23.3 | 13.3 | 41.6 | 0.0 | 0.0 | 33.6 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol, veh/h |  | 977 |  |  | 1189 |  |  | 163 |  |  | 182 |  |
| Approach Delay, s/veh |  | 21.0 |  |  | 23.4 |  |  | 41.6 |  |  | 33.6 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration (G+Y+Rc), s | 5.1 | 73.9 | 41.0 | 10.6 | 68.4 | 41.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 64.9 | 36.5 | 11.5 | 58.5 | 36.5 |
| Max Q Clear Time (g_c+11), s | 2.3 | 23.5 | 22.2 | 7.0 | 35.0 | 13.8 |
| Green Ext Time (p_c), s | 0.0 | 7.7 | 0.8 | 0.0 | 10.1 | 1.1 |

Intersection Summary
HCM 6th Ctrl Delay 24.4
HCM 6th LOS



| Intersection |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Int Delay, s/veh | 0.7 |  |  |  |  |  |
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | 4 | 4 | 个 |  |  |  |
| Traffic Vol, veh/h | 28 | 785 | 996 | 1 | 0 | 69 |
| Future Vol, veh/h | 28 | 785 | 996 | 1 | 0 | 69 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 220 | - | - | - | 0 | - |
| Veh in Median Storage, \# | - | 0 | 0 | - | 0 | - |
| Grade, \% | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, \% | 13 | 13 | 6 | 6 | 9 | 9 |
| Mvmt Flow | 30 | 835 | 1060 | 1 | 0 | 73 |


| Major/Minor | Major1 |  |  | Minor2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Conflicting Flow All | 1061 | 0 | 0 | 1539 | 531 |
| Stage 1 | - | - | - | 1061 | - |
| Stage 2 | - | - | - | 478 | - |
| Critical Hdwy | 4.36 | - | - | 6.98 | 7.08 |
| Critical Hdwy Stg 1 | - | - | - | 5.98 | - |
| Critical Hdwy Stg 2 | - | - | - | 5.98 | - |
| Follow-up Hdwy | 2.33 | - | - | 3.59 | 3.39 |
| Pot Cap-1 Maneuver | 591 | - | - | 99 | 475 |
| Stage 1 | - | - | - | 279 | - |
| Stage 2 | - | - | - | 570 | - |
| Platoon blocked, \% |  | - | - |  |  |
| Mov Cap-1 Maneuver | 591 | - | - | 94 | 475 |
| Mov Cap-2 Maneuver | - | - | - | 94 | - |
| Stage 1 | - | - | - | 265 | - |
| Stage 2 | - | - | - | 570 | - |
|  |  |  |  |  |  |
| Approach | SE |  |  | SW |  |
| HCM Control Delay, s | 0.4 |  |  | 14 |  |
| HCM LOS |  |  |  | B |  |
|  |  |  |  |  |  |
| Minor Lane/Major Mvmt |  | NWT NWR | SEL | SETSWLn1 |  |
| Capacity (veh/h) |  | - | 591 | - | 475 |
| HCM Lane V/C Ratio |  | - | 0.05 | - | 0.155 |
| HCM Control Delay (s) |  | - | 11.4 | - | 14 |
| HCM Lane LOS |  | - | B | - | B |
| HCM 95th \%tile Q(veh) |  | - | 0.2 | - | 0.5 |






HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/08/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | ${ }^{4}$ | 个 ${ }_{\text {a }}$ |  | ＊ | 个4 | 「 |  | ¢ |  |  | \＄ |  |
| Traffic Volume（veh／h） | 158 | 1244 | 158 |  | 1105 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Future Volume（veh／h） | 158 | 1244 | 158 | 8 | 1105 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate，veh／h | 166 | 1309 | 166 | 8 | 1163 | 23 | 143 | 17 | 15 | 42 | 15 | 124 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh，\％ | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap，veh／h | 192 | 1780 | 224 | 15 | 1594 | 694 | 279 | 33 | 24 | 109 | 51 | 267 |
| Arrive On Green | 0.12 | 0.62 | 0.62 | 0.01 | 0.51 | 0.51 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |
| Sat Flow，veh／h | 1628 | 2893 | 364 | 1576 | 3143 | 1368 | 857 | 124 | 92 | 273 | 194 | 1017 |
| Grp Volume（v），veh／h | 166 | 731 | 744 | 8 | 1163 | 23 | 175 | 0 | 0 | 181 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1628 | 1624 | 1634 | 1576 | 1572 | 1368 | 1073 | 0 | 0 | 1484 | 0 | 0 |
| Q Serve（g＿s），s | 12.0 | 37.8 | 38.6 | 0.6 | 34.7 | 1.0 | 7.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 12.0 | 37.8 | 38.6 | 0.6 | 34.7 | 1.0 | 19.3 | 0.0 | 0.0 | 11.9 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.22 | 1.00 |  | 1.00 | 0.82 |  | 0.09 | 0.23 |  | 0.69 |
| Lane Grp Cap（c），veh／h | 192 | 999 | 1005 | 15 | 1594 | 694 | 336 | 0 | 0 | 426 | 0 | 0 |
| V／C Ratio（X） | 0.87 | 0.73 | 0.74 | 0.52 | 0.73 | 0.03 | 0.52 | 0.00 | 0.00 | 0.42 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 251 | 999 | 1005 | 67 | 1594 | 694 | 336 | 0 | 0 | 426 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 52.0 | 16.2 | 16.3 | 59.1 | 23.1 | 14.8 | 40.4 | 0.0 | 0.0 | 37.1 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 21.1 | 4.7 | 4.9 | 24.7 | 3.0 | 0.1 | 5.7 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 6.1 | 14.8 | 15.3 | 0.3 | 13.4 | 0.3 | 5.2 | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 73.1 | 20.9 | 21.2 | 83.8 | 26.1 | 14.9 | 46.1 | 0.0 | 0.0 | 37.8 | 0.0 | 0.0 |
| LnGrp LOS | E | C | C | F | C | B | D | A | A | D | A | A |
| Approach Vol，veh／h |  | 1641 |  |  | 1194 |  |  | 175 |  |  | 181 |  |
| Approach Delay，s／veh |  | 26.3 |  |  | 26.3 |  |  | 46.1 |  |  | 37.8 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | D |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration（G＋Y＋Rc），s | 5.7 | 78.3 | 36.0 | 18.6 | 65.4 | 36.0 |
| Change Period（Y＋Rc），s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.1 | 69.9 | 31.5 | 18.5 | 56.5 | 31.5 |
| Max Q Clear Time（g＿c＋11），s | 2.6 | 40.6 | 21.3 | 14.0 | 36.7 | 13.9 |
| Green Ext Time（p＿c），s | 0.0 | 14.2 | 0.7 | 0.2 | 9.2 | 1.0 |

Intersection Summary

| HCM 6th Ctrl Delay | 28.0 |
| :--- | ---: |
| HCM 6th LOS | C |




| Intersection |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Int Delay, s/veh | 0.6 |  |  |  |  |  |
| Movement | SEL | SET | NWT | NWR | SWL | SWR |
| Lane Configurations | 4 | 4 | 个 |  |  |  |
| Traffic Vol, veh/h | 72 | 1150 | 1089 | 0 | 0 | 37 |
| Future Vol, veh/h | 72 | 1150 | 1089 | 0 | 0 | 37 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 1 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 220 | - | - | - | 0 | - |
| Veh in Median Storage, \# | - | 0 | 0 | - | 0 | - |
| Grade, \% | - | 0 | 0 | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, \% | 3 | 3 | 7 | 7 | 13 | 13 |
| Mvmt Flow | 74 | 1186 | 1123 | 0 | 0 | 38 |


| Major/Minor | Major1 | Major2 |  |  | Minor2 |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | :---: |
| Conflicting Flow All | 1124 | 0 | - | 0 | 1865 | 564 |  |
| Stage 1 | - | - | - | -1124 | - |  |  |
| Stage 2 | - | - | - | - | 741 | - |  |
| Critical Hdwy | 4.16 | - | - | - | 7.06 | 7.16 |  |
| Critical Hdwy Stg 1 | - | - | - | - | 6.06 | - |  |
| Critical Hdwy Stg 2 | - | - | - | - | 6.06 | - |  |
| Follow-up Hdwy | 2.23 | - | - | - | 3.63 | 3.43 |  |
| Pot Cap-1 Maneuver | 611 | - | - | - | 57 | 442 |  |
| $\quad$ Stage 1 | - | - | - | - | 250 | - |  |
| Stage 2 | - | - | - | - | 404 | - |  |
| Platoon blocked, \% |  | - | - | - |  |  |  |
| Mov Cap-1 Maneuver | 610 | - | - | - | 50 | 441 |  |
| Mov Cap-2 Maneuver | - | - | - | - | 50 | - |  |
| Stage 1 | - | - | - | - | 220 | - |  |
| Stage 2 | - | - | - | - | 404 | - |  |


| Approach | SE | NW | SW |
| :--- | ---: | ---: | ---: |
| HCM Control Delay, s | 0.7 | 0 | 13.9 |
| HCM LOS |  |  | B |


| Minor Lane/Major Mvmt | NWT | NWR | SEL | SETSWLn1 |
| :--- | ---: | ---: | ---: | ---: |
| Capacity (veh/h) | - | - | 610 | - |
| HCM Lane V/C Ratio | - | - | 0.122 | -0.086 |
| HCM Control Delay (s) | - | - | 11.7 | -13.9 |
| HCM Lane LOS | - | - | B | - |
| HCM 95th \%tile Q(veh) | - | - | 0.4 | - |




| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{*}$ | $\uparrow$ |  |  | \& |  |  | $\uparrow$ |  |  | \& |  |
| Traffic Vol, veh/h | 24 | 24 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 24 | 28 | 29 |
| Future Vol, veh/h | 24 | 24 | 5 | 2 | 6 | 7 | 4 | 10 | 1 | 24 | 28 | 29 |
| Conflicting Peds, \#/hr | 2 | 0 | 1 | 3 | 0 | 4 | 1 | 0 | 3 | 4 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, \% | 2 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 3 | 3 | 3 |
| Mvmt Flow | 26 | 26 | 5 | 2 | 7 | 8 | 4 | 11 | 1 | 26 | 31 | 32 |




| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 个t |  | \% | 性 | F |  | \$ |  |  | \$ |  |
| Traffic Volume (veh/h) | 59 | 732 | 38 | 4 | 1070 | 10 | 139 | 11 | 3 | 16 | , | 151 |
| Future Volume (veh/h) | 59 | 732 | 38 | 4 | 1070 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate, veh/h | 63 | 779 | 40 | 4 | 1138 | 11 | 148 | 12 | 3 | 17 | 4 | 161 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, \% | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap, veh/h | 77 | 1686 | 87 | 8 | 1687 | 752 | 321 | 24 | 5 | 56 | 28 | 399 |
| Arrive On Green | 0.05 | 0.58 | 0.58 | 0.01 | 0.53 | 0.53 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Sat Flow, veh/h | 1511 | 2916 | 150 | 1589 | 3169 | 1414 | 867 | 79 | 18 | 77 | 94 | 1311 |
| Grp Volume(v), veh/h | 63 | 402 | 417 | 4 | 1138 | 11 | 163 | 0 | 0 | 182 | 0 | 0 |
| Grp Sat Flow(s),veh/h/n | 1511 | 1507 | 1559 | 1589 | 1585 | 1414 | 964 | 0 | 0 | 1482 | 0 | 0 |
| Q Serve(g_s), s | 5.0 | 18.4 | 18.5 | 0.3 | 31.4 | 0.4 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 5.0 | 18.4 | 18.5 | 0.3 | 31.4 | 0.4 | 20.2 | 0.0 | 0.0 | 11.8 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.10 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.88 |
| Lane Grp Cap(c), veh/h | 77 | 871 | 901 | 8 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 0.46 | 0.46 | 0.48 | 0.67 | 0.01 | 0.47 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 145 | 871 | 901 | 68 | 1687 | 752 | 351 | 0 | 0 | 484 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 56.4 | 14.6 | 14.6 | 59.5 | 20.5 | 13.2 | 37.3 | 0.0 | 0.0 | 33.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 18.2 | 1.8 | 1.7 | 38.0 | 2.2 | 0.0 | 4.4 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 2.3 | 6.7 | 6.9 | 0.2 | 12.0 | 0.2 | 4.6 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay (d),s/veh | 74.6 | 16.3 | 16.3 | 97.5 | 22.7 | 13.3 | 41.6 | 0.0 | 0.0 | 33.6 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol, veh/h |  | 882 |  |  | 1153 |  |  | 163 |  |  | 182 |  |
| Approach Delay, s/veh |  | 20.5 |  |  | 22.8 |  |  | 41.6 |  |  | 33.6 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration (G+Y+Rc), s | 5.1 | 73.9 | 41.0 | 10.6 | 68.4 | 41.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 64.9 | 36.5 | 11.5 | 58.5 | 36.5 |
| Max Q Clear Time (g_c+11), s | 2.3 | 20.5 | 22.2 | 7.0 | 33.4 | 13.8 |
| Green Ext Time (p_c), s | 0.0 | 6.7 | 0.8 | 0.0 | 10.0 | 1.1 |

Intersection Summary
HCM 6th Ctrl Delay 24.1
HCM 6th LOS
C



HCM 6th TWSC
3：Dubarko Road／Vista Loop Drive \＆Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 6 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{1}$ | 㻢 |  | ${ }^{7}$ | 車 ${ }^{\text {a }}$ |  |  | $\uparrow$ | 「 |  | $\uparrow$ |  |
| Traffic Vol，veh／h | 22 | 689 | 12 | 57 | 942 | 1 | 38 | 6 | 107 | 0 | 18 | 51 |
| Future Vol，veh／h | 22 | 689 | 12 | 57 | 942 | 1 | 38 | 6 | 107 | 0 | 18 | 51 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | － | － | None | － | － | None | － | － | None | － | － | None |
| Storage Length | 220 | － | － | 200 | － | － | － | － | 0 | － | － | － |
| Veh in Median Storage，\＃ | \＃ | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Grade，\％ | － | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles，\％ | 13 | 13 | 2 | 2 | 6 | 6 | 2 | 2 | 2 | 9 | 2 | 9 |
| Mvmt Flow | 23 | 725 | 13 | 60 | 992 | 1 | 40 | 6 | 113 | 0 | 19 | 54 |







HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/09/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | ${ }^{7}$ | 性 |  | \％ | 个4 | 「 |  | $\uparrow$ |  |  | ¢ |  |
| Traffic Volume（veh／h） | 158 | 1168 | 158 | 8 | 1011 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Future Volume（veh／h） | 158 | 1168 | 158 | 8 | 1011 | 22 | 136 | 16 | 14 | 40 | 14 | 118 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate，veh／h | 166 | 1229 | 166 | 8 | 1064 | 23 | 143 | 17 | 15 | 42 | 15 | 124 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh，\％ | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap，veh／h | 192 | 1717 | 231 | 15 | 1541 | 670 | 298 | 35 | 26 | 114 | 53 | 282 |
| Arrive On Green | 0.12 | 0.60 | 0.60 | 0.01 | 0.49 | 0.49 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 |
| Sat Flow，veh／h | 1628 | 2868 | 385 | 1576 | 3143 | 1367 | 871 | 124 | 93 | 275 | 189 | 1010 |
| Grp Volume（v），veh／h | 166 | 693 | 702 | 8 | 1064 | 23 | 175 | 0 | 0 | 181 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1628 | 1624 | 1630 | 1576 | 1572 | 1367 | 1088 | 0 | 0 | 1474 | 0 | 0 |
| Q Serve（g＿s），s | 12.0 | 35.9 | 36.4 | 0.6 | 31.3 | 1.0 | 7.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 12.0 | 35.9 | 36.4 | 0.6 | 31.3 | 1.0 | 18.7 | 0.0 | 0.0 | 11.6 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.24 | 1.00 |  | 1.00 | 0.82 |  | 0.09 | 0.23 |  | 0.69 |
| Lane Grp Cap（c），veh／h | 192 | 972 | 976 | 15 | 1541 | 670 | 358 | 0 | 0 | 449 | 0 | 0 |
| V／C Ratio（X） | 0.86 | 0.71 | 0.72 | 0.52 | 0.69 | 0.03 | 0.49 | 0.00 | 0.00 | 0.40 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 264 | 972 | 976 | 67 | 1541 | 670 | 358 | 0 | 0 | 449 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 52.0 | 16.9 | 17.0 | 59.1 | 23.6 | 15.9 | 38.6 | 0.0 | 0.0 | 35.4 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 18.9 | 4.5 | 4.6 | 24.7 | 2.6 | 0.1 | 4.7 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 6.0 | 14.2 | 14.4 | 0.3 | 12.1 | 0.4 | 5.0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 70.9 | 21.3 | 21.5 | 83.8 | 26.1 | 15.9 | 43.3 | 0.0 | 0.0 | 36.0 | 0.0 | 0.0 |


|  | E | C | C | F | C | B | D | A | A | D |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| LnGrp LOS | 1561 |  | 1095 |  | 175 | A |  |  |  |  |
| Approach Vol，veh／h | 26.7 |  | 26.3 |  | 43.3 | 181 |  |  |  |  |
| Approach Delay，s／veh | C |  | C |  | D | 36.0 |  |  |  |  |
| Approach LOS |  |  |  |  |  |  |  | D |  |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration $(G+Y+R c)$ ，s | 5.7 | 76.3 | 38.0 | 18.7 | 63.3 | 38.0 |
| Change Period（Y＋Rc），s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.1 | 67.9 | 33.5 | 19.5 | 53.5 | 33.5 |
| Max Q Clear Time（g＿c＋11），s | 2.6 | 38.4 | 20.7 | 14.0 | 33.3 | 13.6 |
| Green Ext Time（p＿C），s | 0.0 | 13.1 | 0.8 | 0.2 | 8.4 | 1.1 |

Intersection Summary
HCM 6th Ctrl Delay 28.1
HCM 6th LOS
C

| Intersection |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 3 |  |  |  |  |  |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | 44 | 「 | ${ }^{7}$ | 中4 | ${ }^{*}$ | 「 |
| Traffic Vol，veh／h | 1123 | 85 | 17 | 1018 | 49 | 34 |
| Future Vol，veh／h | 1123 | 85 | 17 | 1018 | 49 | 34 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | － | None | － | None | － | None |
| Storage Length | － | 160 | 215 | － | 120 | 0 |
| Veh in Median Storage， | \＃ 0 | － | － | 0 | 0 | － |
| Grade，\％ | 0 | － | － | 0 | 0 | － |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles，\％ | 3 | 3 | 7 | 7 | 3 | 3 |
| Mvmt Flow | 1182 | 89 | 18 | 1072 | 52 | 36 |



HCM 6th TWSC
3：Dubarko Road／Vista Loop Drive \＆Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 5.4 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{7}$ | 中 ${ }^{\text {a }}$ |  | ${ }^{7}$ | 中 ${ }^{\text {a }}$ |  |  | 4 | 「 |  | \＆ |  |
| Traffic Vol，veh／h | 62 | 1046 | 38 | 118 | 982 | 0 | 8 | 5 | 116 | 0 | 9 | 28 |
| Future Vol，veh／h | 62 | 1046 | 38 | 118 | 982 | 0 | 8 | 5 | 116 | 0 | 9 | 28 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | － | － | None | － | － | None | － | － | None | － | － | None |
| Storage Length | 220 | － | － | 200 | － | － | － | － | 0 | － | － | － |
| Veh in Median Storage，\＃ | \＃ | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Grade，\％ | － | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles，\％ | 3 | 3 | 2 | 2 | 7 | 7 | 2 | 2 | 2 | 13 | 2 | 13 |
| Mvmt Flow | 64 | 1078 | 39 | 122 | 1012 | 0 | 8 | 5 | 120 | 0 | 9 | 29 |








| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | \% | 中 ${ }^{\text {a }}$ |  | \% | 44 | 「 |  | ¢ |  |  | ¢ |  |
| Traffic Volume (veh/h) | 59 | 738 | 38 | , | 1145 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Future Volume (veh/h) | 59 | 738 | 38 | 4 | 1145 | 10 | 139 | 11 | 3 | 16 | 4 | 151 |
| Initial $Q(Q b)$, veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow, veh/h/ln | 1586 | 1586 | 1586 | 1668 | 1668 | 1668 | 1668 | 1668 | 1668 | 1709 | 1709 | 1709 |
| Adj Flow Rate, veh/h | 63 | 785 | 40 | 4 | 1218 | 11 | 148 | 12 | 3 | 17 | 4 | 161 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, \% | 12 | 12 | 12 | 6 | 6 | 6 | 6 | 6 | 6 | 3 | 3 | 3 |
| Cap, veh/h | 77 | 1662 | 85 | 8 | 1660 | 741 | 331 | 25 | 6 | 57 | 29 | 408 |
| Arrive On Green | 0.05 | 0.57 | 0.57 | 0.01 | 0.52 | 0.52 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |
| Sat Flow, veh/h | 1511 | 2918 | 149 | 1589 | 3169 | 1414 | 875 | 80 | 18 | 78 | 92 | 1307 |
| Grp Volume(v), veh/h | 63 | 405 | 420 | 4 | 1218 | 11 | 163 | 0 | 0 | 182 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1511 | 1507 | 1559 | 1589 | 1585 | 1414 | 972 | 0 | 0 | 1477 | 0 | 0 |
| Q Serve(g_s), s | 5.0 | 19.0 | 19.0 | 0.3 | 35.7 | 0.4 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 5.0 | 19.0 | 19.0 | 0.3 | 35.7 | 0.4 | 19.9 | 0.0 | 0.0 | 11.6 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.10 | 1.00 |  | 1.00 | 0.91 |  | 0.02 | 0.09 |  | 0.88 |
| Lane Grp Cap(c), veh/h | 77 | 859 | 889 | 8 | 1660 | 741 | 361 | 0 | 0 | 495 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 0.47 | 0.47 | 0.48 | 0.73 | 0.01 | 0.45 | 0.00 | 0.00 | 0.37 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 132 | 859 | 889 | 68 | 1660 | 741 | 361 | 0 | 0 | 495 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 56.4 | 15.2 | 15.2 | 59.5 | 22.1 | 13.7 | 36.3 | 0.0 | 0.0 | 32.4 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 18.3 | 1.9 | 1.8 | 38.0 | 2.9 | 0.0 | 4.0 | 0.0 | 0.0 | 0.5 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \%ile BackOfQ(50\%),veh/ln | 2.3 | 6.9 | 7.2 | 0.2 | 13.7 | 0.2 | 4.5 | 0.0 | 0.0 | 4.3 | 0.0 | 0.0 |
| Unsig. Movement Delay, s/veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay(d),s/veh | 74.7 | 17.1 | 17.0 | 97.5 | 25.0 | 13.7 | 40.4 | 0.0 | 0.0 | 32.8 | 0.0 | 0.0 |
| LnGrp LOS | E | B | B | F | C | B | D | A | A | C | A | A |
| Approach Vol, veh/h |  | 888 |  |  | 1233 |  |  | 163 |  |  | 182 |  |
| Approach Delay, s/veh |  | 21.1 |  |  | 25.1 |  |  | 40.4 |  |  | 32.8 |  |
| Approach LOS |  | C |  |  | C |  |  | D |  |  | C |  |


| Timer - Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration (G+Y+Rc), s | 5.1 | 72.9 | 42.0 | 10.6 | 67.4 | 42.0 |
| Change Period (Y+Rc), s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting (Gmax), s | 5.1 | 63.9 | 37.5 | 10.5 | 58.5 | 37.5 |
| Max Q Clear Time (g_c+11), s | 2.3 | 21.0 | 21.9 | 7.0 | 37.7 | 13.6 |
| Green Ext Time (p_c), s | 0.0 | 6.7 | 0.8 | 0.0 | 9.9 | 1.2 |

Intersection Summary
HCM 6th Ctrl Delay 25.3
HCM 6th LOS
C

| Intersection |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 6 |  |  |  |  |  |
| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
| Lane Configurations | 44 | T | ${ }^{*}$ | 44 | ${ }^{7}$ | 「 |
| Traffic Vol, veh/h | 746 | 36 | 19 | 1019 | 105 | 16 |
| Future Vol, veh/h | 746 | 36 | 19 | 1019 | 105 | 16 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Stop | Stop |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | - | 160 | 215 | - | 120 | 0 |
| Veh in Median Storage, \# | \# 0 | - | - | 0 | 0 | - |
| Grade, \% | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles, \% | 13 | 13 | 7 | 7 | 4 | 4 |
| Mvmt Flow | 794 | 38 | 20 | 1084 | 112 | 17 |



HCM 6th TWSC
3：Dubarko Road／Vista Loop Drive \＆Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay，s／veh | 1.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{1}$ | 㻢 |  |  | 中 $\uparrow$ |  |  |  | 「＇ |  | \＆ |  |
| Traffic Vol，veh／h | 28 | 689 | 12 | 0 | 999 | 1 | 0 | 0 | 107 | 0 | 0 | 69 |
| Future Vol，veh／h | 28 | 689 | 12 | 0 | 999 | 1 | 0 | 0 | 107 | 0 | 0 | 69 |
| Conflicting Peds，\＃／hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | － | － | None | － | － | None | － | ， | None | － | － | None |
| Storage Length | 220 | － | － | － | － | － | － | － | 0 | － | － | － |
| Veh in Median Storage，\＃ | \＃－ | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Grade，\％ | － | 0 | － | － | 0 | － | － | 0 | － | － | 0 | － |
| Peak Hour Factor | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 |
| Heavy Vehicles，\％ | 13 | 13 | 2 | 2 | 6 | 6 | 2 | 2 | 2 | 9 | 2 | 9 |
| Mvmt Flow | 30 | 733 | 13 | 0 | 1063 | 1 | 0 | 0 | 114 | 0 | 0 | 73 |



| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 5 |  |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |  |
| Lane Configurations |  | $\uparrow$ | 7 |  | $\uparrow$ | 「 |  | $\uparrow$ |  |  | $\uparrow$ | F |  |
| Traffic Vol, veh/h | 8 | 9 | 34 | 75 | 43 | 34 | 45 | 191 | 118 | 4 | 182 | 2 |  |
| Future Vol, veh/h | 8 | 9 | 34 | 75 | 43 | 34 | 45 | 191 | 118 | 4 | 182 | 2 |  |
| Conflicting Peds, \#/hr | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 |  |
| Sign Control Stor | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |  |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |  |
| Storage Length | - | - | 90 | - | - | 125 | - | - | - | - | - | 330 |  |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |  |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |  |
| Peak Hour Factor | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |  |
| Heavy Vehicles, \% | 1 | 1 | 1 | 5 | 5 | 5 | 2 | 2 | 2 | 5 | 5 | 5 |  |
| Mvmt Flow | 9 | 10 | 38 | 83 | 48 | 38 | 50 | 212 | 131 | 4 | 202 | 2 |  |



| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 8.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{7}$ | $\uparrow$ |  |  | \& |  |  | \& |  |  | $\uparrow$ |  |
| Traffic Vol, veh/h | 19 | 108 | 1 | 1 | 40 | 61 | 4 | 21 | 2 | 12 | 5 | 17 |
| Future Vol, veh/h | 19 | 108 | 1 | 1 | 40 | 61 | 4 | 21 | 2 | 12 | 5 | 17 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| Heavy Vehicles, \% | 5 | 5 | 5 | 18 | 18 | 18 | 8 | 8 | 8 | 23 | 23 | 23 |
| Mvmt Flow | 21 | 121 | 1 | 1 | 45 | 69 | 4 | 24 | 2 | 13 | 6 | 19 |



HCM Signalized Intersection Capacity Analysis
1: Wolf Drive/Ten Eyck Road \& Highway 26
07/09/2020

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |

[^10]| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations | ${ }^{7}$ | 性 |  | \％ | 个4 | 「 |  | $\uparrow$ |  |  | ¢ |  |
| Traffic Volume（veh／h） | 158 | 1173 | 158 | 8 | 1133 | 22 | 141 | 16 | 14 | 40 | 14 | 118 |
| Future Volume（veh／h） | 158 | 1173 | 158 | 8 | 1133 | 22 | 141 | 16 | 14 | 40 | 14 | 118 |
| Initial $Q(Q b)$ ，veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped－Bike Adj（A＿pbT） | 1.00 |  | 0.98 | 1.00 |  | 0.98 | 1.00 |  | 1.00 | 1.00 |  | 1.00 |
| Parking Bus，Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach |  | No |  |  | No |  |  | No |  |  | No |  |
| Adj Sat Flow，veh／h／ln | 1709 | 1709 | 1709 | 1654 | 1654 | 1654 | 1736 | 1736 | 1736 | 1668 | 1668 | 1668 |
| Adj Flow Rate，veh／h | 166 | 1235 | 166 | 8 | 1193 | 23 | 148 | 17 | 15 | 42 | 15 | 124 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh，\％ | 3 | 3 | 3 | 7 | 7 | 7 | 1 | 1 | 1 | 6 | 6 | 6 |
| Cap，veh／h | 192 | 1742 | 233 | 15 | 1568 | 682 | 290 | 33 | 24 | 112 | 52 | 275 |
| Arrive On Green | 0.12 | 0.61 | 0.61 | 0.01 | 0.50 | 0.50 | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 |
| Sat Flow，veh／h | 1628 | 2870 | 384 | 1576 | 3143 | 1367 | 868 | 121 | 90 | 275 | 192 | 1016 |
| Grp Volume（v），veh／h | 166 | 696 | 705 | 8 | 1193 | 23 | 180 | 0 | 0 | 181 | 0 | 0 |
| Grp Sat Flow（s），veh／h／n | 1628 | 1624 | 1630 | 1576 | 1572 | 1367 | 1078 | 0 | 0 | 1483 | 0 | 0 |
| Q Serve（g＿s），s | 12.0 | 35.4 | 36.0 | 0.6 | 36.8 | 1.0 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear（g＿c），s | 12.0 | 35.4 | 36.0 | 0.6 | 36.8 | 1.0 | 19.6 | 0.0 | 0.0 | 11.8 | 0.0 | 0.0 |
| Prop In Lane | 1.00 |  | 0.24 | 1.00 |  | 1.00 | 0.82 |  | 0.08 | 0.23 |  | 0.69 |
| Lane Grp Cap（c），veh／h | 192 | 985 | 989 | 15 | 1568 | 682 | 347 | 0 | 0 | 439 | 0 | 0 |
| V／C Ratio（X） | 0.87 | 0.71 | 0.71 | 0.52 | 0.76 | 0.03 | 0.52 | 0.00 | 0.00 | 0.41 | 0.00 | 0.00 |
| Avail Cap（c＿a），veh／h | 251 | 985 | 989 | 67 | 1568 | 682 | 347 | 0 | 0 | 439 | 0 | 0 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter（l） | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay（d），s／veh | 52.0 | 16.2 | 16.3 | 59.1 | 24.3 | 15.3 | 39.8 | 0.0 | 0.0 | 36.3 | 0.0 | 0.0 |
| Incr Delay（d2），s／veh | 21.1 | 4.3 | 4.4 | 24.7 | 3.5 | 0.1 | 5.5 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 |
| Initial Q Delay（d3），s／veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| \％ile BackOfQ（50\％），veh／ln | 6.1 | 13.9 | 14.2 | 0.3 | 14.3 | 0.3 | 5.3 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 |
| Unsig．Movement Delay，s／veh |  |  |  |  |  |  |  |  |  |  |  |  |
| LnGrp Delay（d），s／veh | 73.1 | 20.5 | 20.7 | 83.8 | 27.8 | 15.4 | 45.2 | 0.0 | 0.0 | 36.9 | 0.0 | 0.0 |


| LnGrp LOS | E | C | C | F | C | B | D | A | A | D |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Approach Vol，veh／h | 1567 |  | 1224 |  | 180 |  | A |  |  |  |
| Approach Delay，s／veh | 26.2 |  | 28.0 |  | 45.2 |  | 361 |  |  |  |
| Approach LOS | C |  | C |  | D | D |  |  |  |  |


| Timer－Assigned Phs | 1 | 2 | 4 | 5 | 6 | 8 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Phs Duration $(G+Y+R c)$ ，s | 5.7 | 77.3 | 37.0 | 18.6 | 64.4 | 37.0 |
| Change Period $(\mathrm{Y}+\mathrm{Rc})$ ，s | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Max Green Setting（Gmax），s | 5.1 | 68.9 | 32.5 | 18.5 | 55.5 | 32.5 |
| Max Q Clear Time（g＿c＋11），s | 2.6 | 38.0 | 21.6 | 14.0 | 38.8 | 13.8 |
| Green Ext Time（p＿c），s | 0.0 | 13.5 | 0.8 | 0.2 | 8.6 | 1.0 |

Intersection Summary

| HCM 6th Ctrl Delay | 28.6 |
| :--- | ---: |
| HCM 6th LOS | C |




HCM 6th TWSC
3: Dubarko Road/Vista Loop Drive \& Highway 26

| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 1.3 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | SEL | SET | SER | NWL | NWT | NWR | NEL | NET | NER | SWL | SWT | SWR |
| Lane Configurations | ${ }^{7}$ | 中 ${ }^{\text {a }}$ |  |  | 中 ${ }^{\text {a }}$ |  |  |  | 7 |  | \& |  |
| Traffic Vol, veh/h | 67 | 1046 | 38 | 0 | 1100 | 0 | 0 | 0 | 116 | 0 | 0 | 37 |
| Future Vol, veh/h | 67 | 1046 | 38 | 0 | 1100 | 0 | 0 | 0 | 116 | 0 | 0 | 37 |
| Conflicting Peds, \#/hr | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Sign Control | Free | Free | Free | Free | Free | Free | Stop | Stop | Stop | Stop | Stop | Stop |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 220 | - | - | - | - | - | - | - | 0 | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| Heavy Vehicles, \% | 3 | 3 | 2 | 2 | 7 | 7 | 2 | 2 | 2 | 13 | 2 | 13 |
| Mvmt Flow | 69 | 1078 | 39 | 0 | 1134 | 0 | 0 | 0 | 120 | 0 | 0 | 38 |





| Intersection |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Int Delay, s/veh | 7.9 |  |  |  |  |  |  |  |  |  |  |  |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | ${ }^{*}$ | 个 |  |  | $\leqslant$ |  |  | $\uparrow$ |  |  | \& |  |
| Traffic Vol, veh/h | 24 | 142 | 5 | 2 | 11 | 29 | 4 | 10 | 1 | 24 | 28 | 29 |
| Future Vol, veh/h | 24 | 142 | 5 | 2 | 11 | 29 | 4 | 10 | 1 | 24 | 28 | 29 |
| Conflicting Peds, \#/hr | 2 | 0 | 1 | 3 | 0 | 4 | 1 | 0 | 3 | 4 | 0 | 2 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | 115 | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, \# | \# | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, \% | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| Heavy Vehicles, \% | 2 | 2 | 2 | 2 | 2 | 2 | 7 | 7 | 7 | 3 | 3 | 3 |
| Mvmt Flow | 26 | 156 | 5 | 2 | 12 | 32 | 4 | 11 | 1 | 26 | 31 | 32 |



Intersection: 1: Wolf Drive/Ten Eyck Road \& Highway 26

| Movement | EB | EB | EB | WB | WB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | T | TR | L | T | T | R | LTR | LTR |
| Maximum Queue (ft) | 189 | 333 | 318 | 124 | 431 | 374 | 68 | 201 | 146 |
| Average Queue (ft) | 62 | 186 | 139 | 11 | 271 | 221 | 5 | 94 | 56 |
| 95th Queue (ft) | 147 | 293 | 265 | 62 | 372 | 327 | 36 | 165 | 111 |
| Link Distance (ft) |  | 538 | 538 |  | 613 | 613 |  | 315 | 380 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |  |  |  |
| Storage Bay Dist (ft) | 165 |  |  | 120 |  |  | 70 |  |  |
| Storage Blk Time (\%) | 1 | 9 |  |  | 30 | 26 | 0 |  |  |
| Queuing Penalty (veh) | 2 | 5 |  |  | 1 | 3 | 0 |  |  |

Intersection: 2: Langensand Road \& Highway 26

| Movement | EB | WB | NB | NB |
| :--- | ---: | ---: | ---: | ---: |
| Directions Served | T | L | L | R |
| Maximum Queue (ft) | 4 | 42 | 140 | 234 |
| Average Queue (ft) | 0 | 8 | 78 | 113 |
| 95th Queue (ft) | 3 | 30 | 155 | 490 |
| Link Distance (ft) | 701 |  |  | 876 |
| Upstream Blk Time (\%) |  |  |  | 0 |
| Queuing Penalty (veh) |  |  |  | 0 |
| Storage Bay Dist (ft) |  | 215 | 120 |  |
| Storage Blk Time (\%) |  |  | 25 | 0 |
| Queuing Penalty (veh) |  |  | 4 | 0 |

Intersection: 3: Dubarko Road/Vista Loop Drive \& Highway 26

| Movement | SE | NW | NE | NE | SW |
| :--- | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | L | LT | R | LTR |
| Maximum Queue (ft) | 61 | 46 | 223 | 92 | 271 |
| Average Queue (ft) | 14 | 17 | 105 | 41 | 115 |
| 95th Queue (ft) | 42 | 38 | 277 | 70 | 292 |
| Link Distance (ft) |  |  | 752 | 752 | 575 |
| Upstream Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
| Storage Bay Dist (ft) | 220 | 200 |  |  |  |
| Storage Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |

Intersection: 4: Highway 211 \& Dubarko Road

| Movement | EB | EB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | LT | R | LT | R | LTR | LT |
| Maximum Queue (ft) | 51 | 46 | 120 | 63 | 48 | 23 |
| Average Queue (ft) | 15 | 20 | 53 | 19 | 4 | 1 |
| 95th Queue (ft) | 41 | 44 | 94 | 46 | 23 | 9 |
| Link Distance (ft) | 645 |  | 745 |  | 654 | 862 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |
| Storage Bay Dist (ft) |  | 90 |  | 125 |  |  |
| Storage Blk Time (\%) |  |  | 0 |  |  |  |
| Queuing Penalty (veh) |  |  | 0 |  |  |  |

Intersection: 5: Langensand Road \& Dubarko Road

| Movement | EB | EB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | TR | LTR | LTR | LTR |
| Maximum Queue (ft) | 43 | 74 | 94 | 15 | 6 |
| Average Queue (ft) | 14 | 38 | 49 | 1 | 0 |
| 95th Queue (ft) | 40 | 59 | 82 | 8 | 4 |
| Link Distance (ft) |  | 604 | 851 | 716 | 706 |
| Upstream Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
| Storage Bay Dist (ft) | 115 |  |  |  |  |
| Storage Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
|  |  |  |  |  |  |

Network wide Queuing Penalty: 15

Intersection: 1: Wolf Drive/Ten Eyck Road \& Highway 26

| Movement | EB | EB | EB | WB | WB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | T | TR | L | T | T | R | LTR | LTR |
| Maximum Queue (ft) | 190 | 424 | 367 | 101 | 459 | 418 | 86 | 193 | 194 |
| Average Queue (ft) | 136 | 262 | 231 | 10 | 288 | 242 | 8 | 93 | 79 |
| 95th Queue (ft) | 223 | 381 | 352 | 52 | 405 | 363 | 41 | 168 | 166 |
| Link Distance (ft) |  | 538 | 538 |  | 613 | 613 |  | 315 | 380 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |  |  |  |
| Storage Bay Dist (ft) | 165 |  |  | 120 |  |  | 70 |  |  |
| Storage Blk Time (\%) | 9 | 12 |  |  | 35 | 31 | 0 |  |  |
| Queuing Penalty (veh) | 52 | 20 |  |  | 3 | 7 | 0 |  |  |

Intersection: 2: Langensand Road \& Highway 26

| Movement | EB | WB | NB | NB |
| :--- | ---: | ---: | ---: | ---: |
| Directions Served | R | L | L | R |
| Maximum Queue (ft) | 4 | 47 | 134 | 168 |
| Average Queue (ft) | 0 | 12 | 61 | 39 |
| 95th Queue (ft) | 3 | 38 | 136 | 145 |
| Link Distance (ft) |  |  |  | 876 |
| Upstream Blk Time (\%) |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |
| Storage Bay Dist (ft) | 160 | 215 | 120 |  |
| Storage Blk Time (\%) |  |  | 14 |  |
| Queuing Penalty (veh) |  |  | 5 |  |

Intersection: 3: Dubarko Road/Vista Loop Drive \& Highway 26

| Movement | SE | SE | SE | NW | NW | NW | NE | NE | SW |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | T | TR | L | T | TR | LT | R | LTR |
| Maximum Queue (ft) | 85 | 22 | 20 | 109 | 15 | 4 | 341 | 126 | 435 |
| Average Queue (ft) | 29 | 1 | 2 | 40 | 1 | 0 | 169 | 50 | 233 |
| 95th Queue (ft) | 64 | 11 | 11 | 80 | 12 | 3 | 338 | 94 | 567 |
| Link Distance (ft) |  | 1135 | 1135 |  | 800 | 800 | 615 | 615 | 575 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |  |  | 7 |
| Queuing Penalty (veh) |  |  |  |  |  |  |  |  | 0 |

## Intersection: 4: Highway 211 \& Dubarko Road

| Movement | EB | EB | WB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Directions Served | LT | R | LT | R | LTR | LT |
| Maximum Queue (ft) | 77 | 73 | 213 | 117 | 64 | 48 |
| Average Queue (ft) | 32 | 29 | 84 | 21 | 13 | 4 |
| 95th Queue (ft) | 64 | 55 | 169 | 69 | 43 | 21 |
| Link Distance (ft) | 645 |  | 745 |  | 654 | 862 |
| Upstream Blk Time (\%) |  |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |  |
| Storage Bay Dist (ft) |  | 90 |  | 125 |  |  |
| Storage Blk Time (\%) | 0 | 0 | 8 | 0 |  |  |
| Queuing Penalty (veh) | 0 | 0 | 2 | 0 |  |  |

Intersection: 5: Langensand Road \& Dubarko Road

| Movement | EB | EB | WB | NB | SB |
| :--- | ---: | ---: | ---: | ---: | ---: |
| Directions Served | L | TR | LTR | LTR | LTR |
| Maximum Queue ( ft ) | 36 | 76 | 83 | 12 | 38 |
| Average Queue $(\mathrm{ft})$ | 17 | 40 | 42 | 0 | 2 |
| 95th Queue (ft) | 42 | 63 | 66 | 6 | 17 |
| Link Distance (ft) |  | 604 | 851 | 716 | 706 |
| Upstream Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |
| Storage Bay Dist (ft) | 115 |  |  |  |  |
| Storage Blk Time (\%) |  |  |  |  |  |
| Queuing Penalty (veh) |  |  |  |  |  |

Network wide Queuing Penalty: 88


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LANGENSAND RD at MT HOOD HY, City of Sandy, Clackamas County, 01/01/2013 to 12/31/2017 of 6 Crash records shown

|  |  |
| :--- | :--- | :--- | :--- |

总





CDS380
$07 / 07 / 2020$
CITY OF SAI
OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION


| 1/01/2013 | to $12 / 31 / 2017$ |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |



## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 26 at Langensand Road
Scenario: 2022 Background Plus Site Trips
Number of Major Street Lanes $\qquad$ PM Peak Hour Volume $\qquad$ 2243 (sum of both approaches) PM Peak Hour Volume $\qquad$ (highest-volume approach) ${ }^{\text {a }}$
Number of Minor Street Lanes 1 49 Posted or 85th percentile speed > 40 mph : Yes

Isolated Population Less than 10,000: $\qquad$ No

## Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving traffic on each approach |  | Vehicles per hour on major street (total of both approaches) |  |  |  | Vehicles per hour on minor street (total of both approaches) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | 100\% | 80\% | 70\% | 56\% | 100\% | 80\% | 70\% | 56\% |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |
| Warrant Anaylsis Calculations |  |  |  | 8th Highest Hour ${ }^{\text {b }}$ |  | Minimum Volume |  | Warrant Satisfied? |  |
| Condition A - Minimum Vehicular Volume |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 420 |  |  |  |
| Minor Street Volume |  |  |  | 28 |  | 105 |  | No |  |
| Condition B - Interruption of Continuous Traffic |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 630 |  |  |  |
| Minor Street Volume |  |  |  | 28 |  | 53 |  | No |  |
| Combination Warrant ${ }^{\text {c }}$ |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 504 |  |  |  |
| Minor Street Volume |  |  |  | 28 |  | 84 |  | No |  |
| ${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red. |  |  |  |  |  |  |  |  |  |
| ${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems. |  |  |  |  |  |  |  |  |  |

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 26 at Dubarko Road
Scenario: 2022 Background Plus Site Trips
Number of Major Street Lanes $\qquad$ PM Peak Hour Volume $\qquad$ 2243 (sum of both approaches) PM Peak Hour Volume $\qquad$ (highest-volume approach) ${ }^{\text {a }}$
Number of Minor Street Lanes 1 13
Posted or 85 th percentile speed $>40 \mathrm{mph}$ : $\qquad$
Isolated Population Less than 10,000: $\qquad$
Warrant 1, Eight-Hour Vehicular Volume
Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving traffic on each approach |  | Vehicles per hour on major street (total of both approaches) |  |  |  | Vehicles per hour on minor street (total of both approaches) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | 100\% | 80\% | 70\% | 56\% | 100\% | 80\% | 70\% | 56\% |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |
| Warrant Anaylsis Calculations |  |  |  | 8th Highest Hour ${ }^{\text {b }}$ |  | Minimum Volume |  | Warrant Satisfied? |  |
| Condition A - Minimum Vehicular Volume |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 420 |  |  |  |
| Minor Street Volume |  |  |  | 7 |  | 105 |  | No |  |
| Condition B - Interruption of Continuous Traffic |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 630 |  |  |  |
| Minor Street Volume |  |  |  | 7 |  | 53 |  | No |  |
| Combination Warrant ${ }^{\text {c }}$ |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 1267 |  | 504 |  |  |  |
| Minor Street Volume |  |  |  | 7 |  | 84 |  | No |  |
| ${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {b }}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems. |  |  |  |  |  |  |  |  |  |

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 211 at Dubarko Road
Scenario: 2022 Background Plus Site Trips (30th-Highest Hour)
Number of Major Street Lanes: 1
Number of Minor Street Lanes 1 PM Peak Hour Volume $\qquad$ 644 (sum of both approaches) Posted or 85 th percentile speed $>40 \mathrm{mph}$ : Yes
Isolated Population Less than 10,000: $\qquad$ PM Peak Hour Volume 199 (highest-volume approach) ${ }^{\text {a }}$

Warrant 1, Eight-Hour Vehicular Volume
Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |

## Warrant Anaylsis Calculations

Condition A - Minimum Vehicular Volume
Major Street Volume
Minor Street Volume
Condition B - Interruption of Continuous Traffic
Major Street Volume
Minor Street Volume
Combination Warrant ${ }^{\text {c }}$
Major Street Volume
Minor Street Volume364

420
112
84

350
105 Yes

525
53
No
${ }^{a}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red.
${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume.
${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems.

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Highway 211 at Dubarko Road
Scenario: 2022 Background Plus Site Trips (30th-Highest Hour, with RIRO at Hwy 26)
Number of Major Street Lanes $\qquad$ PM Peak Hour Volume $\qquad$ (sum of both approaches)
Number of Minor Street Lanes 1 PM Peak Hour Volume $\qquad$ 83 (highest-volume approach) ${ }^{\text {a }}$
Posted or 85 th percentile speed $>40 \mathrm{mph}$ : $\qquad$
Isolated Population Less than 10,000: $\qquad$

## Warrant 1, Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving traffic on each approach |  | Vehicles per hour on major street (total of both approaches) |  |  |  | Vehicles per hour on minor street (total of both approaches) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | 100\% | 80\% | 70\% | 56\% | 100\% | 80\% | 70\% | 56\% |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |
| Warrant Anaylsis Calculations |  |  |  | 8th Highest Hour ${ }^{\text {b }}$ |  | Minimum Volume |  | Warrant Satisfied? |  |
| Condition A - Minimum Vehicular Volume |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 436 |  | 350 |  |  |  |
| Minor Street Volume |  |  |  | 47 |  | 105 |  | No |  |
| Condition B - Interruption of Continuous Traffic |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 436 |  | 525 |  |  |  |
| Minor Street Volume |  |  |  | 47 |  | 53 |  | No |  |
| Combination Warrant ${ }^{\text {c }}$ |  |  |  |  |  |  |  |  |  |
| Major Street Volume |  |  |  | 436 |  | 420 |  |  |  |
| Minor Street Volume |  |  |  | 47 |  | 84 |  | No |  |
| ${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red. |  |  |  |  |  |  |  |  |  |
| ${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume. |  |  |  |  |  |  |  |  |  |
| ${ }^{\text {c }}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems. |  |  |  |  |  |  |  |  |  |

## Preliminary Traffic Signal Warrant Analysis

Project Name: Dubarko Road Development
Intersection: Dubarko Road at Langensand Road
Scenario: 2021 Background Plus Site Trips
Number of Major Street Lanes: 1
Number of Minor Street Lanes 1

PM Peak Hour Volume $\qquad$ 306 (sum of both approaches) PM Peak Hour Volume $\qquad$ 74 (highest-volume approach) ${ }^{\text {a }}$

Posted or 85th percentile speed > 40 mph : No
Isolated Population Less than 10,000: $\qquad$
Warrant 1, Eight-Hour Vehicular Volume
Condition A - Minimum Vehicular Volume

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 500 | 400 | 350 | 280 | 150 | 120 | 105 | 84 |
| 2 or more | 1 | 600 | 480 | 420 | 336 | 150 | 120 | 105 | 84 |
| 2 or more | 2 or more | 600 | 480 | 420 | 336 | 200 | 160 | 140 | 112 |
| 1 | 2 or more | 500 | 400 | 350 | 280 | 200 | 160 | 140 | 112 |

Condition B - Interruption of Continuous Traffic

| Number of lanes for moving <br> traffic on each approach | Vehicles per hour on major street <br> (total of both approaches) |  |  | Vehicles per hour on minor street <br> (total of both approaches) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Major Street | Minor Street | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ | $100 \%$ | $80 \%$ | $70 \%$ | $56 \%$ |
| 1 | 1 | 750 | 600 | 525 | 420 | 75 | 60 | 53 | 42 |
| 2 or more | 1 | 900 | 720 | 630 | 504 | 75 | 60 | 53 | 42 |
| 2 or more | 2 or more | 900 | 720 | 630 | 504 | 100 | 80 | 70 | 56 |
| 1 | 2 or more | 750 | 600 | 525 | 420 | 100 | 80 | 70 | 56 |

8th Highest Hour ${ }^{\text {b }} \quad$ Minimum Volume Warrant Satisfied?

## Warrant Anaylsis Calculations

Condition A - Minimum Vehicular Volume
Major Street Volume
173
42

173
42

173
42
600
Major Street Volume
Minor Street Volume
Minor Street Volume
Condition B - Interruption of Continuous Traffic
Major Street Volume
Minor Street Volume
Combination Warrant ${ }^{\text {c }}$
${ }^{\text {a }}$ Minor-Street right turn volumes are reduced to account for the impact of right-turns on red.
${ }^{\mathrm{b}}$ Eighth-highest hour volumes are calculated as 5.65 percent of the expected daily traffic volume.
${ }^{c}$ This warrant should be used only after adequate trial of other alternatives has failed to solve traffic problems.

## Left-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 26 WB at Dubarko Road
Scenario: 2022 Background plus Site Trips

Number of Advancing Lanes: 2
Number of Opposing Lanes: 2
Major-Street Design Speed: 55 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Advancing Volume for Design Hour: | 1000 | 1100 |
| Opposing Volume for Design Hour: | 723 | 1146 |
|  |  |  |
| Design Hour Volume Per Lane: | 861.5 | 1123 |
| Number of Left Turns per Hour: | 57 | 118 |

Left-turn lane warrants satisfied?
YES
YES

## Exhibit 7-1 Left Turn Lane Criterion (TTI)


*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)

## Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 26 Eastbound at Dubarko Road
Scenario: 2022 Background Plus Site Trips

Major-Street Design Speed: 55 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Number of Right Turns per Hour: | 12 | 38 |
| Approaching DVH in Outside Lane: | 351 | 542 |
| Calculated Turn Volume Threshold: | 32 | 20 |
| Right Turn Volume Exceeds Threshold? | NO | YES |

## Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

## Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

## Left-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 211 NB at Dubarko Road
Scenario: 2022 Background plus Site Trips
$\begin{array}{lcl}\text { Number of Advancing Lanes: } & 1 & \\ \text { Number of Opposing Lanes: } & 1 & \\ \text { Major-Street Design Speed: } & 45 & \mathrm{mph}\end{array}$

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Advancing Volume for Design Hour: | 354 | 408 |
| Opposing Volume for Design Hour: | 111 | 236 |
|  |  |  |
| Design Hour Volume Per Lane: | 465 | 644 |
| Number of Left Turns per Hour: | 45 | 61 |
| Left-turn lane warrants satisfied? | YES | YES |

## Exhibit 7-1 Left Turn Lane Criterion (TTI)


*(Advancing Volume/Number of Advancing Through Lanes) + (Opposing Volume/Number of Opposing Through Lanes)

## Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Highway 211 Northbound at Dubarko Road
Scenario: 2019 Existing Conditions

Major-Street Design Speed: 45 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Number of Right Turns per Hour: | 13 | 52 |
| Approaching DVH in Outside Lane: | 321 | 366 |
| Calculated Turn Volume Threshold: | 34 | 31 |
| Right Turn Volume Exceeds Threshold? | NO | YES |

## Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

## Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

## Right-Turn Lane Warrant Analysis (ODOT Methodology)

Project Name: Bull Run Terrace Subdivision
Approach: Dubarko Road Westbound and Langensand Road
Scenario: 2022 Background Plus Site Trips (RIRO)

Major-Street Design Speed: 25 mph

|  | AM Volume | PM Volume |
| :--- | :---: | :---: |
| Number of Right Turns per Hour: | 61 | 29 |
| Approaching DVH in Outside Lane: | 102 | 42 |
| Calculated Turn Volume Threshold: | 99 | 107 |
| Right Turn Volume Exceeds Threshold? | NO | NO |

## Criterion 1: Vehicular Volume

The vehicular volume criterion is intended for application where the volume of intersecting traffic is the principal reason for considering installation of a right turn lane. The vehicular volume criteria are determined using the curve in Exhibit 7-2.

## Exhibit 7-2 Right Turn Lane Criterion



Note: If there is no right turn lane, a shoulder needs to be provided. If this intersection is in a rural area and is a connection to a public street, a right turn lane is needed.

| Intersection |  |
| :--- | ---: | :--- |
| Intersection Delay，s／veh | 13.7 |
| Intersection LOS | B |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations |  | $\uparrow$ | 「 |  | $\uparrow$ | 「 |  | \＆ |  |  | \＄ | 「 |
| Traffic Vol，veh／h | 8 | 9 | 34 | 132 | 43 | 34 | 45 | 191 | 118 | 4 | 107 | 2 |
| Future Vol，veh／h | 8 | 9 | 34 | 132 | 43 | 34 | 45 | 191 | 118 | 4 | 107 | 2 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Heavy Vehicles，\％ | 1 | 1 | 1 | 5 | 5 | 5 | 2 | 2 | 2 | 5 | 5 | 5 |
| Mvmt Flow | 9 | 10 | 38 | 147 | 48 | 38 | 50 | 212 | 131 | 4 | 119 | 2 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| Approach | EB |  |  | WB |  |  | NB |  |  | SB |  |  |
| Opposing Approach | WB |  |  | EB |  |  | SB |  |  | NB |  |  |
| Opposing Lanes | 2 |  |  | 2 |  |  | 2 |  |  | 1 |  |  |
| Conflicting Approach Left | SB |  |  | NB |  |  | EB |  |  | WB |  |  |
| Conflicting Lanes Left | 2 |  |  | 1 |  |  | 2 |  |  | 2 |  |  |
| Conflicting Approach Right | NB |  |  | SB |  |  | WB |  |  | EB |  |  |
| Conflicting Lanes Right | 1 |  |  | 2 |  |  | 2 |  |  | 2 |  |  |
| HCM Control Delay | 9.1 |  |  | 12.1 |  |  | 16.4 |  |  | 10.3 |  |  |
| HCM LOS | A |  |  | B |  |  | C |  |  | B |  |  |


| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Vol Left，\％ | $13 \%$ | $47 \%$ | $0 \%$ | $75 \%$ | $0 \%$ | $4 \%$ | $0 \%$ |
| Vol Thru，\％ | $54 \%$ | $53 \%$ | $0 \%$ | $25 \%$ | $0 \%$ | $96 \%$ | $0 \%$ |
| Vol Right，\％ | $33 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 354 | 17 | 34 | 175 | 34 | 111 | 2 |
| LT Vol | 45 | 8 | 0 | 132 | 0 | 4 | 0 |
| Through Vol | 191 | 9 | 0 | 43 | 0 | 107 | 0 |
| RT Vol | 118 | 0 | 34 | 0 | 34 | 0 | 2 |
| Lane Flow Rate | 393 | 19 | 38 | 194 | 38 | 123 | 2 |
| Geometry Grp | 6 | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util（X） | 0.6 | 0.035 | 0.06 | 0.353 | 0.057 | 0.207 | 0.003 |
| Departure Headway（Hd） | 5.494 | 6.677 | 5.724 | 6.543 | 5.45 | 6.031 | 5.303 |
| Convergence，Y／N | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 661 | 536 | 624 | 550 | 657 | 596 | 674 |
| Service Time | 3.494 | 4.423 | 3.469 | 4.279 | 3.186 | 3.766 | 3.038 |
| HCM Lane V／C Ratio | 0.595 | 0.035 | 0.061 | 0.353 | 0.058 | 0.206 | 0.003 |
| HCM Control Delay | 16.4 | 9.7 | 8.8 | 12.8 | 8.5 | 10.3 | 8.1 |
| HCM Lane LOS | C | A | A | B | A | B | A |
| HCM 95th－tile Q | 4 | 0.1 | 0.2 | 1.6 | 0.2 | 0.8 | 0 |


| Intersection |  |
| :--- | ---: | :--- |
| Intersection Delay，s／veh | 18.2 |
| Intersection LOS | C |


| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Lane Configurations |  | $\uparrow$ | 「 |  | $\uparrow$ | 「 |  | \＆ |  |  | $\uparrow$ | 「 |
| Traffic Vol，veh／h | 11 | 51 | 55 | 149 | 53 | 27 | 61 | 171 | 176 | 10 | 223 | 11 |
| Future Vol，veh／h | 11 | 51 | 55 | 149 | 53 | 27 | 61 | 171 | 176 | 10 | 223 | 11 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles，\％ | 1 | 1 | 1 | 5 | 5 | 5 | 2 | 2 | 2 | 5 | 5 | 5 |
| Mvmt Flow | 12 | 54 | 59 | 159 | 56 | 29 | 65 | 182 | 187 | 11 | 237 | 12 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 |
| Approach | EB |  |  | WB |  |  | NB |  |  | SB |  |  |
| Opposing Approach | WB |  |  | EB |  |  | SB |  |  | NB |  |  |
| Opposing Lanes | 2 |  |  | 2 |  |  | 2 |  |  | 1 |  |  |
| Conflicting Approach Left | SB |  |  | NB |  |  | EB |  |  | WB |  |  |
| Conflicting Lanes Left | 2 |  |  | 1 |  |  | 2 |  |  | 2 |  |  |
| Conflicting Approach Right | NB |  |  | SB |  |  | WB |  |  | EB |  |  |
| Conflicting Lanes Right | 1 |  |  | 2 |  |  | 2 |  |  | 2 |  |  |
| HCM Control Delay | 10.7 |  |  | 15.1 |  |  | 24.1 |  |  | 14.7 |  |  |
| HCM LOS | B |  |  | C |  |  | C |  |  | B |  |  |


| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | WBLn2 | SBLn1 | SBLn2 |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: | ---: |
| Vol Left，\％ | $15 \%$ | $18 \%$ | $0 \%$ | $74 \%$ | $0 \%$ | $4 \%$ | $0 \%$ |
| Vol Thru，\％ | $42 \%$ | $82 \%$ | $0 \%$ | $26 \%$ | $0 \%$ | $96 \%$ | $0 \%$ |
| Vol Right，\％ | $43 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ | $0 \%$ | $100 \%$ |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 408 | 62 | 55 | 202 | 27 | 233 | 11 |
| LT Vol | 61 | 11 | 0 | 149 | 0 | 10 | 0 |
| Through Vol | 171 | 51 | 0 | 53 | 0 | 223 | 0 |
| RT Vol | 176 | 0 | 55 | 0 | 27 | 0 | 11 |
| Lane Flow Rate | 434 | 66 | 59 | 215 | 29 | 248 | 12 |
| Geometry Grp | 6 | 7 | 7 | 7 | 7 | 7 | 7 |
| Degree of Util（X） | 0.731 | 0.136 | 0.108 | 0.443 | 0.051 | 0.46 | 0.019 |
| Departure Headway（Hd） | 6.176 | 7.426 | 6.615 | 7.428 | 6.333 | 6.681 | 5.945 |
| Convergence，Y／N | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Cap | 590 | 484 | 544 | 488 | 568 | 540 | 604 |
| Service Time | 4.176 | 5.148 | 4.337 | 5.139 | 4.044 | 4.396 | 3.66 |
| HCM Lane V／C Ratio | 0.736 | 0.136 | 0.108 | 0.441 | 0.051 | 0.459 | 0.02 |
| HCM Control Delay | 24.1 | 11.3 | 10.1 | 15.9 | 9.4 | 15 | 8.8 |
| HCM Lane LOS | C | B | B | C | A | B | A |
| HCM 95th－tile Q | 6.2 | 0.5 | 0.4 | 2.2 | 0.2 | 2.4 | 0.1 |



February 20, 2020

Ms. Shelley Denison
City of Sandy
39250 Pioneer Blvd.
Sandy, OR 97055

## RE: CITY OF SANDY <br> BULL RUN TERRACE SUBDIVISION <br> PRELIMINARY REVIEW (File No. 19- 050 CPA/ZC?SUB)

## Dear Shelley:

We have reviewed the submittal preliminary plans and supporting documents for the above noted development and have the following comments:

1. All earthwork activities on the project site should be in compliance with the recommendations of the geotechnical report prepared by GeoPacific Engineering, Inc., dated August 16, 2005. The above noted report should be referenced on the construction plans and a copy provided to the Contractor's to ensure all grading activities have been performed in conformance with the contents of the report. The grading setbacks, drainage and terracing should comply with the Oregon Structural Specialty Code (OSSC) requirements and the geotechnical report recommendations and conclusions as indicated in the report.
2. The developer should retain appropriate professional geotechnical services for the grading activities. When the grading is completed, a final report should be submitted to the City by the Geotechnical Engineer stating that adequate inspections and testing have been performed and all work is in compliance with the above noted report and the IBC.
3. We have reviewed the preliminary stormwater calculations that was provided with this submittal. The calculations are found to meet the water quality/quantity criteria as stated in the City of Sandy Development Code (SDC) 13.18 Standards and the City of Portland Stormwater Management Manual (SWMM) Standards, that were adopted by reference into the Sandy Development Code. However, a detailed final report stamped by a licensed professional shall be submitted for review with the final construction plans.
4. The site frontage with Hwy 26 should be subject to the review process of Oregon Department of Transportation (ODOT) and Development Requirements. The traffic impact study prepared by ARD Engineering, dated December 18, 2019 recommends a

Ms. Shelley Denison
February 20, 2020
Page 2
northwest bound left-turn lane and a southeast bound right turn on Hwy 26 at the intersection with Dubarko Road.
5. Street A shall be constructed to local street standards (28-foot wide paved surface, curbs on both sides, 5 -foot planter strips and 5 -foot wide sidewalks) in compliance with the City of Sandy Transportation System Plan (TSP), figure 12. The proposed 50-foot right of way is adequate.
6. Street B shall be constructed to match the existing street width (36-foot wide paved surface, curbs on both sides, 5 -foot planter strips and 6 -foot wide sidewalks) in compliance with the City of Sandy Transportation System Plan (TSP), figure 12. The proposed 50 -foot right of way is adequate.
7. Dubarko Road is classified by the City Transportation System Plan as a minor arterial. The proposed paved surface of 52 feet for the segment south of the intersection with Street A and Street B is adequate to include curbs on both sides, 5-foot planter strips, 6foot wide sidewalks and 5 -foot wide bike lanes.
8. Similarly, for Dubarko Road segment north of the intersection with Street A and Street B, the proposed paved surface of 54 feet is adequate. The left turn lane width should be increased to 12 feet and a median width be reduced to 10 feet. The improvements shall include curbs on both sides, 5 -foot planter strips, the sidewalks width should also be changed to 6 -foot wide and 5 -foot wide bike lanes. The traffic impact study prepared by ARD Engineering, dated December 18, 2019 restricts the turning movement from Hwy 26 to Dubarko Road to right-in only and for the turning movements from Dubarko Road to Hwy 26 to right-out only.
9. Sandy Development Code (SDC), section 17.84.50.H.5.b requires the intersection of all local streets with Dubarko Rd to have a minimum of 50 feet of straight tangent alignment perpendicular to the intersection. However, it is does not clearly state the "straight tangent" measurement limits. We suggest the "straight tangent" be measured from the face of the curb line and not at the intersection points.
10. The vertical design grade for landing at all the Tee intersections where controlled with "Stop" signs should be no greater than $8 \%$ for a minimum of 50 feet or two car lengths.
11. The intersection of Hwy 26 and Dubarko Rd should comply with the intersection sight distance standards. All other local street intersections should comply with the vision triangle standards.

Ms. Shelley Denison
February 20, 2020
Page 3
12. The developer's engineer should provide a profile design for a minimum of 200 feet for Street B future extension past the project boundary to ensure future grades can be met.
13. All ADA ramps shall be designed, inspected by the design engineer and constructed by the contractor to meet the most current PROWAG requirements.
14. All public sanitary sewer, waterline mains to be a minimum of 8-inches in diameter and a minimum of 12 -inches in diameter for storm drains and be extended to the plat boundaries where practical to provide future connections to adjoining properties.
15. The existing 8-inch waterline in Dubarko Rd, located between the south side of Hwy 26 and the easterly boundary line of Deer Pointe phase 1 Subdivision should be potholed and depth verified to assure acceptable cover is adequate from the new street grades.

We have no concerns about the proceedings with this project subject to the above stated comments.

Sincerely,

## CURRAN-McLEOD, INC.



Hassan Ibrahim, PE
cc: Mr. Mike Walker, City of Sandy

OREGON

## Bull Run Terrace 19-050 CPA/ZC/SUB

2 messages

## EXHIBIT T

Gary Boyles [fmboyles.sandyfire@gmail.com](mailto:fmboyles.sandyfire@gmail.com)
Tue, Feb 25,
To: sdenison@ci.sandy.or.us, "p.schneider@sandyfire.org" [p.schneider@sandyfire.org](mailto:p.schneider@sandyfire.org), d.patty3710@gmail.com
Hello Shelley,
It was nice to meet you today. As discussed, I am responding to you about the 7 lot subdivision that will extend Dubarko Rd and connect it to Hwy 26 . Sandy Fire is supportive of the propost provided that fire department access and water supply requirements are in compliance with the adopted Oregon Fire Code. The only concern that Sandy Fire has is the proposed access from Hwy 26 and the unprotected left turns. I would be couriers what comments ODOT will have as well as other City staff.

If you have any questions for me, please let me know.
Gary Boyles
Fire Marshal
Sandy Fire District No. 72
PO Box 518
17460 SE Bruns Ave.
Sandy, Oregon 97055
Business line: 503-668-8093
Cell number: 503-891-7042
CONFIDENTIALITY NOTICE- This email, and any attachments may contain information that is privileged, confidential, or otherwise exempt from disclosure under applicable law. It is intendel use of the person(s) names above. If you are not the intended recipient, you are hereby notified that any review, dissemination, distribution, or duplication of this communication is strictly proh not the intended recipient, please contact me by reply email and delete the message and any attachments from your system.

Cc: "p.schneider@sandyfire.org" [p.schneider@sandyfire.org](mailto:p.schneider@sandyfire.org), d.patty3710@gmail.com
Thanks Gary!
[Quoted text hidden]
--
Shelley Denison
Associate Planner
City of Sandy
Development Services Department
39250 Pioneer Blvd
Sandy, OR 97055
503-783-2587
sdenison@ci.sandy.or.us



Transit

## Memorandum

Date: February 28, 2020
To: Kelly O'Neill, Planning Director
Emily Meharg, Associate Planner
From: Andi Howell, Transit Director
Re: Transit Amenities
Bull Run Terrace Subdivision

The proposed development will require 2 concrete bus shelter pads and green benches (Fairweather model PL-3, powder-coated RAL6028). The required pad size is 7' x 9.5' and the amenities should be located on lot 1 and lot 5. Engineering specifications are available from the transit department.

If I can be of further assistance please contact me at 503-489-0925.


## EXHIBIT W

## REPLINGER \& ASSOCIATES LLC

TRANSPORTATION ENGINEERING

February 28, 2020

Ms. Shelley Denison
City of Sandy
39250 Pioneer Blvd.
Sandy, OR 97055

## SUBJECT: REVIEW OF TRANSPORTATION IMPACT STUDY - BULL RUN TERRACE SUBDIVISION

Dear Shelley:
In response to your request, I have reviewed materials submitted in support of the Bull Run Terrace Subdivision on Dubarko Road in the east part of Sandy. The Transportation Impact Study (TIS), dated December 18, 2019 was prepared under the direction of Michael Ard, PE of Ard Engineering.

The site, with approximately 16 acres, is on the southwest side of US 26 and is bisected by Dubarko Road. TIS describes a proposal to subdivide the property and construct up to 220 apartments and 6 single-family homes. The development proposes extending Dubarko Road, currently a stub street, to connect with US 26 opposite SE Vista Loop (West). Rezoning of the project site is proposed.

## Overall

I find the TIS addresses the city's requirements and provides an adequate basis to evaluate impacts of the proposed development.

## Comments

1. Study Area. The study addresses the appropriate intersections. It includes analyses of:

- US 26 at SE Ten Eyck Road;
- US 26 at SE Langensand Road;
- US 26 at SE Vista Loop Drive;
- Highway 211 at Dubarko Road; and
- Dubarko Road at SE Langensand Road.

2. Traffic Counts. The AM and PM peak hour traffic counts were conducted during March 2019. The engineer adjusted the traffic counts to account for seasonal variations. The
engineer used a combination approach to account for seasonal variation of recreational traffic and separately for commuter traffic on US 26. Volumes on Highway 211 were adjusted by a straight 8 percent. The methodology appears consistent with the procedures defined by the Oregon Department of Transportation (ODOT). The adjusted counts appear reasonable.
3. Trip Generation. The TIS uses trip generation for single-family dwellings and multifamily dwellings (land use code 210 and 220, respectively) from the Institute of Transportation Engineers' (ITE) Trip Generation Manual. The engineer calculates that the subdivision would produce 105 total AM peak hour trips; 125 total PM peak hour trips; and 1678 total daily trips. The calculation of trips generated by the development appears reasonable.
4. Trip Distribution. The TIS provided information about trip distribution from the site. The engineer assumed 65 percent of the traffic would travel to and from the northwest on US 26; 20 percent would travel to and from the southeast on US 26; and 15 percent would travel to and from the west on Dubarko Road. The trip distribution seems reasonable.

The TIS also accounts for some diversion of existing traffic due to the new connection between US 26 and Dubarko Road. The engineer explains that some traffic from the east could use this route to get to the south part of the city and the reverse movement. Diversion predicted by the engineer are significant and contribute to traffic issues at the intersection of Highway 211 and Dubarko. This is discussed in \#6 and \#10, below.
5. Traffic Growth. The TIS uses a 1.93 percent annual increase for Highway 26 based on projected volumes at the west boundary of Sandy. For Highway 211, the TIS uses an annual growth rate of 3.16 percent. For other facilities it uses a 2.0 percent annual growth rate to account for background traffic growth. "The Views," a 166-unit development on the north side of US 26 on Vista Loop was also included as an inprocess development. These assumptions account for future traffic and appear reasonable.
6. Analysis. Traffic volumes were calculated for the intersections cited in \#1, above. Intersection level-of-service (LOS) and the volume-to-capacity ( $\mathrm{v} / \mathrm{c}$ ) ratio were provided. The intersection of US 26 with SE Ten Eyck Road is signalized; the other intersections are stop-controlled. The analyses were conducted for existing 2019 conditions, 2021 background conditions, and 2021 with the development. Furthermore, the engineer evaluates traffic operations if the intersection of US 26 and Dubarko Road is restricted to, or operates as, right-in, right-out operation.

The engineer calculates that the signalized intersection of US 26 with Ten Eyck meets the $\mathrm{v} / \mathrm{c}$ standards specified by ODOT under all scenarios. At the intersection of US 26 with Langensand Road, the v/c for both the mainline and minor street approaches are calculated to meet ODOT's v/c standard. However, long delays (the basis for LOS) are calculated to occur on the minor street approaches under existing and future conditions.

The intersection of Dubarko Road and Langensand Road is predicted to operate acceptably under all scenarios. The intersection will operate at LOS "B" or better, meeting city operational standards.

The engineer also predicts that the intersection of US 26 and Dubarko Road/Vista Loop (west) will meet ODOT's v/c standard, but that long delays will occur on the minor street approaches. This led the engineer to calculate what would happen if the Dubarko Road approach were restricted to right-in, right-out. Restricting this to right-in, right-out movements reduces approach volumes, reduces delays, and improves the v/c ratio for the intersection. Even if right-in, right-out restrictions were not in place, extraordinarily long delays encountered by motorists seeking to make left turns from northeast-bound Dubarko Road onto US 26 is likely to cause them to choose alternative routes.

The engineer calculated that the intersection of Highway 211 with Dubarko Road would also meet ODOT's v/c standards, but like the US 26 intersections, long delays can be expected on the minor street approaches. Traffic volumes on Dubarko Road at Highway 211 are influenced by whether the intersection of US 26 with Dubarko Road is restricted to right-in, right-out. Turn restrictions at US 26 that limit diversion of traffic to Dubarko Road reduce traffic volumes for the entire length of Dubarko Road. This also impacts when signal warrants may be met at the intersection of Highway 211 and Dubarko Road. The engineer also evaluated traffic operations at this intersection using a roundabout. He calculated operations would be improved but noted that topographic constraints - a steep grade - would complicate installation of a roundabout.

The engineer concluded that "the study intersections are projected to operate acceptably through year 2021 either with or without the addition of site trips from the proposed development and the diversion of through trips between US 26 and Highway 211 onto Dubarko Road." He also notes that, due to long delays, motorists will likely not choose to make left turns from northeast bound Dubarko Road to westbound US 26. I concur with the engineer's conclusions.

A queuing analysis was also undertaken to determine the appropriate queue storage for the intersection of US 26 and Dubarko Road. For left turns from northwest-bound US 26 to Dubarko Road, he calculated a $95^{\text {th }}$ percentile queue length of 112 feet. For the
northeast-bound left-turn lane for Dubarko Road at US 26, he calculated a $95^{\text {th }}$ percentile queue length of 129 feet.
7. Crash Information. The TIA provides information on crashes for the most recent available five-year period covering 2012 through 2016.

At the intersection of US 26 and SE Ten Eyck Road, there were nine reported and a relatively low crash rate. At the intersection of US 26 and Langensand Road, there were four reported crashes and a low crash rate. At the intersection of Dubarko Road and Langensand Road, there was one reported crash. At US 26 and Vista Loop, there were no reported crashes.

The intersection of Highway 211 and Dubarko Road has been a safety concern for years and has undergone safety improvements. During the five-year period, 28 crashes were reported. Crashes remain a problem following implementation of safety improvements that included realigning the Dubarko Road approaches and added striping on Highway 211. The engineer notes that the crash history indicates warrants are met for all-way stop control. He recommends ODOT consider installation of all-way stop control to address safety issues. I concur.
8. Site Plan and Access. The site plan provides for the extension of Dubarko Road. It will serve as the principal access to the development. Three intersections are proposed along Dubarko Road within the development. The proposed site plan includes a new four-leg intersection on Dubarko Road that will provide access both north and south of Dubarko Road. Additionally, the area on the northwest side of Dubarko Road will have a second access in the form of a connection to Fawn Street at the west side of the development. Homes on the southeast side of Dubarko Road will have a second access in the form of a T-intersection on Dubarko Road approximately 125 feet northeast of the four-leg intersection. The planned intersections within the project site on Dubarko Road provide distances of approximately 375 feet and 500 feet between the near sides of the intersections and the northeast-bound stop bar at US 26. These distances provide adequate separation to be appear appropriate.
9. Sight Distance. The engineer analyzed sight distance at the proposed intersection of US 26 and Dubarko Road. He concluded that sight distance exceeded 1200 feet in each direction, a distance appropriate for a $65-\mathrm{mph}$ roadway. The engineer recommended no mitigation for sight distance. I concur.
10. Traffic Signa/ Warrants. The engineer conducted a thorough analysis of traffic signal warrants at the intersection of Highway 211 and Dubarko Road. He concluded that if a new intersection allowing all movements at US 26 and Dubarko Road is constructed; if

Ms. Shelley Denison
February 28, 2020
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"The Views" development is constructed; and if this development is constructed, traffic signal warrants would be met for the $30^{\text {th }}$ highest hour in 2021. With background traffic growth, traffic signal warrants would be met for average weekday conditions by 2024. If full movements are not provided at the intersection of US 26 and Dubarko Road, traffic volumes along the entire length of Dubarko Road are significantly reduced and traffic volume warrants at the intersection of Highway 211 and Dubarko Road are not met.

The engineer also analyzed warrants for all-way stop control at the intersection of Highway 211 and Dubarko Road. He concluded warrants for all-way stop control were met based on crash history and would be met for minimum traffic volumes with additional traffic diversion to Dubarko Road and from developments. He further analyzed traffic operations with all-way stop control and concluded that the intersection would operate at LOS "C" with a v/c of 0.71 . He recommends that ODOT consider allway stop control at the intersection.
11. Left-Turn Lane Warrants. The TIS indicates that left-turn lanes are provided on eastbound US 26 at Langensand Road. It indicates that the intersection of US 26 at Dubarko Road is projected to meet warrants for a northwest-bound left-turn lane and a southeast-bound right-turn lane upon completion of the extension of Dubarko Road as proposed with this development.

According to the engineer, the intersection of Highway 211 at Dubarko Road currently meets warrants for a northbound left-turn lane and a northbound right-turn lane. However, the need for these turn lanes is not related to the proposed development. He further states that turn lane warrants would not be applicable and added lanes may not be needed if all-way stop control is installed at the intersection as recommended based on his safety analysis, or if a traffic signal is installed at the intersection.

Turn lanes are not warranted at the intersection of Dubarko Road and Langensand Road. The engineer recommends consideration be given to reorienting the stop signs to favor Dubarko Road rather than Langensand Road if volumes increase on Dubarko Road.
12. Transportation Planning Rule Considerations. The TIS provides a detailed analysis of the individual requirements of the TPR. The engineer calculated trips based on the current zoning and on the proposed zoning. The subject property is currently zoned with a mix of 8.05 acres of R-1, 5.01 acres of R-2 and 2.84 acres of C-3 zoning. Under the proposed plan, the zoning will include, 1.95 acres will of POS (Parks \& Open Space), 0.59 acres of R-1, and 11.00 acres of R-3. The remainder of the site area will be public right of way.

Under the current zoning, the engineer calculates full development would generate 98 AM peak hour trips; 184 PM peak hour trips; and 1788 weekday trips. Under the proposed zoning, the engineer calculates full development would generate 105 AM peak hour trips; 128 PM peak hour trips; and 1678 weekday trips. The difference in the AM peak hour is not significant; the PM and weekday trips are lower.

The engineer concludes that no changes to the city's street classification designation or standards are warranted by the rezoning and that the proposed rezoning does not have a significant effect on the transportation system and that mitigation is not necessary. He concludes the Transportation Planning Rule is satisfied. I concur with the engineer's conclusions.
13. Conc/usions and Recommendations. The engineer concludes that the intersections will meet ODOT and city operational standards for the study area intersections either with or without the development.

With the completion of Dubarko Road and a new intersection with US 26, northeastbound motorists on Dubarko Road can expect extraordinarily long delays. Motorists may choose alternative routes. The system has adequate capacity if the US 26/Dubarko Road intersection were restricted to, or effectively operated as right-in, right-out.

While most study area intersections are operating relatively safely, the intersection of Highway 211 and Dubarko Road suffers from a high number of crashes and a high crash rate. Recent safety improvements to not appear to have altered this trend. The proposed development and a new connection of Dubarko Road with US 26 can be expected to increase the traffic using the intersection of Highway 211 and Dubarko Road. The engineer recommends ODOT consider converting the intersection of Highway 211 and Dubarko Road to all-way stop control for safety reasons based on the historical data. He recommends no other mitigation to address safety issues.

The engineer concludes traffic signals will be warranted at the intersection of Highway 211 and Dubarko Road in the near future based on development and on the completion of Dubarko Road, which provides opportunities for rerouting of traffic that currently remains on US 26.

The engineer concludes that turn lanes will be warranted at the intersection of US 26 and Dubarko Road with the completion of Dubarko Road.

The engineer concludes that sight distance is adequate for the new intersection of US 26 and Dubarko Road.

The engineer concludes that the rezoning of the property will not produce a significant change in traffic volumes and will not have a significant effect on the transportation system. He concludes the Transportation Planning Rule is satisfied.

I concur with the engineer's conclusions.

## Conclusion and Recommendations

Based on the information provided by the applicant, I find the TIS meets city requirements. The engineer used appropriate methods and documents his procedures and conclusions.

Because of its location, this development will implement a key project in the city's Transportation System Plan, namely Dubarko Road. Dubarko Road is classified as a minor arterial. Much of the systemwide impact of the development as describe in the TIS is a result of providing a new connection - a connection that will result in diversion of traffic from US 26 to Dubarko Road.

With its connection to US 26, Dubarko Road will become increasingly important to the transportation system. There are implications for operations at the intersection of Dubarko Road and Langensand Road and at the intersection of Highway 211 and Dubarko Road. For the former, it may be appropriate to reorient the stop signs to give priority to Dubarko Road when traffic volumes increase.

At the intersection of Highway 211 and Dubarko Road, the engineer recommends ODOT consider converting the intersection to all-way stop control as a possible safety measure to address historical crash issues. Traffic signal warrants may be met in the not-too-distant future due to traffic diversion on Dubarko Road and growth in the community.

It is important to recognize that trips generated by this development will have some impact on the transportation system, but that much of the predicted impact is from the implementation of Dubarko Road as specified in the city's Transportation System Plan. The construction of the missing segment of Dubarko Road adjacent to US 26 will also necessitate modification to the intersection of US 26 Nista Loop/Dubarko Road. The engineer has provided information about queue storage requirements and has warned of long delays for motorists on the minor street approaches.

It may be appropriate for this development to participate in some off-site improvements, such as intersection improvements at US 26 and Dubarko Road or Highway 211 and Dubarko Road. However, much of the impact described in the TIS is associated with the implementation of Dubarko Road, a project specified in the city's Transportation System Plan.

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February 28, 2020
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To the extent that the developer is required to implement projects or participate in projects involving facilities under the jurisdiction of ODOT, conditions of approval should be included requiring that the development comply with the requirements standards and procedures specified by ODOT. I recommend that that ODOT requirements and standards associated with frontage improvements where the development abuts US 26 be made conditions of approval for the development.

If you have any questions or need any further information concerning this review, please contact me at replinger-associates@comcast.net.

Sincerely,


John Replinger, PE
Principal
BullRunTerraceTIS022820

Department of Transportation
Region 1 Headquarters 123 NW Flanders Street
Portland, Oregon 97209
(503) 731.8200

FAX (503) 731.8259

March 20, 2020

ODOT \#10566

## ODOT Response

| Project Name: Bull Run Terrace | Jurisdiction Case \#: 19-50 CPA/ZC/SUB |
| :--- | :--- |
| Jurisdiction: City of Sandy | State Highway: US 26 and OR 211 |
| Site Address: No Situs: US 26 and Dubarko <br> Road, Sandy, OR |  |

The site of this proposed land use action is for a 7 lot subdivision to be developed with single family detached dwellings and multi-family condos. Comp plan and zoning map amendment to change current designations from C3, R2 and R1 to a mix of R3, R1, parks, and open space. The development proposes to construct a new public road connection to US 26 at Dubarko Rd. US 26 and OR 211 are under ODOT jurisdiction. ODOT is currently working with the City of Sandy to transfer jurisdiction of OR 211 to the city. ODOT has permitting authority for these facilities and an interest in ensuring that this proposed land use is compatible with its safe and efficient operation. Please direct the applicant to the District Contact indicated below to determine permit requirements and obtain application information.

## COMMENTS/FINDINGS

## US 26 and Dubarko Rd Intersection and Access Control

It has been determined that the subject property's highway frontage is access controlled. ODOT has acquired and owns access rights along the subject property's frontage. The City of Sandy Transportation System Plan identifies a new public street connection of Dubarko Rd to US 26. Since Dubarko Road will be extended through the subject property to the highway as a public road and will provide additional properties access to the state highway through the local street system, the City will need to obtain a "Grant of Access" for a public approach. The City will need to document that the proposed road connection is identified in the Transportation System Plan and demonstrate a benefit to the highway. Grant of Access criteria and requirements can be found at OAR 731-051-2020 and Benefit to the Highway OAR 731-051-4030.

The Traffic Impact Study (TIS) prepared by Ard Engineering dated 12/18/19, shows that in 2021 the northeast bound approach on Dubarko Rd at US 26 is projected to operate with high delays. As mitigation, the study recommends that the new connection to the highway be restricted to right in/right out movements. ODOT is unlikely to support the restriction of turning movements at the intersection. Through the Grant of Access process, the City will be required to provide a 20 year traffic analysis which should recommend the intersection configuration at that time. The city will enter into an Intergovernmental Agreement to construct the project.

For information on the Grant of Access process, please contact Marcela Rodriguez, P.E. at 503-731-8494 or marcela.rodriguez@odot.state.or.us. Note: It may take 6 months to a year to process a Grant of Access.

## OR 211 and Dubarko Rd Intersection

The TIS submitted with the proposed development recommends that ODOT consider all way stop control to address safety issues and has indicated that traffic warrants are projected to be met in the near future. Since ODOT is currently working with the city to transfer jurisdiction of OR 211, we recommend the city consider these mitigations as part of the Transportation System Plan Update.

All alterations within the State highway right of way are subject to the ODOT Highway Design Manual (HDM) standards. Alterations along the State highway but outside of ODOT right-of-way may also be subject to ODOT review pending its potential impact to safe operation of the highway. If proposed alterations deviate from ODOT standards a Design Exception Request must be prepared by a licensed engineer for review by ODOT Technical Services. Preparation of a Design Exception request does not guarantee its ultimate approval. Until more detailed plans have been reviewed, ODOT cannot make a determination whether design elements will require a Design Exception.

Note: Design Exception Requests may take up to 3 months to process.
All ODOT permits and approvals must reach $100 \%$ plans before the District Contact will sign-off on a local jurisdiction building permit, or other necessary requirement prior to construction.

## Comprehensive Plan and Zoning Map Amendments

ODOT concurs with the TIS finding that the proposed comprehensive plan and zoning map amendments would decrease the amount of site generated trips and therefore will not have a significant effect on state highway facilities per the Transportation Planning Rule OAR 660-012-0060.

## ODOT RECOMMENDED LOCAL CONDITIONS OF APPROVAL

- ODOT recommends that the site layout and development be consistent with the approved and adopted Transportation System Plan, including:
- The Dubarko Street extension to US 26, aligned with the westerly most SE Vista Loop Drive intersection (see additional comments under 'Dubarko Street Extension and Access Control').
- Accommodation of a Collector road terminating at the southern extents of the subject property to allow the road to extend south from the westernmost leg of the SE Vista Loop Drive intersection. Note: the applicant only needs to accommodate and construct the collector on their property.
- Curb, sidewalk, cross walk ramps, bikeways and road widening along US 26 constructed as necessary to be consistent with local, ODOT and ADA standards.

Please send a copy of the Notice of Decision including conditions of approval to:
ODOT R1_DevRev@odot.state.or.us

| Development Review Planner: Marah Danielson | 503.731 .8258, <br> marah.b.danielson@odot.state.or.us |
| :--- | :--- |
| Traffic Contact: Avi Tayar, P.E. | 503.731 .8221 <br> Abraham.tayar@odot.state.or.us |
| District Contact: Loretta Kieffer | 503.667 .7441 <br>  Loretta.L.KIEFFER@odot.state.or.us |

# EXHIBIT Y 

MEMORANDUM
TO: SHELLEY DENISON, ASSOCIATE PLANNER
FROM: MIKE WALKER, PUBLIC WORKS DIRECTOR
RE: BULL RUN TERRACE - FILE NO. 19-050
DATE: APRIL 29, 2020
The following are Public Works' comments on the above-referenced application:

## Transportation

The proposed street and utility plan depicts Dubarko Rd. between its current eastern terminus and proposed Street A with a 76 ft . wide right-of-way consisting of a 0.5 ft . monumentation strip, a six-foot sidewalk, a five-foot planter strip, a 0.5 ft . curb, a fivefoot bike lane, a 17-foot travel lane and half of an 8 ft . median for a total half section equaling 38 feet and a full section equaling 76 feet. The standard section for an arterial street in the TSP consists of 11 -foot travel lanes with 5 -foot bike lanes. It is not clear why the proposed travel lanes are so wide.

The portion of Dubarko Rd. between Street A west to the west boundary of the development should be used to provide a transition from the proposed three lane section with median to a two lane section with median to match the existing section. The proposed 17 -foot wide travel lanes will be confusing to motorists.

The applicant shall submit a revised cross-section for this portion of Dubarko Rd. with the public improvement plans for the project for City Engineer review and approval.

The traffic analysis makes several references to a right-in/right-out intersection at Dubarko Rd. and US 26. These references are in the context of analysis of the performance of other study intersections examined in the TIS and not a proposal to construct a right-in/right-out intersection at this location.

The adopted Transportation System Plan (TSP) does not contemplate a right-in/rightout intersection at US 26 and Dubarko Rd. The intersection of US 26 and Dubarko Rd. shall be constructed as a full-access intersection in compliance with the TSP.

The alignment of Street B and Dubarko Rd. does not provide the minimum 100 ft . of tangent alignment (as measured from the curb line on Dubarko extended) on Street B as required by section 17.84 .50 H.5.a of the Sandy Municipal Code (SMC). The alignment of this intersection shall be revised to provide the minimum 100 ft . tangent section to comply with the Code.

The applicant shall provide a 40 ft . x 40 ft . right-of-way dedication or permanent traffic signal easement at the northeast corner of lot 7 to accommodate a future traffic signal.

The widening of Dubarko Rd. to accommodate the section recommended in the TSP is eligible for Transportation System Development Charge credits. The difference in cost
between the required minor arterial improvements and a standard local street section is eligible for credits. Estimated costs shall be submitted to City and reviewed and approved by the City Engineer. The City and the Applicant shall enter into an agreement defining the eligible improvements and estimated costs prior to plat approval. SDC credits shall be based on final audited costs.

Any ODOT-required improvements on and adjacent to the US 26 frontage of the site are not included in the City's TSP or capital plans and as such are not eligible for SDC credits or reimbursement.

## Utilities

WATER - The existing 8" diameter water line resides in an easement granted to the City of Sandy recorded at 2004-110340. This waterline must be replaced with an 8" diameter water line with no more than 42 " or less than 36 " of cover. There will be no compensation or credits for replacement of the existing water line. This pipe is a standard pressure line and will be used to provide domestic water service to the development.

The City's water master plan shows an 18" diameter water line in Dubarko Rd. south of US 26. The applicant shall install an 18" water line in Dubarko Rd. connected to the existing 18" water line at the west end of the site and the existing 12" line on US 26. Due to the elevation of the site relative to the existing water reservoirs on Vista Loop Dr. this line will be a low-pressure, high volume line and will be used for fire protection. The cost difference between a standard diameter water line and the required 18" water line is eligible for Water System Development Charge (SDC) credits. The amount of the credit provided will be based on the Water System Construction Cost Credit table in the Water System Development Charge Methodology adopted by City Council motion on September 5, 2017.

Section 17.84.60D SMC states: "As necessary to provide for orderly development of adjacent properties, public facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies)". The applicant shall extend the existing 12" water main in US 26 east from the proposed intersection of Dubarko Rd. and US 26 to the east boundary of the site. The cost difference between a standard diameter (8") water line and the required 12" water line is eligible for Water System Development Charge (SDC) credits. The amount of the credit provided will be based on the Water System Construction Cost Credit table in the Water System Development Charge Methodology adopted by City Council motion on September 5, 2017.

STORMWATER - All site runoff (including new runoff from the widened surfaces of US 26) shall be detained such that post-development runoff does not exceed the predevelopment runoff rate for the $2,5,10$ and 25 year storm events. Stormwater quality treatment shall be provided for all site drainage per the standards in the City of Portland Stormwater Management Manual (COP SWMM).

SANITARY SEWER - Sanitary sewage from lots 1 through 6 will drain to the existing Southeast pump station. The recently adopted Wastewater System Facilities Plan (2019) identified a capacity deficiency in the Southeast pump station and force main as well as several conveyance lines downstream.

The City will adopt a Sanitary Sewer SDC surcharge on each Equivalent Residential Unit developed in the basin served by the Southeast pump station. The surcharge amount will be calculated by dividing the estimated cost of the required capacity improvements by the estimated number of dwelling units that can be built in the pump station drainage basin. The surcharge will be collected with each building permit issued in the basin.

## General

The geotechnical report (2005) submitted with the application is nearly fifteen years old. It does not appear that there have been physical changes to the existing surface of the site in that time span that would impact the findings and recommendations in the geotechnical report but there may have been changes in industry standards or practices since then. As a result, the Applicant shall submit a letter from the original geotechnical engineering firm indicating that the findings and recommendations from the 2005 report remain substantially unchanged or modifying the original findings and recommendations as necessary.

# EXHIBIT Z <br> <br> REPLINGER \& ASSOCIATES LLC 

 <br> <br> REPLINGER \& ASSOCIATES LLC}

TRANSPORTATION ENGINEERING

August 10, 2020

Ms. Shelley Denison
City of Sandy
39250 Pioneer Blvd.
Sandy, OR 97055

SUBJECT: REVIEW OF TRANSPORTATION IMPACT STUDY - BULL RUN TERRACE SUBDIVISION

Dear Shelley:
In response to your request, I have reviewed materials submitted in support of the Bull Run Terrace Subdivision on Dubarko Road in the east part of Sandy. The Transportation Impact Study (TIS), dated July 12, 2020, was prepared under the direction of Michael Ard, PE of Ard Engineering. A preliminary plot, dated 6/29/2020 was also provided.

The site, with approximately 16 acres, is on the southwest side of US 26 and is bisected by Dubarko Road. TIS describes a proposal to subdivide the property and construct up to 158 apartments and 4 single-family homes. A portion of the development is zoned for commercial uses but is not proposed to be developed at this time. The development proposes extending Dubarko Road, currently a stub street, to connect with US 26 opposite SE Vista Loop (West). Rezoning of the project site is proposed.

## Overall

I find the TIS addresses the city's requirements and provides an adequate basis to evaluate impacts of the proposed development.

## Comments

1. Study Area. The study addresses the appropriate intersections. It includes analyses of:

- US 26 at SE Ten Eyck Road;
- US 26 at SE Langensand Road;
- US 26 at SE Vista Loop Drive;
- Highway 211 at Dubarko Road; and
- Dubarko Road at SE Langensand Road.

2. Traffic Counts. The AM and PM peak hour traffic counts were conducted during March 2019. The engineer adjusted the traffic counts to account for seasonal variations. The engineer used a combination approach to account for seasonal variation of recreational traffic and separately for commuter traffic on US 26. Volumes on Highway 211 were adjusted by a straight 8 percent. The methodology appears consistent with the procedures defined by the Oregon Department of Transportation (ODOT). The adjusted counts appear reasonable.
3. Trip Generation. The TIS uses trip generation for single-family dwellings and multifamily dwellings (land use code 210 and 220, respectively) from the Institute of Transportation Engineers' (ITE) Trip Generation Manual. The engineer calculates that the subdivision would produce 76 total AM peak hour trips; 92 total PM peak hour trips; and 1194 total daily trips. This calculation does not include potential trips associated with the future development of the commercially zoned land within the development area. The calculation of trips generated by the residential development appears reasonable.
4. Trip Distribution. The TIS provided information about trip distribution from the site. The engineer assumed 65 percent of the traffic would travel to and from the northwest on US 26; 20 percent would travel to and from the southeast on US 26; and 15 percent would travel to and from the west on Dubarko Road. The trip distribution seems reasonable.

The TIS also accounts for some diversion of existing traffic due to the new connection between US 26 and Dubarko Road. The engineer explains that some traffic from the east could use this route to get to the south part of the city and the reverse movement. Diversion predicted by the engineer are significant and contribute to traffic issues at the intersection of Highway 211 and Dubarko. This is discussed in \#6 and \#10, below.
5. Traffic Growth. The TIS uses a 1.93 percent annual increase for Highway 26 based on projected volumes at the west boundary of Sandy. For Highway 211, the TIS uses an annual growth rate of 3.16 percent. For other facilities it uses a 2.0 percent annual growth rate to account for background traffic growth. "The Views," a 166-unit development on the north side of US 26 on Vista Loop was also included as an inprocess development. These assumptions account for future traffic and appear reasonable.
6. Analysis. Traffic volumes were calculated for the intersections cited in \#1, above. Intersection level-of-service (LOS) and the volume-to-capacity ( $\mathrm{v} / \mathrm{c}$ ) ratio were provided. The intersection of US 26 with SE Ten Eyck Road is signalized; the other intersections are stop-controlled. The analyses were conducted for existing 2019 conditions, 2022

Ms. Shelley Denison

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background conditions, and 2022 with the development. Furthermore, the engineer evaluates traffic operations if the intersection of US 26 and Dubarko Road is restricted to, or operates as, right-in, right-out operation.

The engineer calculates that the signalized intersection of US 26 with Ten Eyck meets the $\mathrm{v} / \mathrm{c}$ standards specified by ODOT under all scenarios. At the intersection of US 26 with Langensand Road, the $\mathrm{v} / \mathrm{c}$ for both the mainline and minor street approaches are calculated to meet ODOT's v/c standard. However, long delays (the basis for LOS) are calculated to occur on the minor street approaches under existing and future conditions.

The intersection of Dubarko Road and Langensand Road is predicted to operate acceptably under all scenarios. The intersection will operate at LOS " $B$ " or better, meeting city operational standards.

The engineer also predicts that the intersection of US 26 and Dubarko Road/Vista Loop (west) will meet ODOT's v/c standard, but that long delays will occur on the minor street approaches. This led the engineer to calculate what would happen if the Dubarko Road approach were restricted to right-in, right-out. Restricting this to right-in, right-out movements reduces approach volumes, reduces delays, and improves the v/c ratio for the intersection. Even if right-in, right-out restrictions were not in place, extraordinarily long delays encountered by motorists seeking to make left turns from northeast-bound Dubarko Road onto US 26 is likely to cause them to choose alternative routes.

The engineer calculated that the intersection of Highway 211 with Dubarko Road would also meet ODOT's v/c standards, but like the US 26 intersections, long delays can be expected on the minor street approaches. Traffic volumes on Dubarko Road at Highway 211 are influenced by whether the intersection of US 26 with Dubarko Road is restricted to right-in, right-out. Turn restrictions at US 26 that limit diversion of traffic to Dubarko Road reduce traffic volumes for the entire length of Dubarko Road. This also impacts when signal warrants may be met at the intersection of Highway 211 and Dubarko Road. The engineer also evaluated traffic operations at this intersection using a roundabout. He calculated operations would be improved but noted that topographic constraints - a steep grade - would complicate installation of a roundabout.

The engineer concluded that "the study intersections are projected to operate acceptably through year 2021 either with or without the addition of site trips from the proposed development and the diversion of through trips between US 26 and Highway 211 onto Dubarko Road." He also notes that, due to long delays, motorists will likely not choose to make left turns from northeast bound Dubarko Road to westbound US 26. I concur with the engineer's conclusions.

Ms. Shelley Denison

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A queuing analysis was also undertaken to determine the appropriate queue storage for the intersection of US 26 and Dubarko Road. For left turns from northwest-bound US 26 to Dubarko Road, he calculated a $95^{\text {th }}$ percentile queue length of 112 feet. For the northeast-bound left-turn lane for Dubarko Road at US 26, he calculated a $95^{\text {th }}$ percentile queue length of 80 feet. The engineer also notes that the queue for northeastbound Dubarko Road at US 26 could extend to 277 feet.
7. Crash Information. The TIA provides information on crashes for the most recent available five-year period covering 2012 through 2016.

At the intersection of US 26 and SE Ten Eyck Road, there were nine reported and a relatively low crash rate. At the intersection of US 26 and Langensand Road, there were four reported crashes and a low crash rate. At the intersection of Dubarko Road and Langensand Road, there was one reported crash. At US 26 and Vista Loop, there were no reported crashes.

The intersection of Highway 211 and Dubarko Road has been a safety concern for years and has undergone safety improvements. During the five-year period, 28 crashes were reported. Crashes remain a problem following implementation of safety improvements that included realigning the Dubarko Road approaches and added striping on Highway 211. The engineer notes that the crash history indicates warrants are met for all-way stop control. He recommends ODOT consider installation of all-way stop control to address safety issues. I concur.
8. Site Plan and Access. The site plan provides for the extension of Dubarko Road. It will serve as the principal access to the development. Three intersections are proposed along Dubarko Road within the development. The proposed site plan includes a new four-leg intersection on Dubarko Road that will provide access both north and south of Dubarko Road. Additionally, the area on the northwest side of Dubarko Road will have a second access in the form of a connection to Fawn Street at the west side of the development. A stub street on the southeast side of Dubarko Road will provide for a connection to adjacent properties when they develop.

The TIS states "It is anticipated that there may also be private access driveways on Dubarko Road within the subject property. Future access driveways should be located outside the standing queue for the intersection of Highway 26 at Dubarko Road or be restricted to right-in, right-out access only in order to ensure that they can operate safely and efficiently." The reason for this anticipated future access is not specified in the TIS, but this future access is presumably associated with future commercial development. I agree with the engineer's conclusion and recommendation. It will be

Ms. Shelley Denison
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important to consider access to Dubarko Road in subsequent development applications. Limiting access to Dubarko Road, a minor arterial, should be minimized to protect its function and the capacity of this important facility. Private driveways serving individual parcels should be avoided.
9. Sight Distance. The engineer analyzed sight distance at the proposed intersection of US 26 and Dubarko Road. He concluded that sight distance exceeded 1200 feet in each direction, a distance appropriate for a $65-\mathrm{mph}$ roadway. The engineer recommended no mitigation for sight distance. I concur.
10. Traffic Signal Warrants. The engineer conducted a preliminary traffic signal analysis warrants at several locations based on ODOT procedures.

Traffic signal warrants were not met for the intersections of US 26 with Dubarko Road or US 26 at Langensand Road based on 2022 volumes with the development. Based on regional growth and the Sandy Transportation System Plan (TSP), the eventual need for a traffic signal at either location may be anticipated.

The engineer also conducted an analysis of traffic signal warrants at the intersection of Highway 211 and Dubarko Road. He concluded that if a new intersection allowing all movements at US 26 and Dubarko Road is constructed; if "The Views" development is constructed; and if this development is constructed, traffic signal warrants would be met for the $30^{\text {th }}$ highest hour in 2021. With background traffic growth, traffic signal warrants would be met for average weekday conditions by 2024. If full movements are not provided at the intersection of US 26 and Dubarko Road, traffic volumes along the entire length of Dubarko Road are significantly reduced and traffic volume warrants at the intersection of Highway 211 and Dubarko Road are not met.

The engineer also analyzed warrants for all-way stop control at the intersection of Highway 211 and Dubarko Road. He concluded warrants for all-way stop control were met based on crash history and would be met for minimum traffic volumes with additional traffic diversion to Dubarko Road and from developments. He further analyzed traffic operations with all-way stop control and concluded that the intersection would operate at LOS " C " with a v/c of 0.74 . He recommends that ODOT consider allway stop control at the intersection.
11. Left-Turn Lane Warrants. The TIS indicates that left-turn lanes are provided on eastbound US 26 at Langensand Road. It indicates that the intersection of US 26 at Dubarko Road is projected to meet warrants for a northwest-bound left-turn lane and a southeast-bound right-turn lane upon completion of the extension of Dubarko Road as proposed with this development.

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According to the engineer, the intersection of Highway 211 at Dubarko Road currently meets warrants for a northbound left-turn lane and a northbound right-turn lane. However, the need for these turn lanes is not related to the proposed development. He further states that turn lane warrants would not be applicable and added lanes may not be needed if all-way stop control is installed at the intersection as recommended based on his safety analysis, or if a traffic signal is installed at the intersection.

Turn lanes are not warranted at the intersection of Dubarko Road and Langensand Road. The engineer recommends consideration be given to reorienting the stop signs to favor Dubarko Road rather than Langensand Road if volumes increase on Dubarko Road.
12. Transportation Planning Rule Considerations. The TIS provides a detailed analysis of the individual requirements of the TPR. The engineer calculated trips based on the current zoning and on the proposed zoning. The subject property is currently zoned with a mix of 8.05 acres of R-1, 5.01 acres of R-2 and 2.84 acres of C-3 zoning. Under the proposed plan, the zoning will include, 1.43 acres will of POS (Parks \& Open Space), 0.59 acres of $\mathrm{R}-1,7.91$ acres of $\mathrm{R}-3$, and 3.12 acres of $\mathrm{C}-3$. The remainder of the site area will be public right of way.

Under the current zoning, the engineer calculates full development would generate 98 AM peak hour trips; 184 PM peak hour trips; and 1788 weekday trips. Under the proposed zoning, the engineer calculates full development would, after accounting for pass-by trips associated with the future commercial development, generate 99 AM peak hour trips; 180 PM peak hour trips; and 2064 weekday trips. The difference in the AM and PM peak hour is not significant; the weekday trips are higher by 274 trips. The engineer points to the Oregon Highway Plan Policy 1F5, which describes daily traffic volume increases less than 400 daily trips as a "small increase."

The engineer concludes that no changes to the city's street classification designation or standards are warranted by the rezoning and that the proposed rezoning does not have a significant effect on the transportation system and that mitigation is not necessary. He concludes the Transportation Planning Rule is satisfied. I concur with the engineer's conclusions.
13. Conclusions and Recommendations. The engineer concludes that the intersections will meet ODOT and city operational standards for the study area intersections either with or without the development.

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With the completion of Dubarko Road and a new intersection with US 26, northeastbound motorists on Dubarko Road can expect extraordinarily long delays. Motorists may choose alternative routes. The system has adequate capacity if the US 26/Dubarko Road intersection were restricted to, or effectively operated as right-in, right-out.

While most study area intersections are operating relatively safely, the intersection of Highway 211 and Dubarko Road suffers from a high number of crashes and a high crash rate. Recent safety improvements to not appear to have altered this trend. The proposed development and a new connection of Dubarko Road with US 26 can be expected to increase the traffic using the intersection of Highway 211 and Dubarko Road. The engineer recommends ODOT consider converting the intersection of Highway 211 and Dubarko Road to all-way stop control for safety reasons based on the historical data. He recommends no other mitigation to address safety issues.

The engineer concludes traffic signals will be warranted at the intersection of Highway 211 and Dubarko Road in the near future based on development and on the completion of Dubarko Road, which provides opportunities for rerouting of traffic that currently remains on US 26.

The engineer concludes that turn lanes (a northeast-bound left-turn lane on Dubarko Road, and a southeast-bound right-turn lane on US 26) will be warranted at the intersection of US 26 and Dubarko Road with the completion of Dubarko Road. The engineer notes that the northeast-bound left-turn lane would not be needed if the Dubarko Road approach were restricted to right-in, right-out. While this is true, failing to construct Dubarko Road to accommodate a northeast-bound left-turn lane would be short-sighted and would not be consistent with the Sandy TSP's designation of Dubarko Road as a minor arterial.

The engineer concludes that sight distance is adequate for the new intersection of US 26 and Dubarko Road.

The engineer concludes that the rezoning of the property will not produce a significant change in traffic volumes and will not have a significant effect on the transportation system. He concludes the Transportation Planning Rule is satisfied.

I concur with the engineer's conclusions.

## Conclusion and Recommendations

Based on the information provided by the applicant, I find the TIS meets city requirements. The engineer used appropriate methods and documents his procedures and conclusions.

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Because of its location, this development will implement a key project in the city's Transportation System Plan, namely Dubarko Road. Dubarko Road is classified as a minor arterial. Much of the systemwide impact of the development as describe in the TIS is a result of providing a new connection - a connection that will result in diversion of traffic from US 26 to Dubarko Road.

With its connection to US 26, Dubarko Road will become increasingly important to the transportation system. There are implications for operations at the intersection of Dubarko Road and Langensand Road and at the intersection of Highway 211 and Dubarko Road. For the former, it may be appropriate to reorient the stop signs to give priority to Dubarko Road when traffic volumes increase.

At the intersection of Highway 211 and Dubarko Road, the engineer recommends ODOT consider converting the intersection to all-way stop control as a possible safety measure to address historical crash issues. Traffic signal warrants may be met in the not-too-distant future due to traffic diversion on Dubarko Road and growth in the community.

It is important to recognize that trips generated by this development will have some impact on the transportation system, but that much of the predicted impact is from the implementation of Dubarko Road as specified in the city's Transportation System Plan. The construction of the missing segment of Dubarko Road adjacent to US 26 will also necessitate modification to the intersection of US 26/Vista Loop/Dubarko Road. The engineer has provided information about queue storage requirements and has warned of long delays for motorists on the minor street approaches.

It may be appropriate for this development to participate in some off-site improvements, such as intersection improvements at US 26 and Dubarko Road or Highway 211 and Dubarko Road. However, much of the impact described in the TIS is associated with the implementation of Dubarko Road, a project specified in the city's Transportation System Plan.

Dubarko Road should be developed to minor arterial standards through the subject property. The developer should be put on notice that any future land use actions, such as development of the C-3 property, will need to address traffic impacts and access. Limits on access involving access spacing and possible turn restrictions may be necessary to protect the function of Dubarko Road and to avoid unacceptable impacts on the operations and safety of the intersection of US 26 and Dubarko Road.

As noted in \#6, above, the engineer predicts that the northeast-bound queue on Dubarko Road could extend to 277 feet. The preliminary plat suggests that Parcel 6, proposed to be

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zoned R-3, would have full access to Dubarko Road. No details are provided about this access in either the TIS or the site plan. If the city chooses to allow direct access to Dubarko Road from Parcel 6 on the southeast side of Dubarko Road, access should be at least 277 feet southwest of US 26 to avoid interference with queues extending from the US 26/Dubarko Road intersection. Providing access to Parcel 6 from "B" Street would be preferable to protect the function of Dubarko Road.

To the extent that the developer is required to implement projects or participate in projects involving facilities under the jurisdiction of ODOT, conditions of approval should be included requiring that the development comply with the requirements standards and procedures specified by ODOT. I recommend that that ODOT requirements and standards associated with frontage improvements where the development abuts US 26 be made conditions of approval for the development.

If you have any questions or need any further information concerning this review, please contact me at replinger-associates@comcast.net.

Sincerely,


John Replinger, PE
Principal
BullRunTerraceTIS081020

## EXHIBIT AA

August 12, 2020

Mr. Marisol Martinez
\& Ms. Shelley Denison
City of Sandy
39250 Pioneer Blvd.
Sandy, OR 97055

## RE: CITY OF SANDY BULL RUN TERRACE SUBDIVISION PRELIMINARY REVIEW (File No. 19-050 CPA/ZC/SUB) REVISED

Dear Marisol and Shelley:
We have reviewed the new preliminary submittal and supporting documents and compared them to the February 2020 submittal for the above noted development. We have modified our comments as shown below to reflect the new findings:

1. The previous preliminary stormwater calculations dated November 20, 2019 that was provided with the February 2020 submittal was found to meet the water quality/quantity criteria as stated in the City of Sandy Development Code (SDC) 13.18 Standards and the City of Portland Stormwater Management Manual (SWMM) Standards, that were adopted by reference into the Sandy Development Code. However, a detailed final report stamped by a licensed professional shall be submitted for review with the final construction plans.
2. The site frontage with Hwy 26 should be subject to the review process of Oregon Department of Transportation (ODOT) and Development Requirements. The traffic impact study prepared by ARD Engineering, dated July 12, 2020 recommends a northwest bound left-turn lane and a southeast bound right turn on Hwy 26 at the time Dubarko Road extends to Hwy 26. The northbound left-turn lane would not be needed at the time of the project completion if the intersection is limited to right-in, right-out only.
3. Street A shall be constructed to local street standards (28-foot wide paved surface, curbs on both sides, 5 -foot planter strips and 5 -foot wide sidewalks) in compliance with the City of Sandy Transportation System Plan (TSP), figure 12. The proposed 50-foot right of way is adequate.
4. Street B shall be constructed to match the existing street width (36-foot wide paved surface, curbs on both sides, 5 -foot planter strips and 6 -foot wide sidewalks) in compliance with the City of Sandy Transportation System Plan (TSP), figure 12. The proposed 50 -foot right of way is adequate.

Mr. Marisol Martinez
\& Ms. Shelley Denison
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5. Dubarko Road is classified by the City Transportation System Plan as a minor arterial. The proposed paved surface of 52 feet for the segment south of the intersection with Street A and Street B is adequate to include curbs on both sides, 5-foot planter strips, 6foot wide sidewalks and 5 -foot wide bike lanes.
6. Similarly, for Dubarko Road segment north of the intersection with Street A and Street B, the proposed paved surface of 54 feet is adequate. The left turn lane width should be increased to 12 feet and a median width be reduced to 10 feet. The improvements shall include curbs on both sides, 5 -foot planter strips, the sidewalks width should also be changed to 6 -foot wide and 5 -foot wide bike lanes. The traffic impact study prepared by ARD Engineering, dated July 12, 2020 restricts the turning movement from Hwy 26 to Dubarko Road to right-in only and for the turning movements from Dubarko Road to Hwy 26 to right-out only.
7. Sandy Development Code (SDC), section 17.84.50.H.5.b requires the intersection of all local streets with Dubarko Rd to have a minimum of 50 feet of straight tangent alignment perpendicular to the intersection. However, it is does not clearly state the "straight tangent" measurement limits. We suggest the "straight tangent" be measured from the face of the curb line and not at the intersection points.
8. The vertical design grade for landing at all the Tee intersections where controlled with "Stop" signs should be no greater than $8 \%$ for a minimum of 50 feet or two car lengths.
9. The intersection of Hwy 26 and Dubarko Rd should comply with the intersection sight distance standards. All other local street intersections should comply with the vision triangle standards.
10. The developer's engineer should provide a profile design for a minimum of 200 feet for Street B future extension past the project boundary to ensure future grades can be met.
11. All ADA ramps shall be designed, inspected by the design engineer and constructed by the contractor to meet the most current PROWAG requirements.
12. All public sanitary sewer, waterline mains to be a minimum of 8-inches in diameter and a minimum of 12 -inches in diameter for storm drains and be extended to the plat boundaries where practical to provide future connections to adjoining properties.
13. The existing 8 -inch waterline in Dubarko Rd, located between the south side of Hwy 26 and the easterly boundary line of Deer Pointe phase 1 Subdivision should be potholed and depth verified to assure acceptable cover is adequate from the new street grades.

Mr. Marisol Martinez
\& Ms. Shelley Denison
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We have no concerns about the proceedings with this project subject to the above stated comments.

Sincerely,
CURRAN-McLEOD, INC.

cc: Mr. Mike Walker, City of Sandy

# SANDY FIRE DISTRICT NO. 72 Fire Prevention Division 

## E-mail Memorandum

## EXHIBIT BB

To: Shelley Denison
From: Gary Boyles
Date: August 13, 2020
Re: Revised Submittals: 19-050 Bull Run Terrace 7-Lot Subdivision

Review and comments are based upon the current version of the Oregon Fire Code (OFC) as adopted by the Oregon Office of State Fire Marshal. The scope of this review is typically limited to fire apparatus access and water supply, although the applicant shall comply with all applicable OFC requirements. When buildings are completely protected with an approved automatic fire sprinkler system, the requirements for fire apparatus access and water supply may be modified as approved by the fire code official. References, unless otherwise specified, include provisions found in the Metro Code Committee's Fire Code Applications Guide, OFC Chapter 5 and appendices $\mathrm{B}, \mathrm{C}$ and D .

## COMMENTS:

## General

1. Construction documents detailing compliance with fire apparatus access and fire protection water supply requirements shall be provided to Sandy Fire District for review and approval.
2. Where fire apparatus access roads or a water supply for fire protection are required to be installed, such protection shall be installed and made serviceable prior to and during the time of construction except where approved alternative methods of protection are provided.

## Fire Apparatus Access

1. Dead-end streets in excess of 150 ft ., resulting from a phased project, are to be provided with an approved temporary turnaround. (Street B).
2. Not less than two approved means of fire apparatus access will be required for multiplefamily residential projects having more than 100 dwelling units.

Exception: Projects having up to 200 dwelling units will be approved with only one means of fire apparatus access where all buildings, including nonresidential occupancies, are equipped throughout with an approved automatic sprinkler system installed in accordance with OFC Section 903.3.1.1 or 903.3.1.2.

If more than 200 dwelling units, not less than two approved means of fire apparatus access will be required.
3. Commercial and industrial buildings exceeding three stories or 30 feet in height shall have not fewer than two means of fire apparatus access for each building.
4. Commercial and industrial buildings having a gross building area of more than 62,000 square feet ( 124,000 square feet if equipped throughout with an approved automatic sprinkler systems) shall be provided with two separated and approved fire apparatus access roads.
5. Where two access roads are required, they shall be placed a distance apart equal to not less than one half of the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses.
6. Fire apparatus access roadway grades shall not exceed 10 percent. Intersections and turnarounds shall be as level as possible and have a maximum of 5 percent grade with the exception of crowning for water run-off.
7. Fire apparatus access roads shall have an unobstructed driving surface width of not less than 20 feet ( 26 feet adjacent to a fire hydrant, exclusive of shoulders) and an unobstructed vertical clearance of 13 feet 6 inches.
8. Where fire apparatus roadways are not of sufficient width (Dubarko Rd. and Streeet B) to accommodate parked vehicles and 20 feet of unobstructed driving surface, "NO PARKING-FIRE LANE" signs shall be placed on one or both sides of the roadway and in turnarounds as needed.
9. Streets and roads shall be identified with approved signs. Temporary signs shall be installed at each street intersection when construction of new roadways allows passage by vehicles.

## Firefighting Water Supplies

1. The minimum available fire-flow and flow duration for commercial and industrial buildings shall be as specified in OFC Appendix B. In no case shall the resulting fireflow be less than $1,500 \mathrm{gpm}$ at 20 psi residual.
2. The minimum available fire flow for one- and two-family dwellings served by a municipal water supply shall be $1,000 \mathrm{gpm}$ at 20 psi residual provided the fire area of the dwelling(s) does not exceed 3,600 square feet. For dwellings that exceed 3,600 square feet, the required fire-flow shall be determined in accordance with OFC Appendix B, Table B105.1(2).
3. For one- and two-family dwellings served by a municipal water system, all portions of the dwellings shall be located within 600 feet from a fire hydrant on a fire apparatus access road, as measured in an approved route that is approved by the fire code official.
4. For commercial and industrial buildings served by a municipal water system where a portion of the building is more than 400 feet from a fire hydrant on a fire apparatus access road ( 600 feet for buildings equipped throughout with an approved automatic sprinkler system), as measured in an approved route around the exterior of the building, on-site fire hydrants and mains shall be provided.
5. If applicable, fire department connections (FDC) shall be remote from the structure they serve and located within 100 feet of a fire hydrant. All FDC's shall be permanently labeled with appropriate address in which it serves and shall be accessible and visible from the fire apparatus access road.
6. Prior to the start of combustible construction, required fire hydrants shall be operational and accessible.
7. Fire hydrants installed within the Sandy Fire District shall comply with the following requirements:
a. Flow requirements and location of fire hydrants will be reviewed and approved by Sandy Fire upon building permit submittal.
b. Each new fire hydrant installed shall be ordered in an OSHA safety red finish and have a 4 -inch non-threaded metal faced hydrant connection with cap installed on the steamer port. If a new building, structure, or dwelling is already served by an existing hydrant, the existing hydrant shall also be OSHA safety red and have a 4-inch non-threaded metal faced hydrant connection with cap installed.
8. The minimum number and distribution of fire hydrants shall be in accordance with City of Sandy requirements and OFC Appendix C.

## NOTE:

Sandy Fire District comments may not be all inclusive based on information provided. A more detailed review may be needed for future development to proceed.

Please do not hesitate to contact Fire Marshal Gary Boyles at 503-891-7042 or fmboyles.sandyfire@gmail.com should you have any questions or concerns.

# PRE-APPLICATION CONFERENCE NOTES EXHIBIT CC 

Project Name: Anna Estates
Pre-Application Conference Date: January 30, 2018
Applicant Name: Christopher M. Tews
Engineer Name: All County Surveyors and Planners
Staff: Thomas Fisher, Emily Meharg, Kelly O’Neill Jr., James A. Cramer \& Mike Walker

## PLANNING DEPARTMENT REVIEW

Sandy Development Code (SDC): Sandy Development Code (SDC) Sections 17.12 Procedures for Decision Making; 17.18 Processing Applications; 17.22 Notices; 17.26 Zoning Map Amendments; 17.30 Zoning Districts; 17.36 R-1 Low Density Residential Zoning District; 17.38 R-2 Medium Density Residential Zoning District; C-3 Village Commercial Zoning District; 17.66 Adjustments and Variances; 17.80 Additional Setbacks on Collectors; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.90 Landscaping and Design Standards; 17.92 Landscaping and Screening; 17.98 Parking, Loading and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; and Chapter 15.30 Dark Sky.

Caveat: This analysis includes a review of those code sections that may conflict with the proposed design as submitted. This review is not intended to be a comprehensive analysis of all applicable code sections.

## Amendments Needed for Proposal

- Comprehensive Map amendment
- Zoning Map amendment
- Transportation System Plan amendment
- Waterline Easement amendment/vacation


## Parking Analysis

- No on-street parking will be permitted on Dubarko Road.
- Locations of the driveways should be identified for review (SDC 17.90.90.B.5).
- 2 off-street parking spaces per dwelling required (SDC 17.98.20), demonstrate compliance.
- On-street parking plan shall be submitted for review. One space required for every dwelling unit within 200 feet of each lot (SDC 17.98.200).


## Access and Utilities

- The alignment of Dubarko Rd. does not match the Transportation System Plan (TSP) therefore an amendment to the TSP would have to occur to accommodate the existing proposal. Chapter 3, Table 8 Roadway Improvement Projects and Cost - Preferred Plan and Figure 15 Motor Vehicle System Plan details the TSP alignments.
- There is a Waterline Easement (Rec. No. 2004-110340) within the site which is designed to follow the TSP alignment of Dubako Rd. This would need to be vacated or amended.
- Frontage improvements along each proposed street frontage within the development is required per Public Works standards.
- Submit a traffic impact analysis (TIA). Need $\$ 1,500$ for third party traffic consultant.
- Vision clearance areas must remain unobstructed (SDC 17.74.30).
- Easements for public sanitary sewer, water, storm drain, pedestrian and bicycle facilities shall be provided whenever these facilities are located outside a public right-of-way.
- The west adjacent development obtained Corps/DSL blessing to bury the intermittent stream on their site. The same stream traverses the subject property. It appears as an intermittent stream on our Locally Significant Wetlands map and is designated TCL on the map. Applicant responsible for researching and providing any communication from the appropriate agency regarding this element of the project.


## Other Planning Items

- The proposed subdivision will require a Comprehensive Plan amendment as Village requires mixture of residential and non-residential. These requests go before the Planning Commission for recommendation and the City Council for review and approval/denial.
- The proposed subdivision will require a Zone Map amendment. This process goes before the Planning Commission for recommendation and City Council for review and approval/denial.
- "Density Calculations" appear accurate based on proposal and information provided.
- Site plan illustrates 31 SF lots while plans indicate 32 SF lots, clarification needed.
- Landscaping is required on Tract A (Landscape standards within SDC 17.92).
- Setback standards can be found in SDC 17.36.30 (R1), 17.38.30(R2) and 17.40.30 (R3).
- A variance would be required to allow a single stack housing development (the 4 lots on the south border of the development), two tier required per SDC 17.100.120 (Dubarko is identified as a Minor Arterial).
- Section 17.80 .20 states any structure located on streets identified in the Transportation System Plan as an arterial shall have a minimum setback of 20 feet measured from the property line. This applies to applicable front, rear and side yards. (Dubarko is identified as a Minor Arterial).
- All buildings fronting Dubarko Road require a primary entrance oriented toward Dubarko (Special Setbacks on Transit Streets within SDC 17.82.20) or variance needed.
- Building Orientation standards set forth in SDC 17.82 must be upheld or variance needed.
- Blocks can't be greater than 400 feet unless justified by topographic, natural area, or other physical conditions. Blocks greater than 400 feet require a variance. Blocks greater than 600 feet require a pedestrian and bicycle access way (17.100.120.B). Additional detail needed to determine if the proposal is compliant with this section of the code.
- A geotechnical study will need to be done for any area at 25 percent slope or greater that is proposed to contain development.
- A wetland mitigation study will define restricted development areas on the site, which in turn will define tree retention requirements in those areas. Will need to define the top of bank for Tickle Creek.
- Submit an arborist report and tree plan for trees 8-inches DBH and greater (and trees 6-inches DBH and greater in the restricted development area). Tree retention at 3 trees per acre. Trees must be 11 " DBH or greater and in good health. Identify on the plans which trees are to be removed as well as retained.


## Parkland and Open Space

- Per SDC 17.86.10 Minimum Parkland Dedication Requirements the project would need to provide 1.6 acres for parks
$(60 \times 3 \times .0043=.7740$ rounded to .77 acres $)$ SF, Zero Lot line \& Duplex
( $96 \times 2 \times .0043=.8256$ rounded to .83 acres ) Multi
- Because the subject property is adjacent to the Deer Pointe Subdivision which provided a parkland dedication and the location of the subdivision is underserved by parkland, the City has previously required dedication of parkland and Staff will uphold that requirement with the proposed subdivision. Section 17.86.40 details that Cash In-Lieu of Dedication is at the city's discretion.
- Land to be dedicated will need to be identified as Parks Open Space (POS) and go through a Zone Map Amendment process (can be done simultaneously with any proposed Zone Map Amendments needed for the project).
- Buildings and streets surrounding proposed parks would need to adhere to Section 17.86.20 design standards for layout.


## Transit Amenity

- The proposed development will require a transit amenity on HWY 26. The amenity required is a $5^{\prime} \mathrm{X}$ $7.5^{\prime}$ bus shelter, which includes a bench, mounted on a $7^{\prime} \mathrm{X} 9.5^{\prime}$ pad. The shelter is to be located east of the zero lot line homes, adjacent to the planned duplex homes or 24 unit apartment building. ODOT would prefer to see the shelter on the "far side" south side of the new HWY 26/Dubarko Rd. intersection.

Application Process: Type IV Map Amendments, III SUB review with requested variances (most likely at least two-three variances), tree removal permit, FSH Overlay review. Need to determine process, cost, and scoping of TSP Modification.

## Projected Processing Steps:

- Submittal Requirements: See requirements lists on City of Sandy website. https://www.ci.sandy.or.us/Planning-Requirements/
- Fees: $\$ 2,200$ Zoning Map Amendment; \$2,900 Comprehensive Plan Amendment; \$2,900 Amendment to TSP (does not include third party review fees for TSP consultant); $\$ 3,000$ for Type III subdivision review plus $\$ 80$ per lot; $\$ 1,000$ per variance; $\$ 700$ for FSH Overlay review; $\$ 150$ for Tree Removal review; $\$ 1,500$ for Third Party traffic consultant.
- Staff review for completeness (30 days max.), if determined incomplete then the applicant submits additional information as required, staff then reviews for completeness again, if the application is deemed complete then the application is processed.


## PRE-APPLICATION CONFERENCE NOTES

Project Name: 6-Lot Subdivision and 216-Unit Condominium Complex ( $3^{\text {rd }}$ Meeting, $1^{\text {st }}$ held $1 / 30 / 18$, $2^{\text {nd }}$ held 6/12/18)
Pre-Application Conference Date: October 10
Applicant Name: Christopher M. Tews (Roll Tide Properties)
Engineer Name: All County Surveyors and Planners
Staff: James Cramer, Kelly O'Neill Jr., Emily Meharg, Mike Walker, Thomas Fisher, Josh Brooking,

## PLANNING DEPARTMENT REVIEW

Sandy Development Code (SDC): Sandy Development Code (SDC) Sections 17.12 Procedures for Decision Making; 17.18 Processing Applications; 17.22 Notices; 17.26 Zoning Map Amendments; 17.30 Zoning Districts; 17.36 R-1 Low Density Residential Zoning District; R-3 High Density Residential District; 17.80 Additional Setbacks on Collectors; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.98 Parking, Loading and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; and Chapter 15.30 Dark Sky.

Caveat: This analysis includes a review of those code sections that may conflict with the proposed design as submitted. This review is not intended to be a comprehensive analysis of all applicable code sections nor shall this review nullify code requirements that are determined necessary during land use review.

## Amendments Needed for Proposal

- Comprehensive Map Amendment (Village to Applicant's Proposal)
- Zoning Map Amendment (R-2 \& C-3 to R-3)
- ODOT would require Transportation Planning Rule (TPR) findings for the zoning map amendments. ODOT explained the same requirements from the last meeting are applicable (see attached).


## Parking Analysis

- No on-street parking will be permitted on Dubarko Road. On-street parking on the collector street heading south (Street A) will need to be discussed.
- Locations of the driveways for the six SF lots should be identified for review (SDC 17.90.90.B.5).
- 2 off-street parking spaces per dwelling required (SDC 17.98.20) for single family dwellings, demonstrate compliance.
- On-street parking plan shall be submitted for review. One space required for every dwelling unit within 200 feet of each lot (SDC 17.98.200). Demonstrate compliance.
- With regards to the proposed multi-family dwelling development the required number of parking spaces for Tract C should be 135 spaces and Tract D should be 225 based on the information provided. This will be evaluated in detail during land use approval.
- Design, Size and Access requirements for parking shall meet SDC 17.98 .60 while on-site circulation shall meet 17.98.70.
- Handicapped parking spaces shall be 9 feet wide by 18 feet with access aisles (striped area on the passenger side). Accessible parking shall be provided for all uses in compliance with the requirements of the State of Oregon (ORS 447.233) and the Americans with Disabilities Act. Demonstrate compliance.


## Access and Utilities

- There is a Waterline Easement (Rec. No. 2004-110340) within the site which is designed to follow the TSP alignment of Dubarko Rd.
- Frontage improvements along each proposed street frontage within the development is required per Public Works standards.
- Submit a traffic impact analysis (TIA). TIA should demonstrate that the maximum permitted density of the subject property can be accommodated including multi-family dwelling units. Will require $\$ 1,500$ for third party traffic consultant.
- Vision clearance areas must remain unobstructed (SDC 17.74.30).
- Easements for public sanitary sewer, water, storm drainage, pedestrian and bicycle facilities shall be provided whenever these facilities are located outside a public right-of-way.
- The development to the west of the subject site has buried the intermittent stream on their site. The same stream traverses the subject property. It appears as an intermittent stream on our Locally Significant Wetlands map and is designated TCL on the map. Applicant is responsible for researching and providing any communication from the appropriate agency regarding this element of the project.
- VNAR required on Lots $4-6$ as well as Tracts $C$ and $D$ to ensure there is no vehicular driveway on Dubarko Road.
- Ensure separation requirements between Street A and Meadow Avenue is met. 17.100.110(E) recommends spacing of 8-10 local streets per mile (528-660 feet).
- The City's TSP shows a placement of the proposed Street A further to the west, within submitted narrative provide justification for the proposed placement.
- A pedestrian connection should be included connecting Tracts C \& E to the Dubarko Road right-of-way sidewalk.
- The ingress/egress points from Tracts D \& E should align. The access points being staggered/offset like shown on the site plan does not work.
- HWY 26 will need improvements per ODOT. The City of Sandy will want street trees between the HWY 26 sidewalk and the curb which may require a Design Exception request through ODOT.
- Intersection of Dubarko Road and HWY 26 needs to have a width appropriate to accommodate a double left turn lane, median and bike lane. The proposed 76 feet of right-of-way may be adequate; however, additional analysis is required to confirm. SDC credit eligible for street larger than a local street segment.
- Collector Street (Street A, south of Dubarko only) shall be at least 60 feet in width to accommodate travel lanes, bike lanes, planter strips, 6 foot wide sidewalks, curbs, and monumentation areas. More right-of-way may need to be dedicated if on-street parking is required on Street A.
- There's only a single 6 -inch water line, which is inadequate for the subdivision. You would need to complete a water model analysis for fire flow and domestic water.
- Conduit and vault infrastructure are required for all new developments. Please coordinate with SandyNet General Manager for infrastructure requirements and design standards.
- Applicant responsible for obtaining ODOT "Grant of Access" and complete "Approach Application" for the Dubarko/HWY 26 connection. See ODOT comments for additional details on process.
- A draft of the proposed easement language within Tracts C \& E shall be submitted for review at time of initial application.


## Other Planning Items

- The proposed subdivision will require a Comprehensive Plan amendment as Village requires a mixture of residential and non-residential uses. This plan amendment request goes before the Planning Commission for recommendation and the City Council for review and approval/denial.
- A Zone Map amendment is required to establish new boundaries for R-1 and R-3 rezone as well as Parks and Open Space (POS) with the parkland dedication. This zone change process goes before the Planning Commission for recommendation and City Council for review and approval/denial.
- Density Calculations on submitted plan sheet have been calculated per code requirements:
- R-1: there is approximately . 91 net acres therefore density shall be between 5-7 units (58 units/net acre)
- R-3: there is approximately 11.08 net acres therefore density shall be between 111-222 units (10-20 units/net acre)
- Demonstrate Lot 3 meets the 50 foot Minimum Average Lot Width based on the Lot Width definition, "Lot Width: The horizontal distance between the midpoints of the side lot lines".
- $\quad$ Setback standards can be found in SDC 17.36 .30 (R-1) and 17.40.30 (R-3).
- Section 17.80.20 states any structure located on streets identified in the Transportation System Plan as an arterial shall have a minimum setback of 20 feet measured from the property line. This applies to applicable front, rear and side yards. Dubarko is identified as a Minor Arterial, and HWY 26 is a Transit Street therefore Lots 4-6 and Tracts C, D \& E must adhere to this standard.
- All buildings fronting Dubarko Road and/or HWY 26 require a primary entrance oriented toward Dubarko (Special Setbacks on Transit Streets within SDC 17.82.20) or variance needed. Building Orientation standards set forth in SDC 17.82 must be upheld or variance needed.
- The garages along HWY 26 need robust SandyStyle elements including items such as dormers, a mixture of siding types, etc. Subsection 17.90.160 Parking lots in multi-family developments shall not occupy more than $50 \%$ of the frontage of any public street abutting the lot or building.
- A geotechnical study will need to be done for any area at 25 percent slope or greater that is proposed to contain development.
- A wetland mitigation study will define restricted development areas on the site, which in turn will define tree retention requirements in those areas.
- Submit an arborist report and tree plan for trees 8 -inches DBH and greater (and trees 6 -inches DBH and greater in the restricted development area). Tree retention at 3 trees per acre. Trees must be 11" DBH or greater and in good health. Identify on the plans which trees are to be removed as well as retained. All significant trees (8-inches DBH and greater) should be preserved to the extent practicable.
- Multi-Family Dwelling proposal would need to be more detailed with site planning, proposed pedestrian connections, parking, design of buildings, landscaping, shared outdoor recreation, etc.
- Retaining walls proposed on the site? If so what are their heights, materials, etc.? We will want the walls to be textured and include details to remove monotonous planes.
- If the apartments are proposed to have a clubhouse building it will need to adhere to standards in 17.90.120 as we view the clubhouse building as a non-residential use in a residential zone for design standard purposes.


## Parkland and Open Space

- Per SDC 17.86.10 Minimum Parkland Dedication Requirements the project would need to provide 1.94 acres ( 84,506 SF) for parks (Formula: Required parkland dedication (acres) = (proposed units) x (persons/unit) x 0.0043 (per person park land dedication factor)
( $6 \times 3 \times .0043=.0774$ rounded to .08 acres) SF
( $216 \times 2 \times .0043=1.8576$ rounded to 1.86 acres) Multifamily
- 29,829 SF (. 7 acres) deficiency in required Parkland Dedication.
- Because the subject property is adjacent to the Deer Pointe Subdivision which provided a parkland dedication and the location of the subdivision is underserved by parkland, the City has previously required dedication of parkland and staff will uphold that requirement with the proposed subdivision. Section 17.86.40 details that Cash In-Lieu of Dedication is at the city's discretion. Add the deficient parkland area or request the City consider a payment of $\$ 168,700$ In-Lieu Fee of dedication for the difference.
- Land to be dedicated will need to be identified as Parks and Open Space (POS) and go through a Zone Map Amendment process (can be done simultaneously with any proposed Zone Map Amendments needed for the project).
- Buildings and streets surrounding proposed parks would need to adhere to Section 17.86.20 design standards for layout. Lot 1 shall be oriented with the front of the house facade facing Tract A (proposed parkland dedication). Additionally, consider redesigning the site plan of Tract C to relocate a building to border the land proposed to be dedicated for parkland.
- Per 17.86.20 a street shall abut the east side of the park or the applicant shall request a special variance. City would want an analysis on the number of street parking that would be eliminated if a variance were to be granted.


## Transit Amenity

- The proposed development will require two complimentary bus shelter pads each with a green bench (Fairweather model PL-3, powder-coated RAL6028). The required pad size is 7' $\times 9.5^{\prime}$. One pad is to be located before Street A on the north side of Dubarko Road. The complimentary pad is to be located north of the fire access to Dubarko Rd. Exact locations and engineering specifications are available from the transit department.

Application Process: Type IV Comp Plan and Type IV Zoning Map Amendments, Type III SUB review with requested variances, tree removal permit, FSH Overlay review. *Type II Design Review needed for apartments or Type III Design review if deviations are requested.

## Projected Processing Steps:

- Submittal Requirements: Land Use Application Form, Supplemental Land Use Application Form No. 1, Narrative, Detailed Site Plan, Tentative Plat, Utility Plan, Stormwater Analysis, Traffic Impact Study, Grading and Erosion Control Plan, Arborist Report \& Tree Retention Plan, Photometric study with fixture cut sheets of the lights to be used, Easement Draft Language and Architectural elevations.

See requirements lists on City of Sandy website. https://www.ci.sandy.or.us/Planning-Requirements/

- Grant of Access and Approach Application (see attached comments and email from ODOT)
- Fees: $\$ 2,350$ Zoning Map Amendment; \$3,100 Comprehensive Plan Amendment; \$3,210 for Type III subdivision review plus \$86 per lot (\$946 11 lots including Tracts A-E); \$320-\$1,070 per variance (dependent on type of request); $\$ 750$ for FSH Overlay review; $\$ 160$ for Tree Removal review; $\$ 1,500$ for Third Party traffic consultant. Other fees may be identified. * Does not include Design Review fees associated with Multi-Family Dwelling development.
- Staff review for completeness (30 days max.), if determined incomplete then the applicant submits additional information as required, staff then reviews for completeness again, if the application is deemed complete then the application is processed.

January 27, 2020

Roll Tide Properties Corporation
ATTN: Dave Vandehey
PO Box 703
Cornelius, OR 97113

All County Surveyors \& Planners, Inc.
ATTN: Ray Moore
PO Box 955
Sandy, OR 97055

Tracy Brown Planning Consultants, LLC
ATTN: Tracy Brown
17075 Fir Drive
Sandy, OR 97055
Johnson Economics
ATTN: Jerry Johnson
621 SE Alder, Ste. 605
Portland, OR 97205

## RE: NOTICE REGARDING COMPLETION OF SUBMISSION

FILE NUMBER: 19-050 CPA/ZC/SUB
PROJECT NAME: Bull Run Terrace
$\square \quad$ Application accepted as complete on: $\qquad$

Application incomplete. The additional information necessary to consider your application is listed below. The application will be deemed complete upon submission of one of the following options:

1. All of the missing information;
2. Some of the missing information and written notice that no other information will be provided; or
3. Written notice that none of the missing information will be provided.

If one of the above listed options is not received by the city by the $180^{\text {th }}$ day following submittal of your application, the application will be void per state law (ORS 227.178 (4)).
$\square \quad$ Requested additional information filed on: $\qquad$
Following submission of your land use application (received on $12 / 30 / 2019$ ), staff finds the application incomplete. Please submit the following:

- \$1,500 third party fee for traffic review
- $\$ 164$ tree application review fee
- Clarification on narrative regarding Section 17.86.20 explaining if a variance is being requested and detailing how the future units will provide housing units 'fronting on the parkland'. I would suggest including an elevation of the apartments or something similar for Planning Commission and City Council to consider. While the apartments are not being reviewed as part of this application the subdivision layout is being reviewed and considerations for the east side of the park will need to be considered with this application.
- Clarification on the public needs analysis from Johnson Economics regarding if this analysis and conclusions were reviewed by the Department of Land Conservation and Development (DLCD). The application and more specifically the analysis from Johnson Economics will be reviewed by DLCD as part of the PAPA notice. As analyzed by Johnson Economics the City is processing another comprehensive plan and zoning map change on McCormick Drive. I want to allow the applicant to reach out to DLCD prior to deeming this application complete.
- Digital copy of all items
- 8 additional copies of the plan set and narrative
- 2 additional copies of all other plans and reports

Please call me at (503) 489-2163 or email koneill@ci.sandy.or.us if you have any questions.
Sincerely,

Kelly O’Neill Jr.
Development Services Director

February 14, 2020

Roll Tide Properties Corporation
ATTN: Dave Vandehey
PO Box 703
Cornelius, OR 97113
All County Surveyors \& Planners, Inc.
ATTN: Ray Moore
PO Box 955
Sandy, OR 97055

Tracy Brown Planning Consultants, LLC
ATTN: Tracy Brown
17075 Fir Drive
Sandy, OR 97055
Johnson Economics
ATTN: Jerry Johnson
621 SE Alder, Ste. 605
Portland, OR 97205

RE: NOTICE REGARDING COMPLETION OF SUBMISSION FILE NUMBER: 19-050 CPA/ZC/SUB PROJECT NAME: Bull Run Terrace

区 Application accepted as complete on: February 14, 2020
$\square \quad$ Application incomplete. The additional information necessary to consider your application is listed below. The application will be deemed complete upon submission of one of the following options:

1. All of the missing information;
2. Some of the missing information and written notice that no other information will be provided; or
3. Written notice that none of the missing information will be provided.

If one of the above listed options is not received by the city by the $180^{11}$ day following submittal of your application, the application will be void per state law (ORS 227.178 (4)).

- Requested additional information filed on: $\qquad$
Following submission of your land use application (received on 12/30/2019) and additional materials received on $2 / 11 / 2020$, staff finds the application complete for the purpose of beginning the " 120 -day clock." At this time staff will begin reviewing the application.

Please call me at (503) 783-2587 or email sdenison@ci.sandy.or.us if you have any questions.
Sincerely,


Associate Planner

OREGON

# Roll Tide Properties Corp. request for development at Deer Point 

'ame williams' via Planning [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)
Thu, Apr 23, 2020 at 3:43 PM
Reply-To: ame williams [amewilliams0955@yahoo.com](mailto:amewilliams0955@yahoo.com)
To: "planning@ci.sandy.or.us" [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us), "sdenison@ci.sandy.or.us" [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)
Cc: Kyle Robinson [kidder74@gmail.com](mailto:kidder74@gmail.com)

Dear City of Sandy Planning Division,
April 23, 2020

Thank you for your letter dated April 17, 2020 regarding the applicant Roll Tide Properties request for adding a development behind our homes. I am a resident at 18402 Antler Ave., one street West of Meadow and have read through the proposal and would like to take this opportunity to tell you a little about my home here and my philosophy about expansion.

I am incredibly happy that Sandy can expand in size and population, and that the applicant has the necessary means to provide space for families. The arrangement seems correct considering water lines and the space you will need for the additional traffic. Our home sits next to two corner homes with large families and all the vehicles for each driving member of the households, including trucks for work. It was the largest concern for me on deciding the purchase of our home. We have our narrow little entry into the driveway and up into the garage. It feels very claustrophobic and there are times I feel sick about it. However, the house is two stories and feels like a cozy treehouse inside because of the elevation of the property. I really love the house (Not including the parking issue). And, I love it for what we have in nature. Behind our home is a run of coniferous and deciduous trees that absolutely light up my day, every day. When I come home from my long drive from Portland and look out at the gorgeous trees, all the stress melts away. They are beautiful and add a dimension to our neighborhood that will be totally lost in our lifetimes, forever if they are removed. From Sunrises, to sunsets, to harvest moons and the seasons, the trees offer some of the most fantastic backdrops for light to play among the tops. And, if that is the case, can you say snowfall view? Again, priceless, and beautiful.

In reviewing the tree map on the back of the proposal, I cannot see that any of these trees are slated to be saved. Understandably, some need to be removed for all the various reasons in construction. How can Roll Tide reevaluate the tree situation? There must be a zone of 10 feet or so that would allow the trees to stand? I have not walked back there to see myself, but I am also not versed in building a neighborhood. I do however ask, please, if we could keep more of the trees along the back of Meadow Ave. They truly are a part of what makes this neighborhood feel like home, like a permanent home. Without the trees, my treehouse will look out beyond what I know is missing and I cannot imagine the view will be better. I could be reading the tree map incorrectly, but I do not think I am. I am grateful for the patch of trees on the North side of the plan, but it will not help our neighborhood with texture and warmth. If all the trees along that boundary are removed, we will look like any other neighborhood, in any other place in the US.

Thank you for your time. I am pessimistic that the chance of keeping more trees will be a primary request, but I am also hopeful, others in the neighborhood have the same concern. Please, please City of Sandy, ask about keeping the tree line safe. I state that I feel the application should be amended to include keeping the trees parallel to Meadow Ave.

If there is an update on the removal of the trees, please let us know. Also, this letter came to our home we lived in before we moved to Sandy. Please update our address to 18402 Antler Ave. 97055.

Sincerely,
Amelia Williams Robinson
817-320-9534
amewilliams0955@yahoo.com

## Disagreement on Proposal File \# 19-050 CPA/ZC/SUB

## 1 message

'Miriam Chmykhalov' via Planning [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)
Reply-To: Miriam Chmykhalov [miriamchmykhalov@yahoo.com](mailto:miriamchmykhalov@yahoo.com)
To: planning@ci.sandy.or.us, sdenison@ci.sandy.or.us

## Dear City of Sandy,

My husband and I do not approve of this proposal. One of the reasons why we love this property that we moved into is the beautiful forest in our backyard. It would be heartbreaking to see the tall trees and nature that has been here so long destroyed. In addition to that, these trees give us the privacy we were looking for when purchasing this home. We do not want our privacy to be taken away from us.

If this proposal does get approved, we would like to keep a section of those trees that provide us the nature and privacy we need. If not, then replanting new trees along our properties to maintain that privacy.

Please consider our disagreement on this proposal, thank you.
FILE \# 19-050 CPA/ZC/SUB

## Proposed New Development

## Linda Sue Hunt [lscedarview@msn.com](mailto:lscedarview@msn.com)

Dear City of Sandy Planning Commission;
We bought our house on Meadow Ave. because we were told by both the builders that the grassy/trees area across the street was a Dog Park and would never change as designated by writen documents passed by the city. We do not want a rezoned high density housing area (220 apartments) so close, nearly across the road.
We have had family and friends that lived in Dumbarko apartments and it was a nightmare. Kids up all night in the parking lot, drug sales in the parking lot, and so much more worse including entering apartments without permission. These apartments are too far out for good police patroling. We already have a problem with homeless men. It is all a great concern.

Tom and Linda Hunt
5412207898
18199 Meadow Ave.
Sandy, OR 97055

## EXHIBIT II

Re: Comments On Proposed New Development - Bull Run Terrace (TYPE IV)
Reference File Number: 19-CPA/ZC/SUB

## Comments Listed Below.

My wife and I have lived in the current Deer Point Subdivision since 2006.
Our concerns for the new subdivision are as follows:
1.) Apartments across from single family homes isn't conducive to our neighborhood.
2.) Apartments devalue a neighborhood. The residents of those apartments do not have any direct or long term ownership in the property the apartments are built on.
3.) Traffic into and out of our neighborhood will increase considerably. The proposed increase in traffic concerns the families in our neighborhood for the safety of our children.
4.) The size of the lots in our neighborhood are too small to say the least. We were promised a park 14 years ago for the children to play in and to date there hasn't been one spade of dirt turned and not one single piece of playground equipment constructed to fulfill that promise. Where are the children suppose to play? The streets have been the only option. My wife and I have already been the beneficiaries of having to repaint the side of one of our vehicles because the children don't have any where to play. These streets are also too narrow. Additional neighborhood concerns are can an emergency vehicle navigate down these streets safely if there are parked cars on both sides of a street.
5.) The average Oregon family owns 2 -automobiles. With the proposed 210 apartments slated to be built that is $\mathbf{4 2 0}$ possible automobiles commuting in and out of this new subdivision daily. These streets were not constructed to carry that amount of automobile traffic.
6.) We don't have any concerns about the amount of trees the builder has asked to remove. We feel that living on the edge of a large amount of forest, removal of those trees would add a measure of safety should a fire arise in our nearby national forest. There is no shortage of trees in our area so we believe there will be no impact.
7.) Our last concern is how the additional burden the 210 apartments will impact our local schools. Homeowners in Sandy have already absorbed a huge tax levy in the not so recent past when the bill for the new high school was brought to the voters. Why add new congestion to our educational buildings? Our schools are just fine the way they are with the population of students they are presently carrying.


Vincent \& Lynn K. Mandina
18351 Meadow Avenue
Sandy, OR 97055

COMMENT SHEET for File No. 19-050 CPA/ZC/SUB:
Dear City of Sandy,
My husband and 1 do not approve
of this proposal. One of the reasons Why we love this property that we moved into is the beautiful forest
in our backyard. It would be heatbreaking to see the tall trees
and nature that has been here so long destroyed. In addition to that, these trees give us the privacy We were looking for when purchasing
this home. We do not want dur


Please consider our disaggrement on this proposal, thank you.
$\frac{\text { Valium }}{\text { Your Mime }}$ + Minim Verbelchuk ( 971 (300-3944
$\frac{18382}{\text { Address }}$ Meadow Ave, Sandy or 97055
18382 Meadow Ave, Sandy dol 97055

APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18
Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

## Fwd: 19-050 CPA/ZC/SUB

Shelley Denison [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)
To: Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us)
Hey Marisol,
Could you add this to the 19-050 folder? Thanks!

Forwarded message<br>$\qquad$<br>From: skinner.nuskin [skinner.nuskin@yahoo.com](mailto:skinner.nuskin@yahoo.com)<br>Date: Thu, Apr 30, 2020 at 6:29 PM<br>Subject: 19-050 CPA/ZC/SUB<br>To: [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

This is in regards to Bull Run Terrace file \#19-050
Our neighborhood is a quiet one with many seniors that live here. No one wants someone to build behind them, but the existing plan is somewhat doable.
The ammendment changes this tremendously, especially from Village to R3 (Apartments). Along with 220 more households, comes approximately 400 or more vehicles to be coming and going in a neighborhood that can not accommodate the volume of traffic or parking issues as is. With only 2 exits/entrances that would only make this more problematic.

I have contacted several real estate companies who have verified that housing values would decline significantly if either proposal goes through, especially the amended proposal. It doesn't seem that current residents have to much of a say compared to the builders in all the developments that are springing up here in our town.

Another concern is almost all the trees being removed. The only ones being left are on hwy 26. Has someone addressed how this would affect the current residents 80 to 100 ft trees that are on the property lines? Would this compromise them? How would this affect the habitat of a breeding pair of red tail hawks that are here every year since I moved here 5 years ago? Or the owls and deer we see so often? Our neighborhood is called Deer Pointe.
I feel that it would be in the best interest of all, if this ammendment was denied and further studies done, regarding the habitat that will be eliminated.
Thank you for your consideration.
Nicola Skinner
18422 Meadow
Sandy, OR 97055
503-260-1517
Sent via the Samsung Galaxy S10+, an AT\&T 5G Evolution capable smartphone

[^11]Kathleen Walker
15920 SE Bluff Rd.
Sandy, OR 97055
May 1, 2020
Dear Planning Commission:
The Bull Run Terrace proposed zone change will create a deficit in commercial land for the City of Sandy. Commercial zoning along Hwy 26 s virtually the best place for a successful business to be located in Sandy. Businesses off the highway struggle to stay in business. We have alreay depleted our supply of commercial business land and changed some of it to residential to meet developer's preferences for making a quick buck.

It is not the role of the planning commission to change the zone for a process that had extensive public input. The criteria for changing a zone speaks to the following criteria:

Responding to changing conditions: There are no changing conditions. In fact, the UGB boundary was expanded and rezoned to address the lack of commercial land among other things. The analysis was done by a consultant that this developer is using. There is no new conditions, that would overturn the work done in the 2017 UGB expansion planning process.

Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium denisty zoning. We do not support more high density zoning. We have an adequate supply to meet the demand.

Maintaining the integrity of the Comprehensive Plan: The Comp Plan as mentioned zoned a variety of residential densities and commercial zones. While the developer might make more money with high denisty, it is not the responsibility of the City, nor within the criteria to change zoning because they will make more money.

There is an identified public need is for the park and the extension of Dubarko Road. This can be done with existing zoning in place.

I recommend denial of this zone change. I am sure you will be hearing from other people. This proposal was not listed on the City website that I could find. Nor did I see it in the City PR news sheet sent out this week. I am glad to help get the word out.

## Kind Regards,

Kathleen Walker

EXHIBIT MM
COMMENT SHEET for File No. 19-050 CPA/ZC/SUB:


APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18
Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

COMMENT SHEET for File No. 19-050 CPA/ZC/SUB: ЕXH|B|TNN
Please do not add apartsments to the
-rupert development at $41010 \mathrm{HW}_{2} 26$
 resident ion.

$\qquad$
$\qquad$
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APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18
Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

EXHIBIT OO

## File No. 19-050 CPA/ZA/SUB Bull Run Terrace Subdivision

Ann Ruhl [ARuhl@igainc.com](mailto:ARuhl@igainc.com)
Fri, May 1, 2020 at 1:08 PM
To: "sdenison@ci.sandy.or.us" [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)
Cc: "planning@ci.sandy.or.us" [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)

To whom it may concern,
I would like to have it made known - I am against the proposed zoning change for the Bull Run Terrace Subdivision.

I live on Meadow Ave. and this subdivision will be built directly behind my home. While I am glad the proposal has houses planned directly behind me-I am not excited about high density for the rest of the subdivision. I do not want to see the higher traffic in the neighborhoods, the odds in an increase of crime that this number of apartments will bring.

From my understanding there are already plenty of other areas that are already zoned for apartments that developers can develop without a zone changes.

It is important to have commercial zoned land in desirable locations (off HWY 26) to encourage new businesses to be attracted to our town. When we allow this commercial area to be converted to apartments we lose the option for business in the long run. Sandy needs business to thrive. I believe there have been two other commercial zoned areas, with highway frontage that have been changed to apartment zoning. We are losing ground on attracting business in the future.

I believe our population is approaching 12,000 and by state law when a community hits 15,000 ,all new construction is required - to be multi-unit. Why do we need to start this now?

I know I/we cannot stop the growth in Sandy, and growth is necessary to have a thriving community, But I want the City code, policies and a City Council that is resident-friendly not developer-friendly. I see this proposal for changing the zoning to High Density as developer-friendly.

Thank you for your time and consideration.

## Ann Ruhl

503-936-9208
18368 Meadow Ave
Sandy Or 97055
annruhl@hotmail.com

## Comments for File No. 19-050 CPA/ZC/SUB

## Lesley Lowe [lesleydi09@gmail.com](mailto:lesleydi09@gmail.com)

Fri, May 1, 2020 at 9:29 PM
To: planning@ci.sandy.or.us, sdenison@ci.sandy.or.us

## Dear Planning Commission:

The Bull Run Terrace proposed zone change will create a deficit in commercial land for the City of Sandy. Commercial zoning along Hwy 26 is virtually the best place for a successful business to be located in Sandy. Businesses off the highway struggle to stay in business. We have already depleted our supply of commercial business land and changed some of it to residential to meet developer's preferences for making a quick buck.

It is not the role of the planning commission to change the zone for a process that had extensive public input. The criteria for changing a zone speaks to the following criteria:

Responding to changing conditions: There are no changing conditions.
Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more high density zoning. We have an adequate supply to meet the demand.

Maintaining the integrity of the Comprehensive Plan: The Comp Plan as mentioned zoned a variety of residential densities and commercial zones. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria to change zoning because they will make more money.

There is an identified public need is for the park and the extension of Dubarko Road. This can be done with existing zoning in place.

I recommend denial of this zone change as do several of my neighbors who did not receive the planning change notice. I am sure you will be hearing from my neighbors.

Lesley Lowe

## Comments for File No. 19-050 CPA/ZC/SUB

Lonnie Stermon [Lstermon@hotmail.com](mailto:Lstermon@hotmail.com)
Fri, May 1, 2020 at 9:54 PM
To: "planning@ci.sandy.or.us" [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us), "sdenison@ci.sandy.or.us" [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

## Dear Planning Commission:

The Bull Run Terrace proposed zone change will create a deficit in commercial land for the City of Sandy. Commercial zoning along Hwy 26 is virtually the best place for a successful business to be located in Sandy. Businesses off the highway struggle to stay in business. We have already depleted our supply of commercial business land and changed some of it to residential to meet developer's preferences for making a quick buck.

It is not the role of the planning commission to change the zone for a process that had extensive public input. The criteria for changing a zone speaks to the following criteria:

Responding to changing conditions: There are no changing conditions.
Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more high density zoning. We have an adequate supply to meet the demand.

Maintaining the integrity of the Comprehensive Plan: The Comp Plan as mentioned zoned a variety of residential densities and commercial zones. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria to change zoning because they will make more money.

There is an identified public need for the kids park which has been in planning for years along with the dog park, and the extension of Dubarko Road. This can be done with existing zoning in place.

I recommend denial of this zone change as do several of my neighbors who did not receive the planning change notice. I am sure you will be hearing from my neighbors.

We also feel the crime level may go up with high density like apartments and feel that businesses need the land more. Sandy is a small town and growing but we don't need to grow so much that we become closer to those other bigger cities. Let's value sandy where it is and love our town how it is.

Thank you for your time,
Lonnie Stermon
Deer point neighborhood

COMMENT SHEET for File No. 19-050 CPA/ZC/SUB:
We bought our howe on meadow because we were toed by both of the frieders the grassey/trees were a dog park by a written document t past by group of a partenents in high on odium dense living across the vaud. Wive had friends a family who have lived in the Oumberiko apartments and it wren a nightmare, Kid up all night in the parking lot, drug sale in parting lot, and so much moe including entering -apactrunts without permission. These apartments
-ave too for out fo good polis pativeling. We already have a problem with homeless mex. it is sill a great concern.


APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18 Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

19-050 CPA ZC_SUB Bull Run Terrace Neighborhood Notice

## EXHIBIT SS

## Comments for File\# 19-050-CPA/ZC/SUB

## I have three concerns.

One is parking. I encourage the city to require the apartments to all have parking. We all know the problems created when apartments are built with inadequate parking. Tenants getting home late, finding no parking near their apartment, parks two blocks away in a residential neighborhood where parking is already at a premium.

Second is trees. It looks like $90 \%$ of the trees will be removed! Those trees provide noise abatement from noisy Hwy 26, and it is loud. From west bound big rigs slowing down using air brakes to east bound cars and motorcycles speeding up from the traffic light at Wolf Dr. Trees also absorb dust and wind and reduce glare and create an eye-soothing canopy of green. If as many trees can be spared as possible, especially the big ones, it will make the area more tolerable.

I would also like the city to install speed humps or traffic circles on Fawn and Dubarko streets to slow the inevitable vehicles exceeding the speed limit.

Gary and Val Roche
40494 Fawn St
Sandy OR 97055

## Re: EXHIBIT TT

Kelly O'Neill Jr. [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us)
Wed, May 6, 2020 at 12:29 PM
To: Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)
---------- Forwarded message ---------
From: Gary Roche [groche51@gmail.com](mailto:groche51@gmail.com)
Date: Wed, May 6, 2020 at 12:18 PM
Subject:
To: [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us), [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us)

Comments for File\# 19-050 CPA/ZC/SUB Bull Run Terrace
I recently received in the mail a notice of the Bull Run Terrace zoning change. I can see no reason why the zoning on the property should be changed. The owner of the property knew when he bought it what the zoning was and it should not be changed so that the property owner can cram high density apartments on this land and make more money off the property. There is no good reason the city should approve this zoning change.

Land next to Hwy 26 should be reserved for commercial use. Building apartments on the land is a bad idea. Hwy 26 is a very loud highway and not suitable for high density apartments.

Some of the City of Sandy's criteria for changing a zone are:

1) Changing conditions. There are no changing conditions that I can see.
2) Changing community attitudes. No one in my community (Deer Pointe) wants high density apartments next to our single family homes.

I see no plan for a signal at Hwy26/Dubarko Rd. That will make this intersection very dangerous to cross as vehicles are going 55-60 on Hwy 26.

I recommend denial of this zoning change.
Gary and Val Roche

OREGON

## Fwd: Letter for Bull Run Terrace EXHIBIT UU

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Thu, May 7, 2020 at 12:32 PM
To: Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us), Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us)

## FYI

Jeff Aprati
City Recorder / Management Analyst City of Sandy
503-489-0938
japrati@ci.sandy.or.us

## Forwarded message

From: 'RaynRoo Ruehrdanz' via City Recorder [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)
Date: Thu, May 7, 2020 at 12:20 PM
Subject: Letter for Bull Run Terrace
To: spulliam@cityofsandy.com [spulliam@cityofsandy.com](mailto:spulliam@cityofsandy.com), Recorder@ci.sandy.or.us [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us), koneill@ci.sandy.or.us [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us)

## Dear Planning Commission, City Planning Staff, and City Councilors:

I have lived in the Deer Pointe neighborhood for the past 9 years. I moved to the City of Sandy because of its' small town feel and the lower population compared to many other cities in the Urban Growth Boundary. I have seen what large, high density housing can do to a city. This city doesn't have a lot of high density housing, which is why this city is one of the top moveable cities in Oregon. We, as a community, have seen more and more cars and homeless people moving into the area. The traffic in this area has gotten severely worse over the last few years. There are times when you have to wait several minutes just to get onto 26 . This is not acceptable and is only going to get worse when you add in more high density neighborhoods like the proposed zoning changes to conditions at the Bull Run Terrace. This will also create many lost opportunities for commercial businesses to want to come to Sandy and create a new business to thrive in. This city has had the same businesses for years and it would be welcomed to have new business move in to create a new sense of change instead of the same old businesses. I know for my family, we will often go to Gresham for things we need, instead of staying here and shopping local. We need more choices in the city so we can stay local. This is a huge problem that could be solved by keeping the commercial zoning and not changing it to high density housing. The City has already changed several commercial zoning areas to high density, such as the land over by Avamere. This was a commercial zone and a vote was taken to make it apartments. You all need to think about the ramifications on the residents that currently live here and not the ones that will be moving here. I have no problem with the city growing, but make sure it is done correctly. High density housing is not the answer. The overall quality of living will go down and our home prices will go down even faster when you add in apartments in the area. I have no problems with single family dwellings or low density housing.

I also find it hard to believe that you, as high ranking members of the city, would allow only a stop sign to be added to Dubarko Street if it is linked up with Highway 26. It is already hard enough to get out onto 26 safely. Many people go to the light by the post office, which creates major back-ups, which is going to get worse with the high density housing by Avamere. This is going to be a bad situation. The stop sign at Langensand is already a danger with the speed of the cars that are going well over 40 mph speed limit. My wife has already been hit there. You are now going to create an even more dangerous intersection at Dubarko and 26 with only a stop sign. Please reconsider this and make it a light so it is safe for your people who live in the area who will be using that intersection. This area needs to start thinking more about safety and not about tax dollars, which are higher than most cities in the Urban Growth Boundary already. Please reconsider your views on wanting to change the Bull Run Terrace subdivision to high density. It was already voted on to keep it low density and commercial for a reason.

## Scott Ruehrdanz

40498 Fawn Street
Sandy, Oregon
715-703-0839

Sent from Mail for Windows 10

File number 19.050 ( $p A /$ ac $/$ Sub)
EXHIBIT VV

Recd
May 26,2020 Sandy PlaNning Commission
My NAME is MArion" "Io An" Gusclerson 18342 AnTler Aus-Desr Park Subdivision 503-668-4386
Bring The home owner and hiving at This Address Fin very concerned about The plans add lay out of Bull Rudd Terrace Subdivision. We Already have Enough Traffic Thru our NEighbor hood sud Cars parked on both sides of The STreets which Mates iT ONe way Traffic To yet Thru, The plans call for Duborko To be one of the Main roads in To This subdivision, by doing this it will become and Express way, also FAWN STreet will be A shorT CuT Thru our Neighbor hood. Most of us Seniors go To The sToplighT by The post office whickis Always a Traffic dam, your lucky if Three Cars get Thru, Taking hangsusand To get on Hwy 26 west is a death Trip for 45 . If There is a subdivision -puT in NEXT To ours please make Their entrance and exit of s Hwy 26 at a stoplight.
Morrow" Ko an" Aurdeson

Dear Planning Commission and City Planning Staff:

## EXHIBIT WW

The Bull Run Terrace proposed zone change will create a deficit in commercial land for the City of Sandy. Commercial zoning along Hwy 26 is virtually the best place for a successful business to be located in Sandy. Businesses off the highway struggle to stay in business. We have already depleted our supply of commercial business land, and changed some of it to residential, to meet developer's preferences for making a quick buck.
It is not the role of the planning commission to change the zone for a process that had extensive public input. That is called spot zoning. The City's criteria for changing a zone speaks to the following criteria:
Responding to changing conditions: There are no changing conditions. In fact, the UGB boundary was expanded and rezoned recently, to address the lack of commercial land among other things. The analysis was done by a consultant that this developer is using. There are no new conditions that would overturn the work done in the 2017 UGB expansion planning process.

Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more high density zoning. We have an adequate supply to meet the demand.

Maintaining the integrity of the Comprehensive Plan: The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money.

There is an identified public need for the park and the extension of Dubarko Road. This can and will be done with existing zoning in place.

I recommend denial of this zone change. I am sure you will be hearing from other people.
This proposal was not listed on the City website that I could find - and I know where to look. Nor did I see it in the City PR news sheet sent out this week. I am glad to help get the word out, however, I do not believe I should be responsible for doing that. So as annoyed as some of you may be, about the Sandy Residents for Responsible Growth Facebook Page, I found it critically important to let Sandy residents know what is going on. To hear folks say that folks did not show up to a meeting, or provide comments, when they had no idea about it, or if they got a legal notice, did not understand what that meant to them, was frustrating. My repeated pleas for the City to inform folks of zone and code changes and developments, in a short, simple to read explanation with clear maps, on at least the City Facebook page, in a transparent manner were ignored. I hope that can improve in the future. I know you all work hard and I appreciate everyone's efforts.

## EXHIBIT XX

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace proposed zone change will create a deficit in commercial land for the City of Sandy. Commercial zoning along Hwy 26 is virtually the best place for a successful business to be located in Sandy. Businesses off the highway struggle to stay in business. We have already depleted our supply of commercial business land, and changed some of it to residential, to meet developer's preferences for making a quick buck.
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EXHIBIT MY
COMMENT SHEET for File No. 19-050 CPA/ZC/SUB:
Re- Bull Run Terrace (proposed)

I bun a home at 40625 SE HWy 26. 2 strongly oppose building a development with potentially 220 apartment units. She tropic on Aws 26 gang past my residence $\operatorname{lic}^{c}$ at times intolerable. Not to mention the topic gong through sexdiy to try to go to the grocery store ar to a dentoid appointment.
$\qquad$ increase Gupfic? A bought the home 15 gre age thecance it was a small form. Do we wally want to charge the Atmosphere of the from any further? Droit we want to kep it unique with a empale tom fouling?
$\qquad$

| Susan Duller | $207-227-2320$ |
| :---: | :---: |
| Your Name | Phone Number | 1831 NE 3 ts St Ocala FL 34479

Address

APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18 Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

EXHIBIT ZZ

## RE: Comments for file\# 19-050 CPA/ZC/SAP/SUB/TREE Bull Run Terrace Subdivision

Yoshi Hosaka [yoshihosaka@gmail.com](mailto:yoshihosaka@gmail.com)
Tue, Jul 28, 2020 at 1:50 PM
To: planning@ci.sandy.or.us, sdenison@ci.sandy.or.us
Hello,
Application should not be approved.

I would like to see as part of the proposal better traffic transition and mitigation into Hwy26 of both Lagensand and what will now connect Dubarko to Hwy26. As this section of Hwy26 is designated a safety corridor, it implies there is poorly managed traffic risk for these arteries that are opened up to this dangerous stretch of hwy. With the increased density, Lagensand is already an unregulated feeder to hwy26 and now this proposal will add Dubarko.

It is irresponsible to incrementally add increased density and subsequent access to Hwy26 without proper traffic management.

Feel free to reach out via this e-mail address

Thanks,
Yoshi Hosaka
(on behalf of Itsuo Hosaka)
35288 SE Kelso Rd
Boring, OR 97009

## (no subject) EXHIBIT AAA

Gary Roche [groche51@gmail.com](mailto:groche51@gmail.com)
Fri, Jul 31, 2020 at 11:51 AM
To: planning@ci.sandy.or.us
Comments for 19-050 CPA/ZC/SAP/SUB/TREE Bull Run Terrace Subdivision:
It pleases me lot 7 has been changed to C-3. HWY 26 needs more commercial land available to develop. I'm also happy to see the developer saving 59 trees when he only has to save 43 . Of course, more would be better, especially along the west side of lots $1-5$. This would help with noise abatement.

I don't know how stressed the current sewage treatment plant is but maybe Sandy should put a moratorium on new residential construction until the new facility is on line. I'm afraid Sandy is becoming more like Gresham or Portland with all of the apartments being built.

I would like lots 5 and 6 to remain R-2 medium density. Townhouses, condos, etc would blend in with the existing residential neighborhood better than apartments. I would only be in favor of a yes vote for zoning change if there were no high-density building.

Gary and Val Roche 40494 Fawn St
503-341-3257

EXHIBIT BBB

COMMENT SHEET for File No. 19-050 CPA/ZC/SAP/SUB/TREE:
Unlike the original proposal, this proposal
does not detail the number of units
in the R3 High-Density Residential area.

and $R-2$ (medium-Density) building.
 to extend Fawn and cut down a
$\qquad$


APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18 Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.54 Specific Area Plan Overlay; 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

To: planning@ci.sandy.or.us
Comments for 19-050 CPA/ZC/SAP/SUB/TREE Bull Run Terrace Subdivision:
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I don't know how stressed the current sewage treatment plant is but maybe Sandy should put a moratorium on new residential construction until the new facility is on line. I'm afraid Sandy is becoming more like Gresham or Portland with all of the apartments being built.

I would like lots 5 and 6 to remain R-2 medium density. Townhouses, condos, etc would blend in with the existing residential neighborhood better than apartments. I would only be in favor of a yes vote for zoning change if there were no high-density building.

Gary and Val Roche 40494 Fawn St
503-341-3257

EXHIBIT PD

COMMENT SHEET for File No. 19-050 CPAZC/SAP/SUB/TREE:

$\qquad$
$\qquad$
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$\qquad$


APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18 Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.54 Specific Area Plan Overlay; 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

EXHIBIT EEE

## Bull Run Terrace Subdivision Comments

## Jessie Hutson [hutson.jessie@gmail.com](mailto:hutson.jessie@gmail.com)

Wed, Aug 5, 2020 at 5:37 PM
To: planning@ci.sandy.or.us
Hello,
I currently live off Meadow \& Dubarko.

My family and I are very concerned with the change in zoning to high density. The issues we are concerned about are the influx in traffic down Dubarko with cars going well over the speed limit as it is, we fear this will just add to the existing issue. We also are concerned about our property value going down, which comes with having apartments in close proximity. Lastly, we are concerned about the lack of parking available with the influx of all the tenants for the apartment complex. We know several neighbors who are very concerned with the proposed change in density as well. We hope that the zoning can remain the same with medium and low density.

Sincerely,
Jessica Hutson

## Bull run development

1 message

Lee Grundmeyer [DurendConstructionLLC@outlook.com](mailto:DurendConstructionLLC@outlook.com)
Thu, Aug 6, 2020 at 4:26 PM
To: "planning@ci.sandy.or.us" [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)

Hello,

I currently live off Meadow \& Dubarko.
My family and I are very concerned with the change in zoning to high density. The issues we are concerned about are the influx in traffic down Dubarko with cars going well over the speed limit as it is, we fear this will just add to the existing issue. We also are concerned about our property value going down, which comes with having apartments in close proximity. Lastly, we are concerned about the lack of parking available with the influx of all the tenants for the apartment complex. We know several neighbors who are very concerned with the proposed change in density as well. We hope that the zoning can remain the same with medium and low density.

Sincerely,
Lee Grundmeyer -Owner
503.799.8198

PO Box 595
Sandy, Or 97055
DUREND CONSTRUCTION LLC
CCB 198948 Licensed Bonded Insured since 1998
National Certified Tile Installer \#1540
Certified Flooring Installer
National Tile Council of America - Member
WEDI Pro Installer \#127

EXHIBIT GGG

## 19-050 CPA/ZC/SAB/SUB/TREE

## 1 message

Izaac [mckenzi@eou.edu](mailto:mckenzi@eou.edu)
Fri, Aug 7, 2020 at 10:34 AM
To: planning@ci.sandy.or.us, sdenison@ci.sandy.or.us
Hello,
My name is Izaac McKenzie and I live at 18428 Meadow Ave.
My neighbors and I are very concerned about the commercial and high density building that is purposed for the lot in question.
We are concerned that the physical impacts of new multistory development to adjacent residences will have negative effects on both ground-level activities, such as parking and services, and upper-story impacts affecting privacy, sunlight, and visual qualities
Our neighborhood streets are already full due to parking issues and the traffic related to the purposed plan will only increase this issue.
The commercial buildings will bring new concerns related to dumpsters and service areas, particularly if they contain food waste.
We understand that there are advantages to to current purposed plan but we believe the disadvantage outweigh them. Residential and commercial owners and residents often clash, because they hold opposing interests and goals. This will not improve the neighborhood.
Living in close proximity of commercial uses may expose residents to disturbances such as noise, foul odors, bright lights, and similar quality of life nuisances. We are concerned that eliminating trees will have a negative effect on the mental health of the residents, especially with more people working from home due to the current situation.
We are concerned that removing trees for residential building will have an exponentially increasing impact on the community. Listed below are a couple examples from he Food and Agricultural Organization of the United States. Trees play an important role in increasing urban biodiversity, providing plants and animals with a favourable habitat, food and protection.
A mature tree can absorb up to 150 kg of CO2 per year. As a result, trees play an important role in climate change mitigation. Especially in cities with high levels of pollution, trees can improve air quality, making cities healthier places to live in.
Strategic placement of trees in cities can help to cool the air between 2 and 8 degrees Celsius, thus reducing the urban "heat island" effect, and helping urban communities to adapt to the effects of climate change.
Large trees are excellent filters for urban pollutants and fine particulates. They absorb pollutant gases (such as carbon monoxide, nitrogen oxides, ozone and sulfer oxides) and filter fine particulates such as dust, dirt or smoke out of the air by trapping them on leaves and bark.
Research shows that living in close proximity of urban green spaces and having access to them, can improve physical and mental health, for example by decreasing high blood pressure and stress. This, in turn, contributes to the well-being of urban communities.
Mature trees regulate water flow and play a key role in preventing floods and reducing the risk of natural disasters. A mature evergreen tree, for instance, can intercept more than 15000 liters of water per year.
Trees also help to reduce carbon emissions by helping to conserve energy. For example, the correct placement of trees around buildings can reduce the need for air conditioning by 30 percent, and reduce winter heating bills by 20-50 percent. Planning urban landscapes with trees can increase property value, by up to 20 percent, and attract tourism and business. Thank you for taking the time to read our concerns with the current purposed plans.

Thank you
Izaac McKenzie

EXHIBIT HHH

COMMENT SHEET for File No. 19-050 CPA/ZC/SAP/SUB/TREE:


Your Nape
Phone Number


Address

APPLICABLE CRITERIA: Sandy Municipal Code: 17.12 Procedures for Decision Making; 17.18
Processing Applications; 17.20 Public Hearings; 17.22 Notices; 17.24 Comprehensive Plan Amendment Procedures; 17.26 Zoning District Amendments; 17.28 Appeals; 17.30 Zoning District Amendments; 17.32 Parks and Open Space (POS); 17.36 Low Density Residential (R-1); 17.38 Medium Density Residential (R-2); 17.40 High Density Residential (R-3); 17.46 Village Commercial (C-3); 17.54 Specific Area Plan Overlay; 17.80 Additional Setbacks on Collector and Arterial Streets; 17.82 Special Setbacks on Transit Streets; 17.84 Improvements Required with Development; 17.86 Parkland and Open Space; 17.92 Landscaping and Screening; 17.98 Parking, Loading, and Access Requirements; 17.100 Land Division; 17.102 Urban Forestry; 15.30 Dark Sky; and, 15.44 Erosion Control Regulations.

## Fwd: Comments for file no. 19-050 CPA/ZC/SAP/SUB/TREE

Shelley Denison [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)
Tue, Aug 18, 2020 at 7:39 AM
To: Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us)
Heyyy,
Here's some comments for 19-050.
Forwarded message
From: Ryan Clifford [rcclifford@gmail.com](mailto:rcclifford@gmail.com)
Date: Fri, Aug 14, 2020 at 1:23 PM
Subject: Comments for file no. 19-050 CPA/ZC/SAP/SUB/TREE
To: [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Hello Shelley, comments on this project are below
Comments for file no. 19-050 CPA/ZC/SAP/SUB/TREE:
"Tenants have commented that housing in this area is getting quite dense and there is a lack of parks or open spaces for children to play"

Applicable Address: 40488 Fawn St in Sandy, OR
Thank you,
Ryan Clifford
Clifford Enterprises
(509) 456-2530 Voice
(509) 570-0430 Fax

The information contained in this electronic communication, and any electronic attachment(s), is CONFIDENTIAL. Information that is transmitted for the conduction of business is also CONFIDENTIAL. It is intended only for the named recipient(s) above. If the reader of this message is not the intended recipient(s), you are hereby notified that any release of information or distribution of this communication is prohibited by law. If you have received this message in error, or are not the named recipient(s), please immediately notify the sender via reply email and delete this communication.

--<br>Shelley Denison<br>Associate Planner<br>City of Sandy<br>Development Services Department<br>39250 Pioneer Blvd<br>Sandy, OR 97055<br>503-783-2587<br>sdenison@ci.sandy.or.us

EXHIBIT JJJ

## File No. 19-050 CPA/ZA/SUB Bull Run Terrace Subdivision

## Ann Ruhl [ARuhl@igainc.com](mailto:ARuhl@igainc.com)

Mon, Aug 17, 2020 at 11:36 AM
To: "planning@ci.sandy.or.us" [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us), "sd.3077@spartannash.com" [sd.3077@spartannash.com](mailto:sd.3077@spartannash.com)

To whom it may concern,
I would like to have it made known - I am still against the "revised" proposed zoning change for the Bull Run Terrace Subdivision.

I live on Meadow Ave. and this subdivision will be built directly behind my home. While I am glad the revised proposal has houses planned directly behind me - is now including commercial, am not excited about high density for the rest of the subdivision. I do not want to see the higher traffic in the neighborhoods, the odds in an increase of crime that this number of apartments will bring, and the possibility of lower property values due to that amount of apartments.

From my understanding, there are already plenty of other areas that are already zoned for apartments that developers can develop without zone changes.

I believe our population is approaching 12,000 and by state law when a community hits 15,000 , all new construction is required - to be multi-unit. Why do we need to start this now?

I know I/we cannot stop the growth in Sandy, and growth is necessary to have a thriving community, But I want the City code, policies, and a City Council that is resident-friendly, not developer-friendly. I see this proposal for changing the zoning to High Density as developer-friendly. Leave it as approved.

Thank you for your time and consideration.

## Ann Ruhl

503-936-9208
18368 Meadow Ave
Sandy Or 97055
annruhl@hotmail.com

## Concerned citizen of deer point

cameron strey [camstrey@gmail.com](mailto:camstrey@gmail.com)
Thu, Aug 20, 2020 at 8:50 PM
To: recorder@ci.sandy.or.us, planning@ci.sandy.or.us

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
"Comp plan details guide elected and appointed officials in land use decisions, such as whether to allow a zone change or grant a conditional use permit. Because comprehensive plans are so vital in major land use decisions, the law requires an open, transparent process to create or amend them, including citizen and stakeholder input. Comp plans are not, however, engraved in stone. They eventually need change as community needs, goals and resources change. In fact, state rules encourage the periodic review and update of local comp plans."

This proposal, and more recent approved zone changes (for example, west of Avamere), are in affect "spot zoning". If the City wants to review and update our Comp plan and zoning designations for where and how much we have low, medium and high density, commercial and industrial lands, they need to enter into that holistic planning process. They should not continue to allow the planning commission and City Council to make piece meal zone changes as developers come to you saying "they can't make (enough!) money on the property!" It is not the role of the City to manage for developer's maximum profit. The developers should be doing their due diligence on development costs, markets, and demand prior to purchase. The City's criteria for changing a zone speaks to the following criteria:
Responding to changing conditions: There are no changing conditions. In fact, the UGB boundary was expanded and rezoned recently, to address the lack of commercial land among other things. The analysis was done by a consultant that this developer is using. There are no new conditions that would overturn the work done in the 2017 UGB expansion planning process. There is already high density allocations that can meet this need. Because the City has developed much of it's SFR with such small lot sizes, there is more of a deficit of the low density housing.
Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.

Maintaining the integrity of the Comprehensive Plan: Pieemealing zoning decisions to meet individual property owners' whims destroys the integrity of the Comp Plan. The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones to provide diversity and meet our needs. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money. Individual

There is an identified public need for the park and the extension of Dubarko Road. This can be done with existing zoning in place. The City also has the option of purchasing park property. The City should NOT be piecemealing incremental zone changes on the Comp Plan so developers can make "enough" money.
I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely
Cameron Strey

18197 Antler Ave
Sandy OR
97055

## Fwd: Planning Commission and City Planning

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Sat, Aug 22, 2020 at 8:56 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati
City Recorder / Management Analyst
City of Sandy
503-489-0938
japrati@ci.sandy.or.us

## Forwarded message

From: katieannsmith1012 [katieannsmith1012@gmail.com](mailto:katieannsmith1012@gmail.com)
Date: Thu, Aug 20, 2020 at 2:18 PM
Subject: Planning Commission and City Planning
To: [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us), [planningl@ci.sandy.or.us](mailto:planningl@ci.sandy.or.us)

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.

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I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

## Sincerely

Katie Smith
18197 Antler Ave
Sandy OR
97055

## Fwd: letter for Bull Run Terrace

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Sat, Aug 22, 2020 at 8:57 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati<br>City Recorder / Management Analyst<br>City of Sandy<br>503-489-0938<br>japrati@ci.sandy.or.us

## Forwarded message

From: 'RaynRoo Ruehrdanz' via City Recorder [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)
Date: Thu, Aug 20, 2020 at 6:54 PM
Subject: letter for Bull Run Terrace
To: planningl@ci.sandy.or.us [planningl@ci.sandy.or.us](mailto:planningl@ci.sandy.or.us), Recorder@ci.sandy.or.us [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us)

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.

Maintaining the integrity of the Comprehensive Plan: Pie mealing zoning decisions to meet individual property owners' whims destroys the integrity of the Comp Plan. The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones to provide diversity and meet our needs. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money. Individual

There is an identified public need for the park and the extension of Dubarko Road. This can be done with existing zoning in place. The City also has the option of purchasing park property. The City should NOT be piecemealing incremental zone changes on the Comp Plan so developers can make "enough" money.

I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely
Scott Ruehrdanz
40498 Fawn Street Sandy Oregon

Sent from Mail for Windows 10

## Fwd: Supporting Sandy Residents

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)<br>Sat, Aug 22, 2020 at 8:58 AM<br>To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison<br>[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati<br>City Recorder / Management Analyst<br>City of Sandy<br>503-489-0938<br>japrati@ci.sandy.or.us

Forwarded message<br>From: Eileen Suchanek [emcsuch@gmail.com](mailto:emcsuch@gmail.com)<br>Date: Thu, Aug 20, 2020 at 7:50 PM<br>Subject: Supporting Sandy Residents<br>To: [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)

August 20, 2020

## Dear Planning Commission and City Planning Staff:

The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
"Comp plan details guide elected and appointed officials in land use decisions, such as whether to allow a zone change or grant a conditional use permit. Because comprehensive plans are so vital in major land use decisions, the law requires an open, transparent process to create or amend them, including citizen and stakeholder input. Comp plans are not, however, engraved in stone. They eventually need change as community needs, goals and resources change. In fact, state rules encourage the periodic review and update of local comp plans."
This proposal, and more recent approved zone changes (for example, west of Avamere), are in affect "spot zoning". If the City wants to review and update our Comp plan and zoning designations for where and how much we have low, medium and high density, commercial and industrial lands, they need to enter into that holistic planning process. They should not continue to allow the planning commission and City Council to make piece meal zone changes as developers come to you saying "they can't make (enough!) money on the property!" It is not the role of the City to manage for developer's maximum profit. The developers should be doing their due diligence on development costs, markets, and demand prior to purchase. The City's criteria for changing a zone speaks to the following criteria:

Responding to changing conditions: There are no changing conditions. In fact, the UGB boundary was expanded and rezoned recently, to address the lack of commercial land among other things. The analysis was done by a consultant that this developer is using. There are no new conditions that would overturn the work done in the 2017 UGB expansion planning process. There is already high density allocations that can meet this need. Because the City has developed much of it's SFR with such small lot sizes, there is more of a deficit of the low density housing.

Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Up zoning this area to high density is the opposite of that.

Maintaining the integrity of the Comprehensive Plan: Putting together zoning decisions to meet individual property owners' whims destroys the integrity of the Comp Plan. The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones to provide diversity and meet our needs. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money. Individual
There is an identified public need for the park and the extension of Dubarko Road. This can be done with existing zoning in place. The City also has the option of purchasing park property. The City should NOT be putting together incremental zone changes on the Comp Plan so developers can make "enough" money.

I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Eileen Suchanek

17795 Wolf Dr.
Sandy, OR. 97055

Fwd: Bull Run Terrace

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Sat, Aug 22, 2020 at 8:58 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati
City Recorder / Management Analyst
City of Sandy
503-489-0938
japrati@ci.sandy.or.us
---------- Forwarded message ---------
From: 'Ann' via City Recorder [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)
Date: Thu, Aug 20, 2020 at 9:03 PM
Subject: Bull Run Terrace
To: [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us)

August 20, 2020
Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
"Comp plan details guide elected and appointed officials in land use decisions, such as whether to allow a zone change or grant a conditional use permit. Because comprehensive plans are so vital in major land use decisions, the law requires an open, transparent process to create or amend them, including citizen and stakeholder input. Comp plans are not, however, engraved in stone. They eventually need change as community needs, goals and resources change. In fact, state rules encourage the periodic review and update of local comp plans."
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Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.
Maintaining the integrity of the Comprehensive Plan:Pieemealing zoning decisions to meet individual property owners' whims destroys the integrity of the Comp Plan. The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones to provide diversity and meet our needs. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money. Individual
There is an identified public need for the park and the extension of Dubarko Road. This can be done with existing zoning in place. The City also has the option of purchasing park property. The City should NOT be piecemealing incremental zone changes on the Comp Plan so developers can make "enough" money.
I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely,<br>Ann Vedder<br>40493 Fawn St<br>Sandy OR 97055

[^12]
## Fwd: Bull Run Terrace

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Sat, Aug 22, 2020 at 8:59 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati<br>City Recorder / Management Analyst<br>City of Sandy<br>503-489-0938<br>japrati@ci.sandy.or.us

---------- Forwarded message $\qquad$
From: 'Ann' via City Recorder [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)
Date: Thu, Aug 20, 2020 at 9:10 PM
Subject: Fwd: Bull Run Terrace
To: [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us)

To whom it may concern, I would also like to add that we live in a small town and we know growth is inevitable. However, when we bought our home we knew the plan was for more homes, NOT high density housing. We would not have bought in this particular location. It is not fair to the residence already here to change the approved plan. It will already change the neighborhood. We have small children that like to run and ride bikes and it will make our neighborhood the cutthrough around hwy 26.
Sincerely,
Ann Vedder
40493 fawn st
Sandy OR
Sent from my iPhone
Begin forwarded message:

From: Ann [smitha789@aol.com](mailto:smitha789@aol.com)
Date: August 20, 2020 at 9:03:45 PM PDT
To: Recorder@ci.sandy.or.us
Subject: Bull Run Terrace

Quoted text hidden]

## Bull Run Terrace <br> 2 messages <br> EXHIBIT QQQ

'Kelly French' via Planning [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)
Thu, Aug 20, 2020 at 1:57 PM Reply-To: Kelly French [noslugno@yahoo.com](mailto:noslugno@yahoo.com)
To: recorder@ci.sandy.or.us
Cc: planning@ci.sandy.or.us
ugust 20, 2020
Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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This proposal, and more recent approved zone changes(for example, west of Avamere), are in affect "spot zoning". If the City wants to review and update our Comp plan and zoning designations for where and how much we have low, medium and high density, commercial and industrial lands, they need to enter into that holistic planning process. They should not continue to allow the planning commission and City Council to make piece meal zone changes as developers come to you saying "they can't make (enough!) money on the property!" It is not the role of the City to manage for developer's maximum profit. The developers should be doing their due diligence on development costs, markets, and demand prior to purchase. The City's criteria for changing a zone speaks to the following criteria:
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Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of
our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.
Maintaining the integrity of the Comprehensive Plan:Pieemealing zoning decisions to meet individual property owners' whims destroys the integrity of the Comp Plan. The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones to provide diversity and meet our needs. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money. Individual
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I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

## Sincerely

Kelly French
16771 SE Ten Eyck Rd.
Sandy Or 97055

Hey Marisol,
Here's a public comment for 19-050
[Quoted text hidden]

## Bull Run Terrace

1 message

## EXHIBIT RRR

'RaynRoo Ruehrdanz' via Planning [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)<br>Thu, Aug 20, 2020 at 6:57 PM<br>Reply-To: RaynRoo Ruehrdanz [raynroo@yahoo.com](mailto:raynroo@yahoo.com)<br>To: "Recorder@ci.sandy.or.us" [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us), "planning@ci.sandy.or.us" [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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This proposal, and more recent approved zone changes (for example, west of Avamere), are in affect "spot zoning". If the City wants to review and update our Comp plan and zoning designations for where and how much we have low, medium and high density, commercial and industrial lands, they need to enter into that holistic planning process. They should not continue to allow the planning commission and City Council to make piece meal zone changes as developers come to you saying "they can't make (enough!) money on the property!" It is not the role of the City to manage for developer's maximum profit. The developers should be doing their due diligence on development costs, markets, and demand prior to purchase. The City's criteria for changing a zone speaks to the following criteria:

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Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.

Maintaining the integrity of the Comprehensive Plan: Pieemealing zoning decisions to meet individual property owners' whims destroys the integrity of the Comp Plan. The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones to provide diversity and meet our needs. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money. Individual

There is an identified public need for the park and the extension of Dubarko Road. This can be done with existing zoning in place. The City also has the option of purchasing park property. The City should NOT be piecemealing incremental zone changes on the Comp Plan so developers can make "enough" money.

I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely

Rachel Ruehrdanz
40498 Fawn Street Sandy Oregon

Sent from Mail for Windows 10

## Fwd: The Bull Run Terrace EXHIBIT SSS

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Sat, Aug 22, 2020 at 8:59 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati
City Recorder / Management Analyst
City of Sandy
503-489-0938
japrati@ci.sandy.or.us

```
Forwarded message
From: 'Lori Pyles' via City Recorder <recorder@ci.sandy.or.us>
Date: Fri, Aug 21, 2020 at 5:19 AM
Subject: The Bull Run Terrace
To: <recorder@ci.sandy.or.us>, <planningl@ci.sandy.or.us>
```

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely
Lori Pyles
19055 Barrington Ave, Sandy Oregon 97055
Sent from my iPhone

## Fwd: EXHIBIT TTT

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Sat, Aug 22, 2020 at 9:00 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati
City Recorder / Management Analyst
City of Sandy
503-489-0938
japrati@ci.sandy.or.us
---------- Forwarded message ---------
From: Cameron Zebroff [cameronzebroff@gmail.com](mailto:cameronzebroff@gmail.com)
Date: Fri, Aug 21, 2020 at 10:08 AM
Subject:
To: recorder@ci.sandy.or.us [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)

August 20, 2020
Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive

Plan change. I am sure you will be hearing from other people.
Sincerely
Cameron Zebroff
Sandy, OR Resident

## Fwd: Deer Point EXHIBIT UUU

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)<br>[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)<br>Jeff Aprati<br>City Recorder / Management Analyst<br>City of Sandy<br>503-489-0938<br>japrati@ci.sandy.or.us

Sat, Aug 22, 2020 at 9:00 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison

Forwarded message
From: Heather Fitch [heatherfitchphotography@gmail.com](mailto:heatherfitchphotography@gmail.com)
Date: Fri, Aug 21, 2020 at 9:23 AM
Subject: Deer Point
To: recorder@ci.sandy.or.us [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)

August 20, 2020
Dear Planning Commission and City Planning Staff:

The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services.

LCDC's direction on Comp Plan updates say:
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There is an identified public need for the park and the extension of Dubarko Road. This can be done with existing zoning in place. The City also has the option of purchasing park property. The City should NOT be piecemealing incremental zone changes on the Comp Plan so developers can make "enough" money.

I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. Our schools are hurting so bad. They are beyond over crowded and this is going to make it worse. I live on the corner and the traffic is so heavy here my kids cannot play outside.

I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely
Heather Fitch
40448 Therese St
Sandy or 97055
--
Excited!

## Heather Fitch

\{the website\} www.heatherfitchphotography.com
\{the facebook\} HF Photography Facebook
\{the email\} HeatherFitchPhotography@gmail.com
\{capturing moments.\}

Fwd: Deer pointe neighborhood
Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Sun, Aug 23, 2020 at 6:13 PM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison [sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Forwarded message<br>From: Lonnie Rogers [sharpeilover2@hotmail.com](mailto:sharpeilover2@hotmail.com)<br>Date: Sun, Aug 23, 2020 at 5:51 PM<br>Subject: Deer pointe neighborhood<br>To: planningl@ci.sandy.or.us [planningl@ci.sandy.or.us](mailto:planningl@ci.sandy.or.us), Recorder@ci.sandy.or.us [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us)

August 23, 2020

## Dear Planning Commission and City Planning Staff:

## The Bull Run Terrace developers

propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create
high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's
direction on Comp Plan updates say:

## "Comp

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process to create or amend them, including citizen and stakeholder input. Comp
plans are not, however, engraved in stone. They eventually need change as community needs, goals and resources change. In fact, state rules encourage the periodic review and update of local comp plans."

## This proposal, and more recent

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Responding to changing community attitudes: There has been no effort to
assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning.

We do not support more more high density zoning. We have an adequate supply to meet
the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.

## Maintaining the integrity of the Comprehensive Plan:Pieemealing

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I do not support increasing density on
this parcel, and there
by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I
recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people. We do not think apartments is the way to go and bringing more volume of people to Sandy in which to lose our small town feel. We don't want to be a big city. Keep the charm and local businesses the way it is.

Sincerely,

Lonnie Stermon

Sent from my iPhone

Jeff Aprati
City Recorder / Management Analyst
City of Sandy
503-489-0938
japrati@ci.sandy.or.us

# Fwd: Bull Run Terrace EXHIBIT WWW 

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Mon, Aug 24, 2020 at 9:15 AM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati<br>City Recorder / Management Analyst<br>City of Sandy<br>503-489-0938<br>japrati@ci.sandy.or.us

Forwarded message<br>From: 'skinner.nuskin' via City Recorder [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)<br>Date: Mon, Aug 24, 2020 at 9:12 AM<br>Subject: Bull Run Terrace<br>To: [Recorder@ci.sandy.or.us](mailto:Recorder@ci.sandy.or.us)

August 22, 2020
Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

## Sincerely

Nicola A Skinner
18422 Meadow Ave
Sandy, OR 97055

Sent via the Samsung Galaxy S10+, an AT\&T 5G Evolution capable smartphone

Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us)

## The Bull Run Terrace EXHIBIT XXX

Izaac [mckenzi@eou.edu](mailto:mckenzi@eou.edu)
Mon, Aug 24, 2020 at 1:21 PM
To: planning@ci.sandy.or.us, recorder@ci.sandy.or.us
Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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Responding to changing conditions: There are no changing conditions. In fact, the UGB boundary was expanded and rezoned recently, to address the lack of commercial land among other things. The analysis was done by a consultant that this developer is using. There are no new conditions that would overturn the work done in the 2017 UGB expansion planning process. There is already high density allocations that can meet this need. Because the City has developed much of its SFR with such small lot sizes, there is more of a deficit of the low density housing.
Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Up zoning this area to high density is the opposite of that.
Maintaining the integrity of the Comprehensive Plan: Pieemealing zoning decisions to meet individual property owners' whims destroys the integrity of the Comp Plan. The Comp Plan as mentioned, zoned a variety of residential densities and commercial zones to provide diversity and meet our needs. While the developer might make more money with high density, it is not the responsibility of the City, nor within the criteria, to change zoning because they will make more money. Individual
There is an identified public need for the park and the extension of Dubarko Road. This can be done with existing zoning in place. The City also has the option of purchasing park property. The City should NOT be piecemealing incremental zone changes on the Comp Plan so developers can make "enough" money.
I do not support increasing density on this parcel, and thereby increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely<br>Izaac McKenzie<br>18428 Meadow Ave.<br>Sandy, OR 97055

Sent from my iPhone

OREGON

# Fwd: Bull Run Terrace development EXHIBIT YYY 

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Mon, Aug 24, 2020 at 1:52 PM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati<br>City Recorder / Management Analyst<br>City of Sandy<br>503-489-0938<br>japrati@ci.sandy.or.us

Forwarded message
From: 'Liza Chatterton' via City Recorder [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)
Date: Mon, Aug 24, 2020 at 1:49 PM
Subject: Bull Run Terrace development
To: [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)

August 20, 2020
Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
"Comp plan details guide elected and appointed officials in land use decisions, such as whether to allow a zone change or grant a conditional use permit. Because comprehensive plans are so vital in major land use decisions, the law requires an open, transparent process to create or amend them, including citizen and stakeholder input. Comp plans are not, however, engraved in stone. They eventually need change as community needs, goals and resources change. In fact, state rules encourage the periodic review and update of local comp plans."
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Responding to changing community attitudes: There has been no effort to assess or conclude that this zone change is supported by the community. I think you will find from public testimony, quite the opposite! The City has already zoned large sections of our town with high and medium density zoning. We do not support more more high density zoning. We have an adequate supply to meet the demand. The community attitude for one of the fastest growing cities in Oregon is, slow down! Upzoning this area to high density is the opposite of that.
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I do not support increasing density on this parcel, and there by increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive

Plan change. I am sure you will be hearing from other people.
Sincerely
Liza Chatterton for the Chatterton 38827 Haskins Street
Sandy, OR 97055

## Comments on new development at 40808 and 41010 Highway 26

## 1 message

## Douglas Marshall [dougceleste@msn.com](mailto:dougceleste@msn.com)

Mon, Aug 24, 2020 at 2:47 PM
To: "planning@ci.sandy.or.us" [planning@ci.sandy.or.us](mailto:planning@ci.sandy.or.us)
Cc: Douglas Marshall [dougceleste@msn.com](mailto:dougceleste@msn.com)
I am writing to oppose the change to the Sandy Comprehensive Plan and the Type IV Zone map amendment that would allow The Bull Run Terrace developers to create high density zoning.

I live on Laurel Street maybe not within 500 feet of the proposed development but very close.
This proposal is an example is an example of "spot zoning" of the comprehensive plan rather than a thorough evaluation and amendment of the comprehensive plan. there are procedures in place for review and update of the comprehensive planning. those procedures should be followed.

I do not support high density zoning in this area. There has been no effort to assess or conclude that this zone change is supported by the community.

This piecemeal approach to zoning decisions destroys the integrity of the comprehensive plan. The comprehensive plan as written, provides for a variety of residential densities and commercial zones to provide diversity and meet our needs.

While there is an identified public need for the park and the extension of Dubarko Road this can be done with existing zoning in place.

I do not support increasing density on this parcel, and increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I drive on Debarko Street daily to get to my house. The added traffic this construction would have on this street would cause me many additional problems.

I recommend denial of this zone and Comprehensive Plan change.

Doug Marshall
40204 Laurel Street
Sandy, Or 97055

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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Ido not support increasing density on this parcel, and thereby increasing traffic, school students, needed water and sewer capacity and the other effects of high density construction. I recommend denial of this zone and Comprehensive Plan change. I am sure you will be hearing from other people.

Sincerely

## Zoey McKenzie

[Quoted text hidden]

## Fwd: Bull Run Terrace rezoning EXHIBIT BBBB

Jeff Aprati [japrati@ci.sandy.or.us](mailto:japrati@ci.sandy.or.us)
Mon, Aug 24, 2020 at 4:40 PM
To: Kelly O'Neill [koneill@ci.sandy.or.us](mailto:koneill@ci.sandy.or.us), Marisol Martinez [mmartinez@ci.sandy.or.us](mailto:mmartinez@ci.sandy.or.us), Shelley Denison
[sdenison@ci.sandy.or.us](mailto:sdenison@ci.sandy.or.us)

Jeff Aprati
City Recorder / Management Analyst
City of Sandy
503-489-0938
japrati@ci.sandy.or.us

## ---------- Forwarded message

$\qquad$
From: 'Makoto Lane' via City Recorder [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us)
Date: Mon, Aug 24, 2020 at 4:38 PM
Subject: Bull Run Terrace rezoning
To: recorder@ci.sandy.or.us [recorder@ci.sandy.or.us](mailto:recorder@ci.sandy.or.us), planningl@ci.sandy.or.us [planningl@ci.sandy.or.us](mailto:planningl@ci.sandy.or.us)

Dear Planning Commission and City Planning Staff:
The Bull Run Terrace developers propose both a change to the Sandy Comprehensive Plan and a Type IV Zone map amendment to create high density zoning to make more money, leaving Sandy residents to suffer the increased traffic, more crowded schools and increased pressure on our sewer, water and other services. LCDC's direction on Comp Plan updates say:
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Sincerely
Makoto Lane
37828 rachael dr.
Sandy, OR 97055

## EXHIBIT CCCC

Dear Planning Commission:
I am glad to hear that the City is working on the development code to close the large loop hole made by the Bailey Meadows developers, their high paid land use lawyer, and their paid consultants, including Mr. Mobley, our planning commissioner.

It is with extreme skepticism that I hear you have been working with the Bailey Meadows developer's traffic consultant to make changes to City Code. The intent of the Code changes are to ensure that developers pay for the roads (both local and their share of arterials) that are needed for their developments.

I find it incredulous that, after City residents call out the huge conflict of interest of having a planning commissioner who is most often having to recuse himself because he is working for developers, that you would rely on this particular traffic consultant to "fix" the problems with our City code that are benefitting developers and forcing City residents to pay for their roads. This appears to be a serious issue when we have developer consultants rewriting our code. You have plenty of traffic engineers who are not up to their stinky armpits in carrying water for the developers to use.

The changes recommended by Mr. Mobley highlighted in orange and should be tossed out completely. Please provide me with a copy of all changes made at his behest and any written comments he provided. If he wants to offer his comments on something, like any member of the public, he is welcome to do it. He should have no more influence than any other member of the public. It is totally inappropriate to have a developer's consultant rewriting our code! Our transportation code needs to be written to be resident friendly - not developer friendly. Our City lawyer should be working to ensure that the resident friendly policies can survive any land use lawyer wanting to drive a log truck through a loop hole.

There needs to be ADT standards for minor and major arterials, just like there are on the local streets. The lack of clear and objective standards, including ADT's for arterials leave the same loop hole as to when these upgrades be done, and who should be paying for them.

Regarding changes to the Plat approvement deadlines which were normally due within one year, with a possible extension of one more year. Now you are proposing they be due in two years, with a possible extension of a third year by the Planning Director and a fourth year by the Planning Commission! So we have gone from two to four years. This is bad because code changes, and developers are now able to get grandfathered in for four years after a code change that was done to help improve a development. Please eliminate this change entirely. You may still have discretionary review of extending a plat.

Section 7.100.100 should clarify the responsibility that developers must all local streets and arterial streets that are necessary to maintain ADT standards on local streets. They can do this with Local improvement districts or other ways. Residents should not be paying for these arterials. Further, there should not be the ability for them to earn "SDC credit" beyond what they have deposited, nor transfer it to other projects or other developers.

Please revise these standards to incorporate the resident friendly changes and leave out the standards that allow developers more lee way. As one of the fastest growing cities in Oregon, we can afford to slow our roll and make our development code work for residents first. If that costs developers, more
time or money, at least we, who will be stuck living with development, know that the City leaders took all possible effort to minimize the traffic and taxpayer cost impacts us as residents.

Kathleen Walker
15920 SE Bluff Road.

## EXHIBIT DDDD

October 9, 2020

Ms. Marisol Martinez

\& Ms. Shelley Denison
City of Sandy
39250 Pioneer Blvd.
Sandy, OR 97055

## RE: CITY OF SANDY

BULL RUN TERRACE SUBDIVISION
PRELIMINARY REVIEW (File No. 19- 050 CPA/ZC/SUB) REVISED II
Dear Marisol and Shelley:
We have reviewed the new preliminary submittal and supporting documents and compared them to the February 2020 submittal for the above noted development. We have modified our comments as shown below to reflect the new findings:

1. The previous preliminary stormwater calculations dated November 20, 2019 that was provided with the February 2020 submittal was found to meet the water quality/quantity criteria as stated in the City of Sandy Development Code (SDC) 13.18 Standards and the City of Portland Stormwater Management Manual (SWMM) Standards, that were adopted by reference into the Sandy Development Code. However, a detailed final report stamped by a licensed professional shall be submitted for review with the final construction plans. The added new stormwater detention pond appears to be in compliance with City requirements and will be reviewed at the final design stage.
2. Street A shall be constructed to local street standards (28-foot wide paved surface, curbs on both sides, 5 -foot planter strips and 5 -foot wide sidewalks) in compliance with the City of Sandy Transportation System Plan (TSP), figure 12. The proposed 50-foot right of way is adequate.
3. Sandy Development Code (SDC), section 17.84.50.H.5.b requires the intersection of all local streets with Dubarko Rd to have a minimum of 50 feet of straight tangent alignment perpendicular to the intersection. However, it is does not clearly state the "straight tangent" measurement limits. We suggest the "straight tangent" be measured from the face of the curb line and not at the intersection points.
4. The vertical design grade for landing at all the Tee intersections where controlled with "Stop" signs should be no greater than $8 \%$ for a minimum of 50 feet or two car lengths.
5. The intersection of Hwy 26 and Dubarko Rd should comply with the intersection sight distance standards. All other local street intersections should comply with the vision triangle standards.

Ms. Marisol Martinez
\& Ms. Shelley Denison
October 9, 2020
Page 2
6. The developer's engineer should provide a profile design for a minimum of 200 feet for Street B future extension past the project boundary to ensure future grades can be met.
7. All ADA ramps shall be designed, inspected by the design engineer and constructed by the contractor to meet the most current PROWAG requirements.
8. All public sanitary sewer, waterline mains to be a minimum of 8-inches in diameter and a minimum of 12 -inches in diameter for storm drains and be extended to the plat boundaries where practical to provide future connections to adjoining properties. The preliminary noted changes to the street and utility plan seem to be reasonable and don't cause any concerns. We will review further at the design stage to ensure compliance with City requirements.
9. The existing 8-inch waterline in Dubarko Rd, located between the south side of Hwy 26 and the easterly boundary line of Deer Pointe phase 1 Subdivision should be potholed and depth verified to assure acceptable cover is adequate from the new street grades.

We have no concerns about the proceedings with this project subject to the above stated comments.

Sincerely,

## CURRAN-McLEOD, INC.



Hassan Ibrahim, PE
cc: Mr. Mike Walker, City of Sandy

## EXHIBIT EEEE

October 9th, 2020
ODOT \#10566

## ODOT Response

| Project Name: Bull Run Terrace | State Highway: US 26 and OR 211 |
| :--- | :--- |
| Jurisdiction: City of Sandy | Jurisdiction Case \#: 19-50 CPA/ZC/SUB |
| Site Address: No Situs: US 26 and Dubarko <br> Road, Sandy, OR |  |

The site of this proposed land use action is adjacent to US 26 and in the vicinity of OR 211. US 26 and OR 211 are under ODOT jurisdiction. ODOT is currently working with the City of Sandy to transfer jurisdiction of OR 211 to the City. ODOT has permitting authority for these facilities and an interest in ensuring that this proposed land use is compatible with its safe and efficient operation. Please direct the applicant to the District Contact indicated below to determine permit requirements and obtain application information.

## COMMENTS/FINDINGS

The land use proposal for the site has been modified from March 2020 land use notice. The proposed land use action is for a comprehensive plan amendment, zone change and subdivision. ODOT has reviewed the updated Traffic Impact Study (TIS) prepared by ARD Engineering dated September $28^{\text {th }}, 2020$.

The TIS makes the following conclusion relating to the analysis of the new Dubarko Rd connection to US 26:

Based on the warrant analysis, a northwest-bound left-turn lane and a southeast-bound right-turn lane are projected to be warranted at the intersection of Highway 26 at Dubarko Road with completion of the Dubarko Road extension. The northbound left-turn lane would not be needed at the time of project completion if the intersection is limited to right-in, right-out only. No other turn lanes or traffic signals are recommended in conjunction with the proposed subdivision.

It is unclear why the TIS analyzed the new street connection to US 26 to limit movements at the intersection to right in/right out movements. ODOT provided direction to both the city and the applicant that a right in/right out would not be approved by ODOT. As explained below, the Dubarko Rd connection will require a "Grant of Access" and the configuration of the US 26/Dubarko Rd intersection will be determined through that process.

## Transportation Planning Rule Findings

For zone changes and comprehensive plan amendments, local governments must make a finding that the proposed amendment complies with the Transportation Planning Rule (TPR), OAR 660-$012-0060$. There must be substantial evidence in the record to either make a finding of "no significant effect" on the transportation system, or if there is a significant effect, require assurance
that the land uses to be allowed are consistent with the identified function, capacity, and performance standard of the transportation facility.
The TIS has identified that upon completion of the residential development within the proposed subdivision and the connection of Dubarko Road to Highway 26, it is projected that the intersection of Highway 26 at Dubarko Road will operate with very high delays for the northeastbound Dubarko Road approach. The study recommends that a trip cap of 340 PM net new peak hour trips be applied to the subject property as a condition of approval for the proposed zone change. ODOT is supportive of the proposed trip cap.

## US 26 and Dubarko Rd Intersection

The proposed subdivision includes a new public road connection of Durbako Rd to US 26 consistent with the City of Sandy Transportation System Plan. The location for the proposed public road connection is access controlled. ODOT has acquired and owns access rights along the subject property's frontage. Therefore, in order to construct the new public road connection to US 26, the City is required to apply for and obtain a "Grant of Access" for the public approach (OAR 731-051-2020). As part of the application process, the City must address the criteria outlined in the rule including provide the following information:

1. Traffic Impact analysis for 20 years from the year of construction
2. Demonstrate a committed funding source for the US 26 improvements
3. Demonstrate a benefit to the highway (OAR 731-051-4030)
4. $100 \%$ Construction Plans for highway improvements

For information on the Grant of Access process, please contact Marcela Rodriguez, P.E. at 503-731-8494 or marcela.rodriguez@odot.state.or.us.

Note: It may take $\mathbf{6}$ months to a year to process a Grant of Access.

## Subdivision

The subdivision relies on the new Dubarko Rd connection to US 26 for access to the transportation system. Therefore, the subdivision should be conditioned to obtain the Grant of Access including the ODOT Permit to Occupy or Perform Operations upon a State Highway prior to the recording of the plat and the issuance of Building Permits. All improvements that are conditioned as part of the Grant of Access must be constructed and accepted by ODOT prior to the City issuing approval for Occupancy.

## ODOT RECOMMENDED SUBDIVISION CONDITIONS OF APPROVAL

$\boxtimes \quad$ The Dubarko Rd public road connection to US 26 shall be constructed. A Grant of Access (OAR 731-051-2020) shall be obtained from ODOT for the new public road connection to US 26 prior to recording the plan for the subdivision. Prior to issuance of Building Permits, the Grant of Access including the ODOT Permit to Occupy or Perform Operations Upon a State Highway for all improvements highway improvement shall be obtained. All improvements that are conditioned as part of the Grant of Access must be constructed and accepted by ODOT prior to the City issuing approval for Occupancy.
Note: It may take $\mathbf{6}$ months to a year to process a Grant of Access.
$\boxtimes \quad$ Curb, sidewalk, cross walk ramps, bikeways and road widening along the US 26 frontage shall constructed as necessary to be consistent with local, ODOT and ADA standards. ODOT Permit to Occupy or Perform Operations Upon a State Highway for all improvements highway improvement shall be obtained.

Please send a copy of the Notice of Decision including conditions of approval to:
ODOT Region 1 Planning
Development Review
123 NW Flanders St
Portland, OR 97209
ODOT_R1_DevRev@odot.state.or.us

| Development Review Planner: Marah Danielson | 503.731 .8258, <br> marah.b.danielson@ odot.state.or.us |
| :--- | :--- |
| Traffic Contact: Avi Tayar, P.E. | 503.731 .8221 |
|  | Abraham.tayar@odot.state.or.us |
| District Contact: Loretta Kieffer | 503.667 .7441 |
|  | Loretta.L.KIEFFER @ odot.state.or.us |

# PLANNING COMMISSION STAFF REPORT <br> (DRAFT FINDINGS OF FACT and FINAL ORDER TYPE IV DECISION) 

DATE: August 14, 2020
FILE NO.: 19-050 CPA/ZC/SUB/SAP/TREE
PROJECT NAME: Bull Run Terrace

APPLICANT/OWNER: Roll Tide Properties Corp

LEGAL DESCRIPTION: T2 R5E Section 18CD, Tax Lots 900 and 1000
The above-referenced proposal was reviewed concurrently as a Type IV comprehensive plan amendment, zone change, subdivision, and specific area plan overlay with tree removal. The following Findings of Fact are adopted supporting approval of the plan in accordance with Chapter 17 of the Sandy Municipal Code.

## EXHIBITS:

## Applicant's Submittals:

A. Land Use Application
B. Project Narrative (revised July 2020)
C. Civil Plan Set

- Sheet 1 - Cover Sheet, Preliminary Plat Map, and Future Street Plan
- Sheet 2 - Preliminary Plat Map
- Sheet 3 - Existing Conditions and Tree Retention Plan
- Sheet 4 - Tree Tables
- Sheet 5 - Master Street and Utility Plan
- Sheet 6 - Street Sections
- Sheet 7 - Street Tree Plan and Parking Analysis
- Sheet 8 - Proposed Striping Plan
- Sheet 9 - Preliminary Grading and Erosion Control Plan
- Sheet 10 - Slope Analysis
D. Preliminary Storm Drainage Design and Calculations
E. Public Need Analysis
F. Traffic Impact Study
G. Arborist Report
H. Wetland Determination Report
I. Geotechnical Report


## Agency Comments:

J. City Engineer (February 20, 2020)
K. Sandy Fire District No. 72 (February 25, 2020)
L. PGE (February 25, 2020)
M. City of Sandy Transit (February 28, 2020)
N. City Transportation Engineer (February 28, 2020)
O. ODOT (March 20, 2020)
P. City of Sandy Public Works (April 29, 2020)
Q. City Transportation Engineer (August 10, 2020)
R. City Engineer (August 12, 2020)
S. Sandy Fire District No. 72 (August 13, 2020)
T. ODOT (placeholder)
U. City of Sandy Public Works (placeholder)

## Additional Documents from Staff:

V. Pre-application Notes from January 10, 2018, October 10, 2018
W. Incompleteness Letter dated January 27, 2020
X. Completeness Letter dated February 14, 2020

## Public Comments:

Y. Amelia Williams Robinson (April 23, 2020)
Z. Miriam Chmykhalov (April 23, 2020)

AA. Tom and Linda Hunt (April 26, 2020)
BB. Vincent and Lynn Mandina (April 28, 2020)
CC. Vadim and Miriam Verbelchul (April 28, 2020)

DD. Nicola Skinner (April 30, 2020)
EE. Kathleen Walker (May 1, 2020)
FF. David and Nancy Allan (May 1, 2020)
GG. Izaac McKenzie (May 1, 2020)
HH. Ann Ruhl (May 1, 2020)
II. Lesley Lowe (May 1, 2020)

JJ. Lonnie Stermon (May 1, 2020)
KK. Tom and Linda Hunt (May 5, 2020)
LL. Gary and Val Roche (May 5, 2020)
MM. Gary and Val Roche (May 6, 2020)

NN. Scott Ruehrdanz (May 7, 2020)
OO. Marion Gunderson (May 26, 2020)
PP. Christian Vedder (May 27, 2020)
QQ. Ann Smith Vedder (May 27, 2020)
RR. Susan Dulley (June 2, 2020)
SS. Yoshi Hosaka and Itsuo Hosaka (July 28, 2020)
TT. Gary and Val Roche (July 31, 2020)
UU. David and Nancy Allan (July 30, 2020)
VV. David and Nancy Allan (July 31, 2020)
WW. Dennis Fetter (August 3, 2020)
XX. Jessica Hutson (August 5, 2020)

YY. Lee Grundmeyer (August 6, 2020)
ZZ. Izaac McKenzie (August 7, 2020)
AAA. Marilyn E. (August 10, 2020)

## FINDINGS OF FACT

## General

1. These findings are based on the applicant's submittals received on December 30, 2019, July 14, 2020, and other information as detailed in this document. Staff deemed the application incomplete on January 27, 2020. The applicant submitted additional materials on February 11, 2020. The application was deemed complete on February 14, 2020 and the original 120day deadline was June 13, 2020. However, due to the unforeseen effects of COVID-19 affecting the timing of public hearings, the applicant agreed to a deadline extension of 30 days to July 13, 2020.
2. Staff has retained all original submittal items on file but did not include items that are no longer germane to the proposal as exhibits to this staff report as staff believes the omission of the original materials will make the proposal easier to understand and discuss.
3. On May 13, 2020 the Development Services Director sent the applicant the following: "Instead of requesting 120-day extensions and going back and forth between the applicant and city staff we are going to invoke ORS 227.178 (10) to remove the 120 -day clock provisions for the Bull Run Terrace application." Therefore, this application does not have a 120-day deadline as the proposal includes a comprehensive plan map amendment.
4. This report is based upon the exhibits listed in this document, as well as agency comments and public testimony.
5. The subject site is approximately 15.91 acres. The site is located at 40808 and 41010 Highway 26.
6. The parcel has a Comprehensive Plan Map designation of Village and a Zoning Map designation of R-1, Low Density Residential; R-2, Medium Density Residential; and C-3. Village Commercial.
7. This subject property was previously approved for an 88-lot subdivision known as Vista Loop South (File No. 05-029). Vista Loop South received a few tentative plat extensions and one plat reinstatement, but the subdivision was never constructed, and the approval expired in 2015.
8. The applicant, Roll Tide Properties Corp., requests a Type IV Zone Map Amendment, Comprehensive Plan Map Amendment, Specific Area Plan and development of a 7-lot subdivision for two parcels totaling approximately 15.91 acres. Four lots are proposed to have the R-1 zoning designation and are proposed to each contain a single family dwelling. Two lots are proposed to have the R-3 zoning designation. The exact number of multifamily
dwelling units will be determined with a subsequent design review application for these lots, but according to the applicant the maximum number of dwelling units on the $\mathrm{R}-3$ land is 158 dwelling units. While the $\mathrm{C}-3$ zoning district will have to contain some commercial development there is a decent chance the C-3 land will also contain some residential dwelling units. The development code allows for multi family residential in the $\mathrm{C}-3$ zoning district so long as the dwelling units are above, beside, or behind a commercial business.
9. While this proposal will undoubtfully increase traffic on Dubarko Road the Average Daily Traffic (ADT) concerns that were recently raised during the Bailey Meadows approval process are not present with this land use application. In the Bailey Meadows case, Melissa Avenue is designated a local street and the concerns raised relative to ADT impacted a local street. In the case of Bull Run Terrace, the majority of the anticipated trips will use Dubarko Road which is designated a minor arterial and Street B which is designated as a collector. According to Chapter 17.10 of the Development Code, arterial streets are defined as helping interconnect and support the arterial highway system and link major commercial, residential, industrial, and institutional areas. Also, in Chapter 17.10, the definition for collector streets states they are meant to provide both access and circulation within residential neighborhoods and commercial/industrial areas. While staff is sympathetic of existing residents to the west of the proposed Bull Run Terrace subdivision the extension of Dubarko Road has always been intended to occur and the street has been designed to accommodate high traffic volumes. The only street that ADT concerns are valid is Fawn Street/Street A. The four proposed single family homes in the $\mathrm{R}-1$ zoning district (Lots 1-4) will not cause any concerns, but the potential of trips generated from the C-3 zoned property (Lot 7) could cause additional traffic on Fawn Street/Street A and negatively impact the Deer Pointe subdivision. To alleviate potential traffic concerns and to deter trips from heading west on Fawn Street staff recommends that trip distribution is limited from Lot 7. Staff recommends a condition that the exit on the driveway to Lot 7 on Street $A$ is restricted to left-only turning movements (using a left turn only pork chop design and signage) to deter commercial patrons from entering the Deer Pointe subdivision when exiting Lot 7.
10. Notification of the proposed application was mailed to affected agencies on February 14, 2020 and to affected property owners within 500 feet of the subject property on April 17, 2020. A correction to the notice was sent on May 5, 2020.
11. Due to concerns raised by City planning staff as well as by surrounding residents, the applicant requested additional time to modify the application for this proposed development. On May 21, 2020, a notification was mailed to affected property owners stating that the Planning Commission meeting was rescheduled to Monday, July 27, 2020 at 7:00 pm. The City Council meeting was rescheduled to Tuesday, September 8, 2020 at 7:00 pm.
12. After additional discussion, the applicant and City staff agreed to move the public hearing dates once more. A notice was sent on July 23, 2020 informing affected property owners that the Planning Commission meeting will be held on August 24, 2020 and the City Council meeting on October 19, 2020.
13. A legal notice was submitted to the newspaper on August 5, 2020 to be published on August 12,2020 informing residents of the public hearings.
14. Agency comments were received from the City Transportation Engineer, City Engineer, Sandy Transit, Public Works, ODOT, Sandy Fire District No. 72, and PGE.
15. At publication of this staff report 29 written public comments were received. The main concerns expressed by residents include the following:
A. The loss of trees, thus lowering the aesthetic quality of the area as well as privacy for existing homes.
B. The capacity of the police to effectively patrol multi-family dwelling areas.
C. The possibility of criminal activity at multi-family dwelling areas.
D. Being previously told that the land would not be developed as residential.
E. Acres of commercial land use being put into a deficit.
F. Concerns about effects of multi-family housing on property values.
16. Staff is sympathetic to all concerns raised by the public but does not know of any research which shows that an increase in multi-family housing decreases property values for single family homes. There is certainly nothing within the Sandy municipal code which relates multi-family housing and property values, nor is there a way to evaluate this. Furthermore, the existing designation of Medium Density Residential ( $\mathrm{R}-2$ ) allows multi-family dwellings. Multi-family is listed as a permitted outright use in the $\mathrm{R}-2$ zoning district in Section 17.38.10(A)(6). Even if the applicant were not proposing a comprehensive plan map and zoning map amendment the applicant would still have property rights to construct multifamily housing on the existing 5.01 acres of R-2 designated land.

### 17.24 - Comprehensive Plan Amendment Procedures

17. Chapter 17.24, Comprehensive Plan Amendment Procedures, contains review criteria for Comprehensive Plan amendments. The comprehensive plan map change and zone map change proposes to add High Density Residential (R-3) and Parks and Open Space (POS), increase Village Commercial (C-3), remove Medium Density Residential (R-2), and reduce Low Density Residential (R-1). The Comprehensive Plan states that area and density increase within a village may be increased or decreased up to 20 percent. Changes greater than 20 percent will require a Plan Map amendment. The applicant's analysis shows that the maximum residential density with the existing zoning designations on the R-2 and R-1 lands is 101 dwelling units. The applicant's analysis shows that the maximum residential density with the proposed zoning designations on the R-3 and R-1 lands is 163 dwelling units. Therefore, the potential increase in residential density is 61.9 percent which exceeds the threshold as defined in the comprehensive plan. Therefore, a Plan Map amendment is required.
18. Section 17.24 .70 (A) specifies the change being proposed is the best means of meeting the identified public need. The City Council adopted an updated Urbanization Study in February 2015 (Ordinance 2015-01). This study projected the land needs for the Urban Growth Boundary to the year 2034 and concluded there is expected to be a surplus of 13.9 acres of
high density residential land and a deficit of 51.8 acres of commercial land for the planning period. The proposed change would increase the commercial land supply by 0.77 acres and reduce the residential land supply by the same amount.
19. The applicant's original proposed modifications would have resulted in the following:

> Commercial = deficit of 1.71 acres (previously a surplus of 1.13 acres)
> Low Density Residential = surplus of 11.74 acres (previously a surplus of 19.2 acres) Medium Density Residential = surplus of 12.09 (previously a surplus of 17.1 acres) High Density Residential = surplus of 23.60 acres (previously a surplus of 12.6 acres) Industrial is not applicable to this application
20. Because the original proposal would have resulted in a deficit of the 20-year supply of commercial lands and created a Goal 9 violation, the applicant revised their proposal to include commercial land.
21. The applicant's new proposal will result in the following:

Commercial $=$ surplus of 1.90 acres (previously a surplus of 1.13 acres) Low Density Residential = surplus of 11.74 acres (previously a surplus of 19.2 acres) Medium Density Residential = surplus of 12.09 (previously a surplus of 17.1 acres) High Density Residential = surplus of 20.51 acres (previously a surplus of 12.6 acres) Industrial is not applicable to this application

The applicant's surplus numbers on page 11 of their narrative are slightly different, but the above numbers are the correct numbers based on recent comprehensive plan map amendments.
22. Section 17.24 .70 (B) requires the change to conform to all applicable Statewide Planning Goals.

## Goal 1: Citizen Involvement

The application is being reviewed through a Type IV process that requires two public hearings. A public notice was sent to adjoining property owners, a legal notice published in the Sandy Post, and a notice of the proposal was sent to the Department of Land Conservation and Development. The Planning Commission will review the application at a public hearing on August 24, 2020 and make a recommendation to City Council who will hold a public hearing on October 19, 2020. Because the public will have the opportunity to review and comment on the application, the proposal meets the intent of Goal 1.

## Goal 2: Land Use Planning

The City's Comprehensive Plan guides land uses within the City's Urban Growth Boundary. The City's Zoning Ordinance enforces the Comprehensive Plan. Staff has reviewed the application for conformance with the Comprehensive Plan in review of Chapter 17.24, and Zoning Ordinance in review of Chapter 17.26. The City has sent
notification of this proposal to both the Department of Land Conservation and Development as well as the Oregon Department of Transportation.

## Goal 3: Agricultural Lands

Not Applicable

## Goal 4: Forest Lands

Not Applicable

## Goal 5: Natural Resources

The applicant, along with a consultant, have shown that the subject site does not contain any wetland area (Exhibit H). The applicant worked with an arborist to inventory trees and develop a tree retention plan as required in Chapter 17.102 (Exhibit G). The Planning Commission provided a code interpretation that retention trees only have to be protected consistent with Chapter 17.102, and not consistent with the distance requirements in Chapter 17.92. That said, staff finds that to adequately protect the required retention trees on Lot 7 the protection area shall be consistent with Chapter 17.92. The applicant shall install tree protection fencing at the critical root zone of 1 foot per 1 inch DBH to protect the 59 retention trees on the subject property. Additional analysis and conditions are contained in the review of Chapter 17.102 in this document.

## Goal 6: Air, Water, and Land Quality

The applicant proposes that the application complies with all regulations relative to air, water, and land quality.

## Goal 7: Natural Hazards

The site contains minimal steep slopes and no natural hazards are known to exist on the site.

## Goal 8: Recreational Needs

The applicant is dedicating up to 1.426 acres of parkland to the City. This dedication helps expand the existing parkland that will eventually be developed as Deer Point Park. Expanding the Deer Point park is consistent with the goals of the Parks and Trails Advisory Board and the current revisions that are being considered for the Parks Master Plan. Staff finds that parkland dedication is preferable so long as the development to the east of the park is complementary to the parkland. As explained below, Section 17.86.20 has a requirement that all homes must front on the parkland. The applicant is not proposing any houses to the south or east of the parkland, but instead is proposing future commercial development. The applicant's narrative states, "in order to address the spirit of the requirement in this section, the applicant proposes constructing a widened sidewalk along the eastern park frontage adjacent to Lot 7 '. Staff supports the shift of commercial lands from the east side of Dubarko Road to the west side of Dubarko Road if the parkland is accommodated with adequate landscape buffering, pedestrian amenities, and commercial development (albeit mixed use or traditional commercial) having active storefronts or patios facing the parkland. The purpose of having homes front the parkland is to provide eyes on the park and increase safety for park users. Having active storefronts
or patios facing the park will provide the same safety measures as homes facing the park. Additionally, this kind of "active frontage" creates pedestrian interest and engagement.
Staff recommends that the design review approval for Lot 7 shall be conditioned to incorporate storefronts, patios and usable windows facing the parkland. An additional consideration should be to connect the sidewalk along Highway 26 to the walkway on the parkland property to accommodate additional pedestrian connectivity. Staff recommends that the applicant install a walkway along the east side of the park or west side of Lot 7 that connects Fawn Street/Street A to the sidewalk on Highway 26. Staff also recommends that the design review approval for Lot 7 incorporate a landscape buffer that provides visibility between Lot 7 and the parkland but provides a visually attractive separation.

## Goal 9: Economic Development

Goal 9 requires cities to provide an adequate supply of buildable lands for a variety of commercial and industrial activities and requires plans to be based on an analysis of the comparative advantages of a planning region. With the revised proposal, staff finds that each type of land use in the Comprehensive Plan will continue to be in surplus.

## Goal 10: Housing

This proposal to change residential designations on the subject property does not affect compliance with this goal. In fact, the proposed modifications to the comprehensive plan increases the potential diversity in housing types by providing additional multi-family housing.

## Goal 11: Public Facilities and Services

Not Applicable

## Goal 12: Transportation

The applicant contracted with a Traffic Engineer to prepare a Traffic Impact Study (Exhibit F). With development of this project, Dubarko Road will be extended through the property to connect with Highway 26. The submitted traffic study evaluated five existing intersections to determine if they are expected to operate within capacity under year 2021 traffic conditions either with or without the addition of site trips from the proposed development. The study did not identify any required mitigation. According to the traffic study, the proposed development would produce 76 peak AM trips, 92 peak PM trips, and 1,194 total daily trips. The proposed zone change is projected to result in a negligible change to traffic volumes as measured under the "reasonable worst case" development scenarios and therefore will not have a significant effect on operation of area roadways and intersections at the planning horizon as defined by Oregon's Transportation Planning Rule. The City Transportation Engineer (Exhibit M) states that the development will implement a key project in the city's TSP, namely Dubarko Road. With its connection to Highway 26, Dubarko Road will become increasingly important to the transportation system in Sandy. The traffic analysis makes several references to a right-in/right-out intersection at Dubarko Road and Highway 26. These references are in the context of analysis of the performance of other study intersections examined in the traffic study and not a proposal to construct a right-in/right-out intersection at this
location. The adopted Transportation System Plan (TSP) does not contemplate a right-in/right-out intersection at Highway 26 and Dubarko Road. The intersection of Highway 26 and Dubarko Road shall be constructed as a full-access intersection in compliance with the TSP.

## Goal 13: Energy Conservation

Not Applicable

## Goal 14: Urbanization

This proposal accomplishes the objectives of this Statewide Planning Goal by accommodating additional residential and commercial growth within the existing Urban Growth Boundary (UGB) as planned for in the adopted Urbanization Study completed in 2015. As shown in Finding 21, the proposed changes will not result in any deficit in available land use.

## Goals 15-19

Not applicable for the City of Sandy as these goals relate to the Willamette River and the Oregon Coast.

### 17.26 - Zoning District Amendments

23. The applicant is proposing a change in zoning districts as shown in the following table:

| Zoning District | Existing Acres | Proposed Acres |
| :---: | :---: | :---: |
| R-1 | 8.05 | 0.59 |
| R-2 | 5.01 | 0.00 |
| R-3 | 0.00 | 7.91 |
| C-3 | 2.84 | 3.61 |

24. Chapter 17.26 sets forth review criteria and procedural requirements for quasi-judicial and legislative zoning map amendments. The applicant is requesting a quasi-judicial zoning map amendment to modify the zoning district boundaries for the site.
25. Section 17.26.40 outlines the procedures for a quasi-judicial zoning map amendment.
26. Section 17.26 .40 (B)(1) requires the City Council to determine the effects on City facilities and services. With the proposed development, Dubarko road will be extended from its current terminus through the subject site to connect with Highway 26. This road is identified as a necessary future minor arterial in the City's Transportation System Plan. An existing water line is located in the future alignment of Dubarko Road, and the applicant will accommodate this facility during the construction of this road.
27. Section $17.26 .40(B)(2)$ and (3) requires the Council to assure consistency with the purposes of this chapter and with the policies of the Comprehensive Plan, including the following:
A. Maintain sound, stable, and desirable development within the City
B. Permit changes in zoning district boundaries where appropriate
C. Ensure zoning changes are consistent with the community's land use policies and goals
D. Lessen the influence of private economic interests in the land use decisionmaking process

Given that the proposed development conforms with the Sandy Municipal Code and Comprehensive Plan goals, and that multiple conditions have been put in place to ensure that the development meets the intent of the Code and goals, staff finds that these criteria have been met.
28. Section $17.26 .40(B)(4)$ requires the Council to assure consistency with the Statewide Planning Goals as may be necessary, and any other applicable policies and standards adopted by the City Council.

### 17.30 - Zoning Districts

29. The total gross acreage for the entire property is 15.91 acres. After removal of the right-ofway and proposed parkland tract, the net site area (NSA) for the subject property is reduced to 11.59 net acres with three zoning districts. The area proposed to be zoned R-1 contains 0.59 net acres. The area proposed to be zoned R-3 contains 7.91 net acres. The area proposed to be zoned C-3 contains 3.61 net acres.
30. For the area zoned R-1, a minimum of 5 and a maximum of 8 units per acre are allowed. In accordance with Section 17.30 .20 (D) a dwelling unit figure is rounded down to the nearest whole number for all total maximum or minimum figures less than four dwelling units. The minimum density for the subject area is .59 net acres $x 5$ units/net acre $=2.95$ rounded down to 2 units. The maximum density for the subject area is .59 net acres $x 8$ units/net acre $=4.72$ rounded up to 5 units. The applicant is proposing 4 units which is within the density range.
31. For the area zoned R-3, a minimum of 10 and a maximum of 20 units per acre are allowed. The minimum density for the subject area is 7.91 net acres x 10 units/acre $=79$ units. The maximum density for the subject area is 7.91 net acres x 20 units/acre $=158$ units. The applicant has not identified the exact number of units which will be built in the subject area. This will be reviewed in a future design review process.

## $\mathbf{1 7 . 3 2}$ - Parks \& Open Space (POS)

32. The applicant proposes dedicating some parkland and zoning the land as Parks and Open Space (POS).
33. Section 17.32.10 contains the permitted uses in the POS zoning district. The applicant proposes a park dedication consistent with parkland in the Parks Master Plan per Section 17.32.10 (A)(1).

### 17.36 - Low Density Residential (R-1)

34. The applicant proposes constructing four single-family dwellings as permitted in this zoning district. As shown in paragraph 19, the applicant is proposing an appropriate number of units given density requirements.
35. Section 17.36 .30 contains the design standards for this zone. As shown on Sheet C 2 of the plan set (Exhibit 2), all lots in the proposed subdivision contain at least 5,500 square feet, have at least 20 feet of street frontage, and contain an average lot width of at least 50 feet as required. Lot 4 has frontage on Dubarko Road, but access is not permitted from this road. Access to this lot will be across an access easement on Lot 3. The proposed building footprints shown on Sheet C2 indicate that all lots are capable of complying with applicable setbacks in the zone. The details of these development standards will be reviewed with the submittal of building permits.
36. Section 17.36.40(A) requires that water service be connected to all dwellings in the proposed subdivision. Section 17.36 .40 (B) requires that all proposed dwelling units be connected to sanitary service if currently within 200 feet from the site, which it is. Section 17.36.40(C) requires that the location of any real improvements to the property must provide for a future street network to be developed. Section 17.36.40(D) requires that all dwelling units must have frontage or approved access to public streets. The applicant proposes to meet all of these requirements.
37. Section 17.36 .50 (B) requires that lots with 40 feet or less of street frontage shall be accessed by a rear alley or shared private driveway. No proposed lots have 40 feet or less of street frontage.
38. Staff questions the building potential of Lots 3 and 4. After making considerations for typical setbacks in the R-1 zoning district, the additional 20 foot setback along Dubarko Road as required by Chapter 17.80, the easement along the west side of Lot 4 , and the easement along the north side of Lot 3 these lots will be left with reduced buildable lot area. Staff recommends the applicant submit a building footprint plan for Lots $\mathbf{1 - 4}$ for staff to review and analyze prior to the City Council hearing on October 19, 2020.

## 17. 40 - High Density Residential (R-3)

39. The applicant proposes dividing the R-3 portion into two lots allowing a maximum of 158 dwellings units. As noted above in this document, the exact number of units will be determined with a future design review application.
40. The future design review application will include a review of development standards (17.40.30), minimum requirements (17.40.40) and additional requirements (17.40.50).

### 17.46 - Village Commercial (C-3)

41. The applicant proposes 3.61 net acres of C-3 land. This is an increase in commercial land by 0.77 acres. While the $\mathrm{C}-3$ zoning district will have to contain some commercial development there is a decent chance the C-3 land will also contain some residential dwelling units. The exact number of potential residential units is not known at this time. If residential units are proposed on the $\mathrm{C}-3$ land the dwelling units will be assessed in a future design review.
42. Any future development on the land zoned C-3 will require a design review in accordance with the development standards found in Section 17.46.30 and the Sandy Municipal Code.

### 17.54 - Specific Area Plan Overlay

43. The purpose of a specific area plan overlay zone is to allow development and approval of specific area plans in the city. The City of Sandy Comprehensive Plan, Goal 2, Land Use Designations, Village states: "shifting of the underlying zoning district boundaries to accommodate development constraints and land divisions for specific development proposals may be allowed through approval of a Specific Area Plan."
44. The applicant proposes shifting zoning district boundaries as noted in this document and has submitted a Specific Area Plan request according to the standards in the chapter as required. The purpose of a specific area plan overlay zone is to allow development and approval of specific area plans in the city. A specific area plan is a master plan coordinating and directing development in terms of transportation, utilities, open space and land use; however, no phasing or timeline is required. Specific area plans may be located anywhere within the Urban Growth Boundary and are intended to promote coordinated planning concepts and pedestrian-oriented mixed-use development. The City of Sandy Comprehensive Plan, Goal 2, Land Use Designations, Village states: "shifting of the underlying zoning district boundaries to accommodate development constraints and land divisions for specific development proposals may be allowed through approval of a Specific Area Plan".
45. The applicant proposes shifting of zoning district boundaries and therefore submitted a Specific Area Plan request according to the standards in Chapter 17.54. Staff finds that the only other specific area plan in Sandy, the Bornstedt Village Specific Area Overlay, has additional standards related to additional tree retention, green streets, additional design standards for single family homes, etc. Keeping the Bornstedt Village Overlay in mind, staff recommends that additional consideration is given to additional tree protection for the proposed retention trees. The Planning Commission provided a code interpretation that retention trees only have to be protected consistent with Chapter 17.102, and not consistent with the distance requirements in Chapter 17.92. That said, staff finds that to adequately protect the required retention trees on Lot 7 the protection area shall be consistent with Chapter 17.92. The applicant shall install tree protection fencing at the critical root zone of 1 foot per 1 inch DBH to protect the 59 retention trees on the subject property. Additional analysis and conditions are contained in the review of Chapter 17.102 in this document. Consistent with the Bornstedt Village Overlay this development should also consider green streets where practicable. The applicant shall submit additional details defining locations for green street swales. If green streets are practicable the plan set shall be modified to detail additional right-of-way to accommodate the swales.
46. The process to establish a specific area plan shall be initiated by the City Council. The Planning Commission or interested property owners may submit requests to the City Council to initiate the specific area plan process. If owners request initiation of a specific area plan process, the City Council may require an application fee to cover the cost of creating the plan. The applicant requests initiation of this specific area plan and has paid the applicable fees. The comprehensive plan map change and zone map change proposes to add High Density Residential (R-3) and Parks and Open Space (POS), increase Village Commercial (C-3), remove Medium Density Residential (R-2), and reduce Low Density Residential (R-
1). The Comprehensive Plan states that area and density increase within a village may be increased or decreased up to 20 percent. Changes greater than 20 percent will require a Plan Map amendment. The applicant's analysis shows that the maximum residential density with the existing zoning designations on the R-2 and R-1 lands is 101 dwelling units. The applicant's analysis shows that the maximum residential density with the proposed zoning designations on the R-3 and R-1 lands is 163 dwelling units. Therefore, the potential increase in residential density is 61.9 percent which exceeds the threshold as defined in the comprehensive plan.
47. In accordance with Section 17.54 .00 (D) a specific area plan shall be adopted through a Type IV process and shall be evaluated for compliance with the criteria for zoning district amendments and/or comprehensive plan amendments where applicable. The applicant states that this specific area plan request will be reviewed through a Type IV process and shall comply with the criteria for zoning district and Comprehensive Plan amendments. As stated by the applicant the criteria in Chapter 17.24, Comprehensive Plan Amendment Procedures and Chapter 17.26, Zoning District Amendments are reviewed in this document and as reviewed in these chapters, the proposal is found to comply with all required criteria if the conditions of approval as recommended by staff are required.
48. In accordance with Section 17.54.00(G) compliance with specific area plan standards and procedures are required. New construction and land divisions shall meet any development, land division and design standards of the applicable specific area plan. Base zone and land division standards shall apply where no different standard is referenced for the specific plan area. Staff finds that with adequate conditions of approval the proposal will comply with the standards and procedures of a specific area plan.
49. Section 17.54.10 defines eight items that define the specific area plan by providing text and diagrams with the specific area plan application. The eight items relate to the following: plan objectives; site and context; land use diagram; density; facilities analysis; circulation/transportation diagram; market analysis; and, design and development standards. The eight items are reviewed as follows:
A. Plan Objectives. A narrative shall set forth the goals and objectives of the plan. The applicant submitted a robust narrative explaining the proposal for the Bull Run Terrace subdivision. The applicant's narrative elaborates on the objectives of their proposal and the desire to include a few single family dwellings, multi-family dwellings, and village commercial development. The narrative also elaborates on dedications, including 1.43 acres of parkland.
B. Site and Context. A map of the site and existing context shall identify the project area. The applicant submitted a 10 -sheet plan set that details the project area and proposed improvements.
C. Land Use Diagram. The land use diagram shall indicate the distribution and location of planned land uses, including open space and parks, within the area covered by the specific area plan. The applicant's plan set clearly identifies all proposed land uses,
with the exception of Lot 7, which is the Village Commercial lot. The development of Lot 7 will need to follow the uses as defined in Chapter 17.46, Village Commercial (C-3). If the applicant or successor-in-interest proposes uses in Section 17.46.20(B), Conditional Uses, the proposal will need to be reviewed by the Planning Commission.
D. Density. If residential uses are proposed, a narrative shall describe planned residential densities. Density calculations were included by the applicant in their narrative and are included in review of Chapter 17.30, Zoning Districts in this document.
E. Facilities Analysis. The plan shall include an analysis of the general location and extent of major components of sanitary sewer, water, and other essential facilities proposed to be located within the specific plan area and needed to support the land use and densities described in the plan. A review of existing facilities master plans shall be sufficient if these master plans indicate there is adequate capacity to serve the specific plan area. The applicant included a utility plan within the plan set and a preliminary stormwater report. The Public Works Director reviewed the applicant's submission and has provided analysis and recommended conditions as explained in this document.
F. Circulation/Transportation Diagram. The circulation diagram shall indicate the proposed street pattern for the specific area plan area, including pedestrian pathways and bikeways. Design standards and street cross sections shall be included, if different than normal City standards. The applicant included a traffic study from Ard Engineering, a future street plan, a master street plan, and street section details. The City's Transportation Engineer, Public Works Director, ODOT, Fire Marshal and the Transit Director reviewed the applicant's submission and have provided analysis and recommended conditions as explained in this document.
G. Market Analysis. Specific area plans that include amendments to the zoning map affecting the acreage of Village Commercial (C-3) land within the plan area shall include a market analysis of supportable retail space that verifies demand for the proposed acreage of C-3 land. The analysis should include a market delineation, a regional and local economic review, and a retail market evaluation. The applicant submitted an analysis from Johnson Economics. The proposal includes increasing the amount of available commercial lands by 0.77 acres. Johnson Economics explains that the proposal will provide capacity for additional housing options and provide more property that is an active urban use. The analysis states that an increase in multifamily housing will increase local capacity for residential products that can meet a broad range of price points. The analysis goes on to explain that the Highway 26 infrastructure investment requirements were too great to be offset by the value of the underlying property, but that a zone change to allow more residential units will provide the ability of the site to support necessary infrastructure investments. As Johnson Economics correctly identifies the extension of Dubarko Road to Highway 26 and the additional land needed for Deer Pointe park cannot be completed unless the subject site is developed.
H. Design and Development Standards. If standards differ from normal City standards, design and development standards shall be included in the plan. The applicant states that the proposal is anticipated to comply with all design and development standards. As identified by the applicant the exact details of site and building review will be primarily addressed with submittal of subsequent land use applications for development on Lot 5, 6 and 7.

### 17.56 - Hillside Development

50. The applicant submitted a Geotechnical and Slope Stability Investigation (Exhibit I) showing that the subject site contains a small area of slope exceeding 25 percent. All recommendations in Section 6 of Exhibit I shall be conditions for development. The Public Works Director stated the following: "The geotechnical report (2005) submitted with the application is nearly fifteen years old. It does not appear that there have been physical changes to the existing surface of the site in that time span that would impact the findings and recommendations in the geotechnical report but there may have been changes in industry standards or practices since then. As a result, the Applicant shall submit a letter from the original geotechnical engineering firm indicating that the findings and recommendations from the 2005 report remain substantially unchanged or modifying the original findings and recommendations as necessary." The applicant shall submit a letter from the original geotechnical engineering firm indicating that the findings and recommendations from the 2005 report remain substantially unchanged or modifying the original findings and recommendations as necessary.

### 17.74 -Accessory Development

51. Section 17.74 .40 specifies, among other things, retaining wall and fence height in front, side and rear yards. Retaining walls in residential zones shall not exceed 4 feet in height in the front yard, 8 feet in height in rear and side yards abutting other lots, and 6 feet in side and rear yards abutting a street. The submitted plan set does not define any retaining walls with the exception of a retaining wall for the stormwater facility in Tract B. If retaining walls are proposed the applicant shall submit additional details/confirmation on the proposed retaining walls, including heights meeting code requirements and an architectural finish, for staff review and approval.

### 17.80 - Additional Setbacks on Collector and Arterial Streets

52. Chapter 17.80 requires all residential structures to be setback at least 20 feet on collector and arterial streets. Lots 3, 4, 5, 6 and 7 shall adhere to the setback standards in Chapter 17.80 for Dubarko Road which is classified as a minor arterial and Street B which is classified as a collector. The plan set shall be revised to detail 20 foot setbacks on Lots 3, 4, 5, 6, and 7 for Dubarko Road and Street B.

### 17.82 - Special Setbacks on Transit Streets

53. Section 17.82 .20 (A) requires that all residential dwellings shall have their primary entrances oriented toward a transit street rather than a parking area, or if not adjacent to a transit street, toward a public right-of-way or private walkway which leads to a transit street. Lot 4 will be accessed by an easement across Lot 3 and will be designed in accordance with this standard. Lot 3 will be located at the corner of Dubarko Road and a new local street. The dwellings on

Lots 3 and 4 shall be designed to meet all of the requirements as specified in Chapter 17.82 and will be assessed in a future design review.
54. The applicant proposes that all single-family units will meet the requirements of Section 17.82.20(B), which requires that dwellings shall have a primary entrance connecting directly between the street and building interior and outlines requirements for the pedestrian route. The adherence to this code section for the future multi-family units will be determined in a future design review process.
55. The applicant proposes that all single-family units will meet the requirements of Section 17.82.20(C), which requires that primary dwelling entrances shall be architecturally emphasized and visible from the street and shall include a covered porch at least 5 feet in depth. The adherence to this code section for the future multi-family units will be determined in a future design review process.
56. Section 17.82 .20 (D) requires that if the site has frontage on more than one transit street, the dwelling shall provide one main entrance oriented to a transit street or to a corner where two transit streets intersect. The orientation of the future multi-family units that have frontage on both Highway 26 and Dubarko Road will be determined in a future design review process.

### 17.84 - Improvements Required with Development

57. Section17.84.20(A)(1) requires that all improvements shall be installed concurrently with development or be financially guaranteed. All lots in the proposed subdivision will be required to install public and franchise utility improvements or financially guarantee these improvements prior to final plat approval.
58. Section $17.84 .30(\mathrm{~A})(1)$ requires that all proposed sidewalks on the local streets will be five feet wide as required by the development code and separated from curbs by a tree planting area that is a minimum of five feet in width.
59. As required by Section 17.84 .39 (A)(2), six-foot sidewalks are proposed to be constructed along Highway 26, Dubarko Road north of Street B, and on Street B. These frontages will include planter strips as required. As required by Section 17.84.39(A)(4), the applicant intends to construct all sidewalk improvements as required by this section.
60. No exceptions or modifications listed in Section 17.84.39(A)(3) are requested with the application.
61. In relation to Sections 17.84.39(B), 17.84.39(C), 17.84.39(D), and 17.84.39(E), no pedestrian or bicycle facilities other than sidewalks and on-street bicycle lanes have been identified or proposed in the application.
62. Section 17.84.40(A) requires that the developer construct adequate public transit facilities. The proposed development will require two concrete bus shelter pads and green benches (Fairweather model PL-3, powder coated RAL6028). The required pad size is 7
feet by 9 feet 6 inches and the amenities should be located adjacent to Lot 1 and Lot 5. Engineering specifications are available from the Transit Department.
63. Section 17.84.50 outlines the requirements for providing a traffic study. The applicant included a Traffic Impact Study with the application (Exhibit F). The study did not identify any required mitigation. According to the traffic study, the proposed development would produce 76 peak AM trips, 92 peak PM trips, and 1,194 total daily trips. The proposed zone change is projected to result in a negligible change to traffic volumes as measured under the "reasonable worst case" development scenarios and therefore will not have a significant effect on operation of area roadways and intersections at the planning horizon as defined by Oregon's Transportation Planning Rule. The City Transportation Engineer (Exhibit M) states that the development will implement a key project in the city's TSP, namely Dubarko Road. With its connection to Highway 26, Dubarko Road will become increasingly important to the transportation system in Sandy. The traffic analysis makes several references to a right-in/right-out intersection at Dubarko Road and Highway 26. These references are in the context of analysis of the performance of other study intersections examined in the traffic study and not a proposal to construct a right-in/right-out intersection at this location. The adopted Transportation System Plan (TSP) does not contemplate a right-in/right-out intersection at Highway 26 and Dubarko Road. The intersection of Highway 26 and Dubarko Road shall be constructed as a full-access intersection in compliance with the TSP.
64. The proposed street and utility plan depicts Dubarko Road between its current eastern terminus and proposed Street A with a 76 ft . wide right-of-way consisting of a 0.5 foot monumentation strip, a six-foot sidewalk, a five-foot planter strip, a 0.5 foot curb, a five foot bike lane, a 17 -foot travel lane and half of an 8 foot median (i.e. 4 feet) for a total half section equaling 38 feet and a full street section equaling 76 feet. The standard section for an arterial street in the TSP consists of 11 -foot travel lanes with 5 -foot bike lanes. It is unclear to staff as to why the proposed travel lanes are so wide. The portion of Dubarko Road between Street A to the west boundary of the development should be used to provide a transition from the proposed three lane section with median to a two lane section with median to match the existing section. The proposed 17 -foot wide travel lanes will be confusing to motorists. The applicant shall submit a revised cross-section for the portion of Dubarko Road between the existing terminus and Street A with construction plans for City Engineer review and approval.
65. The extension of Dubarko Road is classified as a minor arterial street and shall meet the standards of Section $17.84 .50(B)$ which states that arterial streets should generally be spaced in one-mile intervals and traffic signals should generally not be spaced closer than 1,500 ft for reasonable traffic progression. The proposed alignment of Dubarko Road is consistent with the TSP and is an extension of an existing arterial street, not a new arterial street. The traffic study concluded that based on warrant analysis a traffic signal is not warranted. The City Transportation Engineer (Exhibit M) states that a traffic signal at Dubarko Road and Highway 26 will be needed in the near future based on future development but did not recommend a traffic signal at this time. The applicant shall provide a 40 foot by 40 foot right-of-way dedication or permanent traffic signal easement at the northeast corner of

Lot 7 to accommodate a future traffic signal. This right-of-way dedication could impact the tree retention area. The applicant shall submit revised plans showing a 40 foot by 40 foot dedication on Lot 7 and detailing how that will impact the tree retention area. If the tree retention area is negatively impacted the applicant shall preserve additional trees. Street B (defined as 'New Road in the TSP) is classified as a collector street and does not need to adhere to the standards in Section 17.84.50(B).
66. The alignment of Street B and Dubarko Road does not provide the minimum 100 feet of tangent alignment (as measured from the curb line on Dubarko extended) on Street B as required by Section $17.84 .50(\mathrm{H})(5)(\mathrm{a})$ of the Sandy Municipal Code (SMC). The alignment of the intersection of Street B and Dubarko Road shall be revised to provide the minimum 100 feet of tangent section to comply with the Development Code.
67. The widening of Dubarko Road to accommodate the section recommended in the TSP is eligible for Transportation System Development Charge credits. The difference in cost between the required minor arterial improvements and a standard local street section is eligible for credits. Estimated costs shall be submitted to City staff and reviewed and approved by the City Engineer. The City and the Applicant shall enter into an agreement defining the eligible improvements and estimated costs prior to plat approval. SDC credits shall be based on final audited costs.
68. Dubarko Road will contain a dedicate left turn and right turn/through lane, a median with street trees, and a dedicated left turn lane to Street B. Highway 26 improvements will include among other things a dedicated right turn lane to Dubarko Road, sidewalks, street trees, and restriping. The applicant shall adhere to all standards and requirements that are defined by ODOT, including the Dubarko Road connection to Highway 26 and all required improvements along Highway 26 constructed as necessary to be consistent with local, ODOT, and ADA standards. As stated by the Public Works Director any ODOT required improvements on and adjacent to the Highway 26 frontage of the site are not included in the City's TSP or capital plans and as such are not eligible for SDC credits or reimbursement.
69. The proposed development does not include any long straight street segments or cul-de-sac streets and is thus not required to follow the standards in Section 17.84.50(C).
70. Section 17.84.50(D) requires that development sites shall be provided with access from a public street improved to City standards. All single-family homes will gain direct access from a public street improved to city standards with the exception of Lot 4 which will be accessed across an easement on Lot 3 . All new streets are proposed as full street improvements with the exception of improvements along Highway 26. No off-site improvements have been identified or are warranted with the construction of this subdivision. All streets are proposed as full streets; with no three-quarter streets being proposed.
71. Section 17.84.50(E) requires that public streets installed concurrent with development of a site shall be extended through the site to the edge of the adjacent property. The proposed street layout results in one temporary dead-end street (Street B) that will be stubbed to the southern property line of the subject property. To accommodate fire apparatus turnaround the
temporary dead-end of Street B shall include turnarounds, subject to the approval of the Fire Marshal. The applicant shall revise the plan set to detail fire turnaround easements on Lots 5 and 6 as approved by the Sandy Fire District Fire Marshal. The applicant shall also ensure that water supply requirements are in compliance with the adopted Oregon Fire Code.
72. The proposed development includes the need to name Street B. The street name shall follow the deer related theme in the development to the west and shall be an 'avenue' as it runs north/south. Staff recommends the name Velvet Avenue.
73. Proposed streets meet the requirements of $17.94 .50(\mathrm{H})$. The future street plan (Exhibit C, Sheet 1) shows that the proposed development will facilitate and not preclude development on adjacent properties. Both Dubarko Road and Street B are identified in the TSP and proposed to be constructed with the development. All proposed streets comply with the grade standards, centerline radii standards, and TSP-based right-of-way improvement widths. Dubarko Road will be extended by a continuation of the centerline of the existing section. All proposed streets are designed to intersect at right angles with the intersecting street and comply with the requirements of Section 17.94.50.(H)(5). No private streets are proposed in the development.
74. Section 17.84.60 outlines the requirements of public facility extensions. The applicant submitted a utility plan (Exhibit C, Sheet 5) which shows the location of proposed public water, sanitary sewer, and stormwater drainage facilities. Broadband fiber service will be detailed with construction plans. A private sanitary sewer connection is proposed to serve Lot 7. All other utilities will be public.
75. Franchise utilities will be provided to all lots within the proposed subdivision as required in Section 17.84.80. The location of these utilities will be identified on construction plans and installed or guaranteed prior to final plat approval. The applicant does not anticipate extending franchise utilities beyond the site. All franchise utilities other than streetlights will be installed underground. The developer will make all necessary arrangements with franchise utility providers. The developer will install underground conduit for street lighting.
76. Section 17.84.90 outlines requirements for land for public purposes. A 15-foot public storm easement is proposed along the back of Lots 1-4 and a storm easement and sanitary sewer easement are identified in Tract A. The majority of public facilities will be located within public rights-of-way including the existing waterline that will be contained within the Dubarko Road right-of-way. Eight-foot wide public utility easements will be provided along all lots adjacent to street rights-of-way for future franchise utility installations. All easements and dedications will be identified on the final plat as required.
77. Section 17.84.100 outlines the requirements for mail delivery facilities. The location and type of mail delivery facilities shall be coordinated with the City Engineer and the Post Office as part of the construction plan process.
78. ODOT recommends that the site layout and development be consistent with the approved and adopted Transportation System Plan, including: the Dubarko Road extension to Highway 26, aligned with the westerly most SE Vista Loop Drive intersection; accommodation of a Collector road terminating at the southern extents of the subject property to allow the road to extend south from the westernmost leg of the SE Vista Loop Drive intersection; and curb, sidewalks, cross walk ramp, bikeways and road widening along Highway 26 constructed as necessary to be consistent with local, ODOT, and ADA standards.
79. The intersection of Dubarko Road and Highway 26 requires a grant of access from ODOT. Prior to final plat approval the applicant shall obtain a grant of access for the intersection of Dubarko Road and Highway 26 from ODOT.
80. The City Transportation Engineer (Exhibit M) stated that conditions of approval should be included requiring the development comply with the standards and procedures specified by ODOT. He went on to say that ODOT requirements and standards associated with frontage improvements where the development abuts Highway 26 shall be made conditions of approval with the development.

### 17.86 - Parkland and Open Space

81. The applicant intends to dedicate parkland as outlined in the requirements of Section 17.86.
82. 17.86.10(2) contains the calculation requirements for parkland dedication. The formula is acres $=$ proposed units $\times$ (persons/unit) $\times 0.0043$. For the four single family homes, acres $=4$ $\mathrm{x} 3 \times 0.0043=0.05$ acres. For the maximum development of 158 multifamily units, acres $=$ $158 \times 2 \times 0.0043=1.36$ acres. Combined, this totals 1.41 acres. The applicant proposes to dedicate 1.426 acres of parkland and is thus in compliance with this requirement.
83. Section 17.86.20 has a requirement that all homes must front on the parkland. The applicant is not proposing any houses to the south or east of the parkland, but instead are proposing future commercial development. The applicant's narrative states, "in order to address the spirit of the requirement of this requirement in this section, the applicant proposes constructing a widened sidewalk along the eastern park frontage adjacent to Lot 7 ". Staff supports the shift of commercial lands from the east side of Dubarko Road to the west side of Dubarko Road if the parkland is accommodated with adequate landscape buffering, pedestrian amenities, and commercial development (albeit mixed use or traditional commercial) having active storefronts or patios facing the parkland. The purpose of having homes front the parkland is to provide eyes on the park and increase safety for park users. Having active storefronts or patios facing the park will provide the same safety measures as homes facing the park. Staff recommends that the design review approval for Lot 7 shall be conditioned to incorporate storefronts, patios and usable windows facing the parkland. An additional consideration should be to connect the sidewalk along Highway 26 to the walkway on the parkland property to accommodate additional pedestrian connectivity. Staff recommends that the applicant install a walkway along the east side of the park or west side of Lot 7 that connects Fawn Street/Street A to the sidewalk on Highway 26. Staff also recommends that the design review approval for Lot 7 incorporate a
landscape buffer that provides visibility between Lot 7 and the parkland but provides a visually attractive separation.
84. On June 10, 2020, the applicant brought the parkland dedication proposal to the Sandy Parks and Trails Advisory Board. At the meeting, the Board verbally agreed to provide the applicant SDC credits in exchange for development of the park. This verbal agreement is not a decision as the Parks and Trails Advisory Board cannot make financial decisions but can make recommendations to other hearing bodies. Staff supports the request from the applicant and the verbal agreement from the Parks and Trails Advisory Board. The City Council may consider this offer from the applicant and make a decision regarding the request for SDC credits in lieu of parkland development.
85. Section 17.86.30 lists the requirements of the developer prior to acceptance of required parkland dedications. The applicant shall clear, grade, and seed the proposed parkland as specified by the City in the construction plans. The applicant shall also provide a Phase I Environmental Assessment.
86. The applicant proposes including two utility easements within the proposed parkland dedication. However, these easements are unavoidable given the location of existing utilities. The applicant shall define these utilities on the tentative plat.

### 17.92 - Landscaping and Screening

87. Section 17.92.10 contains general provisions for landscaping. As required by Section 17.92.10 (C), trees over 25 -inches circumference measured at a height of 4.5 feet above grade are considered significant and should be preserved to the greatest extent practicable and integrated into the design of a development. A 25 -inch circumference tree measured at 4.5 feet above grade has roughly an eight-inch diameter at breast height (DBH). Based on the Planning Commission interpretation from May 15, 2019, Subsection 17.92.10(C) does not apply to residential subdivisions. Tree protection fencing and tree retention will be discussed in more detail under Chapter 17.102 in this document. Per Section 17.92.10(L), all landscaping shall be continually maintained, including necessary watering, weeding, pruning, and replacing.
88. Section 17.92.20 lists the requirements for minimum landscaping improvements. The details of this section will be considered with submittal of a design review application for the proposed multi-family units and commercial property.
89. Section 17.92 .30 specifies that street trees shall be chosen from the City-approved list. As required by Section 17.92.30, the development of the subdivision requires medium trees spaced 30 feet on center along all street frontages. The current street tree plan (Exhibit D, Sheet 7) does not show the distance between trees. The applicant shall update the Street Tree Plan to show the distance between trees, and this distance shall be 30 feet on center.

The applicant is proposing to mass grade the buildable portion of the site. This will remove top soil and heavily compact the soil. In order to maximize the success of the required street
trees, the applicant shall aerate the planter strips to a depth of $\mathbf{3}$ feet prior to planting street trees. The applicant shall either aerate the planter strip soil at the subdivision stage and install fencing around the planter strips to protect the soil from compaction or shall aerate the soil at the individual home construction phase.

If the plans change in a way that affects the number of street trees (e.g., driveway locations), the applicant shall submit an updated street tree plan for staff review and approval. Street trees are required to be a minimum caliper of 1.5 -inches measured 6 inches from grade and shall be planted per the City of Sandy standard planting detail. Trees shall be planted, staked, and the planter strip shall be graded and backfilled as necessary, and bark mulch, vegetation, or other approved material installed prior to occupancy. Tree ties shall be loosely tied twine or other soft material and shall be removed after one growing season (or a maximum of 1 year).
90. Section 17.92.40 requires that all landscaping shall be irrigated, either with a manual or automatic system. As required by Section 17.92.140, the developer and lot owners shall be required to maintain all vegetation planted in the development for two (2) years from the date of completion, and shall replace any dead or dying plants during that period.
91. Section 17.92 .50 specifies the types and sizes of plant materials that are required when planting new landscaping. Street trees are typically required to be a minimum caliper of 1.5inches measured 6 inches from grade. All street trees shall be a minimum of 1.5 -inches in caliper measured 6 inches above the ground and shall be planted per the City of Sandy standard planting detail. The applicant shall submit proposed trees specifies to City staff for review and approval concurrent with construction plan review.
92. Section 17.92.60 requires revegetation in all areas that are not landscaped or remain as natural areas. The applicant did not submit any plans for re-vegetation of areas damaged through grading/construction, although most of the areas affected by grading will be improved. Exposed soils shall be covered by mulch, sheeting, temporary seeding or other suitable material following grading or construction to maintain erosion control for a period of two (2) years following the date of recording of the final plat associated with those improvements.
93. Section 17.92.130 contains standards for a performance bond. The applicant has the option to defer the installation of street trees and/or landscaping for weather-related reasons. Staff recommends the applicant utilize this option rather than install trees and landscaping during the dry summer months. Consistent with the warranty period in Section 17.92.140, staff recommends a two-year maintenance and warranty period for street trees based on the standard establishment period of a tree. If the applicant chooses to postpone street tree and/or landscaping installation, the applicant shall post a performance bond equal to 120 percent of the cost of the street trees/landscaping, assuring installation within 6 months. The cost of the street trees shall be based on the average of three estimates from three landscaping contractors; the estimates shall include as separate items all
materials, labor, and other costs of the required action, including a two-year maintenance and warranty period.

### 17.98 - Parking, Loading, and Access Requirements

94. Section 17.98.10(M) requires that the developer provide a Residential Parking Analysis Plan. This plan identifying the location of parking for the four R-1 zoned lots and is included in Exhibit C, Sheet 7.
95. Section $17.98 .20(\mathrm{~A})$ requires that each single family dwelling unit is required to provide at least two off-street parking spaces. Compliance with this requirement will be evaluated during building plan review. Parking for the proposed multi family units will be evaluated as part of a future design review application.
96. Section 17.98.60 has specifications for parking lot design and size of parking spaces. No lots are proposed to gain access from an arterial or collector street (17.98.80).
97. Section 17.98 .90 requires that all streets proposed will be improved to city standards.
98. Section 17.98.100 has specifications for driveways. The minimum driveway width for a single-family dwelling is 10 feet. The Public Works driveway approach standard detail specifies a maximum of 24 feet wide for a residential driveway approach. Additionally, all driveways will meet vertical clearance, slope, and vision clearance requirements. Staff has concerns with the proposed driveway on Lot 7 as it's within 150 feet of the intersection of Dubarko Road and Highway 26. The applicant shall revise the driveway locations on Lots 5-7 during construction plan review and after receiving approval for revised locations from the City Public Works Director and City Engineer.
99. Section 17.98.110 outlines the requirements for vision clearance. The requirements of this section will be considered in placing landscaping in these areas with construction of homes and will be evaluated with a future design review application for the multi family units.
100. Section 17.98 .130 requires that all parking and vehicular maneuvering areas shall be paved with asphalt or concrete. As required by Section 17.98.130, all parking, driveway and maneuvering areas shall be constructed of asphalt, concrete, or other approved material.
101. Section 17.98.200 contains requirements for providing on-street parking spaces for new residential development. Per 17.98.200, one on-street parking space at least 22 feet in length has been identified within 200 feet of each of the 4 lots zoned as R-1 as required. Exhibit C, Sheet 7 shows that 20 on-street parking spaces have been identified in compliance with this standard. No parking courts are proposed by the applicant.

### 17.100 - Land Division

102. Submittal of preliminary utility plans is solely to satisfy the requirements of Section 17.100.60. Preliminary plat approval does not connote utility or public improvement
plan approval which will be reviewed and approved separately upon submittal of public improvement construction plans.
103. Pre-application conferences were held with the City on January 10, 2018, June 12, 2018, and October 10, 2018 per 17.100.60(A).
104. As required by Section 17.100 .60 (E), the proposed subdivision is designed to be consistent with the density, setback, design standards, dimensional standards in the R-1 zoning district. The details of the development in the $\mathbf{R}-3$ district will be addressed with a future design review application. As illustrated in Exhibit C, Sheet 1, the proposed street system is consistent with the City's Transportation System Plan and Comprehensive Plan. The City has indicated that all public facilities have capacity to serve the proposed subdivision. All improvements in the proposed development are designed in compliance with City standards. The applicant proposes developing the subdivision in a single phase.
105. Section 17.100.60(E)(1) requires subdivisions to be consistent with the density, setback, and dimensional standards of the base zoning district, unless modified by a Planned Development approval. The application for the subdivision is being processed through a Type IV procedure. The proposal is consistent with density and other dimensional standards of the base zoning district.
106. Section $17.100 .60(\mathrm{E})(2)$ requires subdivisions to be consistent with the design standards set forth in this chapter. Consistency with design standards in this chapter are discussed under each subsection below. Conditions of approval can be adopted where necessary to bring the proposal into compliance with applicable standards.
107. Section $17.100 .60(\mathrm{E})(3)$ requires the proposed street pattern to be connected and consistent with the Comprehensive Plan or official street plan for the City of Sandy. The proposed street pattern is consistent with the Comprehensive Plan and the city's standards, including connecting Dubarko Road to Highway 26 and extending Street B to the south.
108. Section $17.100 .60(\mathrm{E})(4)$ requires that adequate public facilities are available or can be provided to serve the proposed subdivision. All public utilities including water, sewer and stormwater are available or will be constructed by the applicant to serve the subdivision. The applicant also intends to dedicate public parkland, the calculation of which can be found in the review of Chapter 17.86 in this document.
109. Section 17.100.60(E)(5) requires all proposed improvements to meet City standards through the completion of conditions as listed within this final order and as detailed within these findings. The detailed review of proposed improvements is contained in this report. Staff has identified a few aspects of the proposed subdivision improvements requiring additional information or modification by the applicant, but conditions of approval can be adopted to bring the proposal into compliance with City standards. In order to meet the standards as defined in the Sandy Development Code the applicant shall submit items for staff to analyze prior to the City Council hearing. The items shall include the following:

- Submit a building footprint plan for Lots 1-4 for staff to review and analyze.
- Submit a proposal for removal of the trees adjacent to the retention trees for staff to review and analyze.
- Revise the plan set to detail to detail the following:
a) 20 foot setbacks on Lots $3,4,5,6$, and 7 for Dubarko Road and Street B;
b) A walkway along the east side of the park or west side of Lot 7 that connects Fawn Street/Street A to the sidewalk on Highway 26;
c) A 15 foot wide pedestrian easement on the east side of Lot 6 or a tract to the east of Lot 6 with an 8 foot wide concrete walkway with light bollards and landscaping to connect Highway 26 to future development south of Lot 6.
d) Fire turnaround easements on Lots 5 and 6 as approved by the Sandy Fire District Fire Marshal.
e) Detail the exit on the driveway to Lot 7 on Street A restricted to left-only turning movements (using a left turn only pork chop design and signage) to deter commercial patrons from entering the Deer Pointe subdivision when exiting Lot 7.
f) Detail the alignment of the intersection of Street B and Dubarko Road to provide the minimum 100 feet of tangent section.
g) Detail a 40 foot by 40 foot right-of-way dedication or permanent traffic signal easement at the northeast corner of Lot 7 to accommodate a future traffic signal.
h) Detail the retention trees along Highway 26 in a separate tree preservation tract.
i) Modify the plat to include a vehicular easement on Lot 4 to accommodate maneuvering for vehicles on Lot 3.
j) Define locations for green street swales. If green streets are practicable the plan set shall be modified to detail additional right-of-way to accommodate the swales.
- Submit a letter from the original geotechnical engineering firm indicating that the findings and recommendations from the 2005 report remain substantially unchanged or modify the original findings and recommendations as necessary.

110. Section 17.100.60(E)(6) strives to ensure that a phasing plan, if requested, can be carried out in a manner that meets the objectives of the above criteria and provides necessary public improvements for each phase as it develops. The applicant is not requesting a phased development. That said, the applicant is proposing that the design of the multi family dwellings occurs at a future date.
111. Section 17.100 .80 provides standards for denial of a development application due to physical land constraints. The subject site does not contain any physical constraints that would make it unsuitable for the proposed subdivision.
112. The subject property abuts Highway 26 and notification of the proposal was sent to ODOT as required by Section 17.100.90.
113. As required by 17.100 .100 (A), a traffic impact study prepared in compliance with the City standards was submitted with the application (Exhibit F). With the exception of a revised striping plan and frontage improvements on the Highway 26 frontage, this study does not identify any issues requiring mitigation by the applicant.
114. None of the special traffic generators listed in section 17.100.100(B) are located near the subject site.
115. While 17.100.100(C) calls for a rectangular grid pattern, the proposed street layout is predominantly controlled by the alignment of Dubarko Road that will be extended through the site from the current terminus to connect with Highway 26. The future street plan details Street B extending south consistent with the TSP. The only other street in the subdivision is the extension of Street A into the property. The proposed intersection of Street A and Dubarko Road seems logical and appropriate considering the nearby intersection of Dubarko Road and Highway 26. Staff finds that the proposed street layout represents a logical street pattern.
116. A future street plan in compliance with the requirements of $17.100 .100(\mathrm{D})$ is included in Exhibit C, Sheet 1.
117. Given the requirements in Section 17.100.100(E), the proposed street layout on the subject property is limited because of the alignment of Dubarko Road, Street B, and the location of Fawn Street extended into the property. In addition, because the development type includes two large lot multi family development sites, the street network is further limited. Given these facts, the proposed street layout represents a logical design.
118. All blocks within the proposed subdivision have sufficient width to provide for two tiers of lots as required in 17.100.120(A). The local streets of Fawn Street/Street A meet the maximum block length standards of 400 feet. The block length from Street A to Highway 26 is 437 feet and the block length from Street B to Highway 26 is 434 feet. The block length requirements in Section 17.100.120 are in conflict with the preferred spacing standards on arterial and collector streets. While local streets are required to be spaced 8-10 streets per mile in accordance with Section 17.100.110(E) the spacing standards for arterial and collector streets are required to be spaced at much greater distances. The distance from Highway 26 to Street B is needed to maintain distance between the Highway and the collector street (Street B). Fawn Street/Street A has to be aligned with Street B to create a safe intersection. Furthermore, the City Transportation Engineer did not recommend alternative spacing for the streets proposed in the Bull Run Terrace subdivision. Therefore, all block lengths meet the Sandy development code provisions and staff does not recommend any changes to street spacing. The spacing from Dubarko Road to the east property line of Lot 6 is 431 feet. Staff finds that providing a pedestrian connection along the east side of the Bull Run Terrace subdivision will be vital for providing future connectivity for the subject area and development to the south of Bull Run Terrace. Staff
recommends that Lot 6 shall include a pedestrian easement on the east side of the property or a tract to the east of Lot 6 that is at least 15 feet wide with an 8 foot wide concrete walkway with light bollards and landscaping to connect Highway 26 to future development south of Lot 6 .
119. As required by 17.100 .130 , eight-foot wide public utility easements will be included along all property lines abutting a public right-of-way. Because access is limited along Dubarko Road, an access easement is also proposed across Lot 3 to provide access to Lot 4. In addition, a 10 -foot PUE/sidewalk easement is proposed along the Highway 26 frontage of Lot 7 and the majority of the frontage of Tract A. A conservation easement is also proposed to be platted across the northern portion of Lot 7 to protect retained trees in this area. Finally, a public storm easement is proposed along the back of Lots 1, 2, and 4 and public and private utility easements are proposed across Tract A.
120. No public alleys, flag lots, or public access lanes are proposed in this development. One residential shared private drive is being proposed by using an easement over Lot 3 to access Lot 4. Staff recommends the applicant modify the plat to include a vehicular easement on Lot 4 to accommodate maneuvering for vehicles on Lot 3 .
121. Section 17.100.180(A) requires that intersections are designed with right angles. Both the extension of Fawn Street and Street B are designed to intersect at right angles to Dubarko Road as required. Additionally, Dubarko Road will intersect Highway 26 at a right angle.
122. All streets in the proposed subdivision have a minimum curve radius as required by Section 17.100.180(B).
123. A lighting plan will be coordinated with PGE and the City as part of the construction plan process and prior to installation of any fixtures as required by Section 17.100.210.
124. All lots in the proposed subdivision have been designed so that no foreseeable difficulties due to topography or other conditions will exist in securing building permits on these lots as required by Section 17.100.220(A).
125. All lots in the R-1 zone comply with the minimum standards in that zone as required by Section $17.100 .220(B)$. No lots are proposed to contain more than double the minimum lot size.
126. Section 17.100.220 states that all new lots shall have at least 20 feet of street frontage. All lots in the proposed subdivision contain at least 29 feet of frontage along a public street therefore meeting the requirements of Section 17.100.220(C).
127. Lots 6 and 7 both contain frontage on Highway 26 and Dubarko Road. Because no direct access to Highway 26 is allowed the creation of these double frontage lots is unavoidable and is thus allowed as required by Section 17.100.220(D).
128. The applicant shall install all water lines and fire hydrants in compliance with the applicable standards in Section 17.100.230, which lists requirements for water facilities. According to the Public Works Director the existing 8 inch diameter water line resides in an easement granted to the City of Sandy recorded at 2004-110340. The applicant shall replace the existing waterline with an 8 inch diameter water line with no more than 42 inches or less than 36 inches of cover. There will be no compensation or credits for replacement of the existing water line. This pipe is a standard pressure line and will be used to provide domestic water service to the development. The City's water master plan shows an 18 inch diameter water line in Dubarko Road south of Highway 26. The applicant shall install an 18 inch water line in Dubarko Rd. connected to the existing 18 inch water line at the west end of the site and the existing 12 inch line on Highway 26. Due to the elevation of the site relative to the existing water reservoirs on Vista Loop Drive this line will be a lowpressure, high volume line and will be used for fire protection. The cost difference between a standard diameter water line and the required 18 inch water line is eligible for Water System Development Charge (SDC) credits. The amount of the credit provided will be based on the Water System Construction Cost Credit table in the Water System Development Charge Methodology adopted by City Council motion on September 5, 2017. Section 17.84.60D SMC states: "As necessary to provide for orderly development of adjacent properties, public facilities installed concurrent with development of a site shall be extended through the site to the edge of adjacent property(ies)". The applicant shall extend the existing 12 inch water main in Highway 26 east from the proposed intersection of Dubarko Road and Highway 26 to the east boundary of the site. The cost difference between a standard diameter ( 8 inch ) water line and the required 12 inch water line is eligible for Water System Development Charge (SDC) credits. The amount of the credit provided will be based on the Water System Construction Cost Credit table in the Water System Development Charge Methodology adopted by City Council motion on September 5, 2017.
129. The applicant intends to install sanitary sewer lines in compliance with applicable standards in Section 17.100.240. All lots except Lot 7 are designed to gravity drain to the sanitary sewer line in Dubarko Road. Due to grade, Lot 7 is not able to drain to the line in Dubarko Road but is proposed to connect to the existing sanitary sewer line at the north end of the park property. According to the Public Works Director the recently adopted Wastewater System Facilities Plan (2019) identified a capacity deficiency in the Southeast pump station and force main as well as several conveyance lines downstream. The City will adopt a Sanitary Sewer SDC surcharge on each Equivalent Residential Unit developed in the basin served by the Southeast pump station. The surcharge amount will be calculated by dividing the estimated cost of the required capacity improvements by the estimated number of dwelling units that can be built in the pump station drainage basin. The surcharge will be collected with each building permit issued in the basin.
130. Section 17.100.250(A) details requirements for stormwater detention and treatment. A public stormwater quality and detention facility is proposed as Tract B to be located north of Lot 1 and south of the Fawn Street extension. This facility has been sized and located to accommodate the water quality and stormwater detention needs of all streets in addition to Lots 1-4. The water quality and detention needs of Lots 5-7 will be accommodated on each
of those lots and stormwater from Lots 5 and 6 will be routed to flow through Tract B. After onsite detention and water quality treatment, stormwater from Lot 7 will be piped and connected to the existing storm line in the park. All site runoff (including new runoff from the widened surfaces of Highway 26) shall be detained such that post-development runoff does not exceed the predevelopment runoff rate for the $2,5,10$ and 25 year storm events. Stormwater quality treatment shall be provided for all site drainage per the standards in the City of Portland Stormwater Management Manual (COP SWMM).
131. Section 17.100.260 states that all subdivisions shall be required to install underground utilities. The applicant shall install utilities underground with individual service to each lot.
132. Planter strips will be provided along all frontages as required in Section 17.100.290. Street trees in accordance with City standards will be provided in these areas. A Street Tree Plan is included in Exhibit C, Sheet 7.
133. Grass seeding shall be completed as required by Section 17.100.300. The submitted preliminary Grading and Erosion Control Plan (Exhibit C, Sheer 9) provides additional details to address erosion control concerns. A separate Grading and Erosion Control Permit will be required prior to any site grading. Erosion control requirements are defined in greater detail in Chapter 15.44 of this document.

### 17.102 - Urban Forestry

134. Section 17.102.20 contains information on the applicability of Urban Forestry regulations. An Arborist Report is included as Exhibit G. The arborist inventoried all trees eleven inches and greater DBH for the portion of the property proposed to satisfy tree retention requirements as required in 17.102.50. The inventory is included in Exhibit C, Sheet 4 and the proposed retention trees are shown in Exhibit C, Sheet 3.
135. The property contains 15.91 acres requiring retention of 48 trees, 11 inches and greater DBH ( $15.91 \times 3=47.73$ ). The submitted plan identifies 59 trees that will be retained. All of the trees proposed for retention are conifers, primarily Doug fir, at least 11 inches DBH, and in good condition as identified by the arborist.
136. A majority of the proposed retention trees are located along Highway 26 in Lot 7, which is proposed to be zoned C-3, Village Commercial. As indicated on the Preliminary Plat (Exhibit C, Sheet C-2), the applicant is proposing to place a conservation easement over an area that encompasses the retention trees along Highway 26, including their critical root zones. Staff believes there could be a future conflict between retention trees along the Highway and future commercial property visibility on Lot 7. Thus, staff recommends the retention trees be placed into a separate tree retention tract. The applicant shall update the site plan to detail the retention trees along Highway 26 in a separate tree preservation tract.
137. The Arborist Report (Exhibit G) provides recommendations for protection of retained trees including identification of the recommended tree protection zone for these trees. The requirements of $17.102 .50(\mathrm{~B})$ will be complied with prior to any grading or tree removal on the site. The applicant shall install tree protection fencing at the critical root zone of 1 foot per 1 inch DBH to protect the 59 retention trees on the subject property as well as all trees on adjacent properties. The tree protection fencing shall be $\mathbf{6}$ foot tall chain link or no-jump horse fencing and the applicant shall affix a laminated sign (minimum 8.5 inches by 11 inches) to the tree protection fencing indicating that the area behind the fence is a tree retention area and that the fence shall not be removed or relocated. No construction activity shall occur within the tree protection zone, including, but not limited to, dumping or storage of materials such as building supplies, soil, waste items, equipment, or parked vehicles. The applicant shall request an inspection of tree protection measures prior to any tree removal, grading, or other construction activity on the site. Up to 25 percent of the area between the minimum root protection zone of 0.5 feet per 1-inch DBH and the critical root zone of 1 foot per 1 inch DBH may be able to be impacted without compromising the tree, provided the work is monitored by a qualified arborist. The applicant shall retain an arborist on site to monitor any construction activity within the critical root protection zones of the retention trees or trees on adjacent properties that have critical root protection zones that would be impacted by development activity on the subject property.
138. The Tree Preservation Plan (Exhibit C) details a number of trees being removed right next to the trees proposed for retention. The trees proposed for removal that are adjacent to retention trees shall be removed in in a way that does not harm or damage adjacent trees. The applicant shall submit a proposal for removal of the trees adjacent to the retention trees for staff review and approval. Staff recommends that the applicant not fully remove the trees adjacent to the retention trees but rather leave snags. Tree removal and/or snag creation shall be completed without the use of heavy equipment in the tree protection zone; trunks and branches of adjacent trees shall not be contacted during tree removal or snag creation. The applicant shall submit a post-construction report prepared by the project arborist or other TRAQ qualified arborist to ensure none of the retention trees were damaged during construction.
139. To ensure protection of the required retention trees, the applicant shall record a tree protection covenant specifying protection of trees on the subject property and limiting removal without submittal of an Arborist's Report and City approval.

### 15.30 - Dark Sky

140. Chapter 15.30 contains the City of Sandy's Dark Sky Ordinance. The applicant will need to install street lights along all street frontages wherever street lighting is determined necessary. The locations of these fixtures shall be reviewed in detail with construction plans. Full cut-off lighting shall be required. Lights shall not exceed 4,125 Kelvins or 591 nanometers in order to minimize negative impacts on wildlife and human health.

### 15.44 - Erosion Control

141. The applicant submitted a Geotechnical Engineering Report (Exhibit I) prepared by GeoPacific Engineering, Inc., dated August 16, 2005. The Public Works Director stated the following: "The geotechnical report (2005) submitted with the application is nearly fifteen years old. It does not appear that there have been physical changes to the existing surface of the site in that time span that would impact the findings and recommendations in the geotechnical report but there may have been changes in industry standards or practices since then. As a result, the Applicant shall submit a letter from the original geotechnical engineering firm indicating that the findings and recommendations from the 2005 report remain substantially unchanged or modifying the original findings and recommendations as necessary." The applicant shall submit a letter from the original geotechnical engineering firm indicating that the findings and recommendations from the 2005 report remain substantially unchanged or modifying the original findings and recommendations as necessary.
142. All the work within the public right-of-way and within the paved area should comply with American Public Works Association (APWA) and City requirements as amended. The applicant shall submit a grading and erosion control permit and request an inspection of installed devices prior to any additional grading onsite. The grading and erosion control plan shall include a re-vegetation plan for all areas disturbed during construction of the subdivision. All erosion control and grading shall comply with Section 15.44 of the Municipal Code. The proposed subdivision is greater than one acre which typically requires approval of a DEQ 1200-C Permit. The applicant shall submit confirmation from DEQ if a $\mathbf{1 2 0 0} \mathbf{- C}$ Permit will not be required.
143. Section 15.44.50 contains requirements for maintenance of a site including re-vegetation of all graded areas. The applicant's Erosion Control Plan shall be designed in accordance with the standards of Section 15.44.50.
144. Recent development has sparked unintended rodent issues in surrounding neighborhoods. Prior to development of the site, the applicant shall have a licensed pest control agent evaluate the site to determine if pest eradication is needed.

## RECOMMENDATION:

Staff recommends the Planning Commission approve the Type IV comprehensive plan amendment, zone change, subdivision, and specific area plan overlay with tree removal associated with the proposed development subject to the conditions of approval below. This proposal achieves some major goals consistent with long range planning objectives in the City of Sandy, including but not limited to the following:

1) Extending Dubarko Road to intersect with Highway 26 consistent with the Transportation System Plan that was adopted in 2011;
2) Installing Street B to the south consistent with the Transportation System Plan that was adopted in 2011;
3) Extending Fawn Street to the east;
4) Expanding the Deer Point park consistent with the goals of the Parks and Trails Advisory Board and the current revisions that are being considered for the Parks Master Plan;
5) Creating available commercial land in the C-3 zoning district consistent with the 2040 Plan that was created in 1997;
6) Fulfilling housing needs as defined in the Urbanization Study that was adopted in 2015; and,
7) Providing a mixture of housing types consistent with the goals of the 2040 Plan that was created in 1997.

## ADDITIONAL REVIEW NEEDED PRIOR TO THE CITY COUNCIL HEARING:

1. Submit a building footprint plan for Lots $1-4$ for staff to review and analyze.
2. Submit a proposal for removal of the trees adjacent to the retention trees for staff to review and analyze.
3. Revise the plan set to detail to detail the following:
a) 20 foot setbacks on Lots 3, 4, 5, 6, and 7 for Dubarko Road and Street B;
b) A walkway along the east side of the park or west side of Lot 7 that connects Fawn Street/Street A to the sidewalk on Highway 26;
c) A 15 foot wide pedestrian easement on the east side of Lot 6 or a tract to the east of Lot 6 with an 8 foot wide concrete walkway with light bollards and landscaping to connect Highway 26 to future development south of Lot 6.
d) Fire turnaround easements on Lots 5 and 6 as approved by the Sandy Fire District Fire Marshal.
e) Detail the exit on the driveway to Lot 7 on Street A restricted to left-only turning movements (using a left turn only pork chop design and signage) to deter commercial patrons from entering the Deer Pointe subdivision when exiting Lot 7.
f) Detail the alignment of the intersection of Street B and Dubarko Road to provide the minimum 100 feet of tangent section.
g) Detail a 40 foot by 40 foot right-of-way dedication or permanent traffic signal easement at the northeast corner of Lot 7 to accommodate a future traffic signal.
h) Detail the retention trees along Highway 26 in a separate tree preservation tract.
i) Modify the plat to include a vehicular easement on Lot 4 to accommodate maneuvering for vehicles on Lot 3 .
j) Define locations for green street swales. If green streets are practicable the plan set shall be modified to detail additional right-of-way to accommodate the swales.
4. Submit a letter from the original geotechnical engineering firm indicating that the findings and recommendations from the 2005 report remain substantially unchanged or modify the original findings and recommendations as necessary.

## CONDITIONS:

## A. The applicant shall submit a complete set of revised plans to the Planning Division.

## B. Prior to earthwork, grading, or excavation, the applicant shall complete the following and receive necessary approvals as described:

1. Apply for a grading and erosion control permit in conformance with Chapter 15.44. The grading and erosion control plan shall include a re-vegetation plan for all areas disturbed during construction of the subdivision. (Submit 2 copies to Planning/Building Department.)
2. Submit proof of receipt of a Department of Environmental Quality 1200-C permit or submit confirmation from DEQ if a 1200-C Permit will not be required. (Submit to Planning/Building Department.)
3. Submit proof that a licensed pest control agent evaluated the site to determine if pest eradication is needed.
4. Install tree protection fencing at the critical root zone of 1 foot per 1 inch DBH to protect the 59 retention trees on the subject property as well as all trees on adjacent properties. The tree protection fencing shall be 6 foot tall chain link or no-jump horse fencing and the applicant shall affix a laminated sign (minimum 8.5 inches by 11 inches) to the tree protection fencing indicating that the area behind the fence is a tree retention area and that the fence shall not be removed or relocated. No construction activity shall occur within the tree protection zone, including, but not limited to, dumping or storage of materials such as building supplies, soil, waste items, equipment, or parked vehicles. The applicant shall request an inspection of tree protection measures prior to any tree removal, grading, or other construction activity on the site. Up to 25 percent of the area between the minimum root protection zone of 0.5 feet per 1 -inch DBH and the critical root zone of 1 foot per 1 inch DBH may be able to be impacted without compromising the tree, provided the work is monitored by a qualified arborist. The applicant shall retain an arborist on site to monitor any construction activity within the critical root protection zones of the retention trees or trees on adjacent properties that have critical root protection zones that would be impacted by development activity on the subject property. Tree removal and/or snag creation shall be completed without the use of heavy equipment in the tree protection zone; trunks and branches of adjacent trees shall not be contacted during tree removal or snag creation. The applicant shall submit a postconstruction report prepared by the project arborist or other TRAQ qualified arborist to ensure none of the retention trees were damaged during construction.
5. Request an inspection of erosion control measures and tree protection measures as specified in Section 17.102.50 C. prior to construction activities or grading.
C. Prior to all construction activities, except grading and/or excavation, the applicant shall submit the following additional information as part of construction plans and complete items during construction as identified below: (Submit to Public Works unless otherwise noted)
6. Submit estimated costs of widening Dubarko Road to City staff for review and approval by the City Engineer. The City and the Applicant shall enter into an agreement defining the eligible improvements and estimated costs prior to plat approval. SDC credits shall be based on final audited costs.
7. All on-site earthwork activities including any retaining wall construction should follow the requirements of the City of Sandy Development Code and the current edition of the Oregon Structural Specialty Code (OSSC).
8. Submit written confirmation from the Sandy Fire District regarding the number and location of required fire hydrants. Submit a revised Residential Parking Access Plan if required fire hydrants affect on-street parking spaces.
9. Revise the driveway locations on Lots 5-7 after receiving approval for revised locations from the City Public Works Director and City Engineer.
10. Submit a revised cross-section for the portion of Dubarko Road between the existing terminus and Street A.
11. Specify the locations of street lights on all streets being improved within and adjacent to the subdivision. Street lights shall be full cut-off, shall not exceed 4,150 Kelvins, and shall conform to the Dark Sky standards of Chapter 15.30. The locations of light fixtures shall be reviewed in detail with construction plans.
12. Submit a detailed drainage report meeting the water quality and water quantity criteria as stated in the City of Sandy Development Code (SDC) 13.18 Standards and the most current City of Portland Stormwater Management Manual (SWMM) Standards that were adopted by reference into the Sandy Development Code.
13. Submit additional details/confirmation on any proposed retaining walls, including heights meeting code requirements and an architectural finish.
14. Submit a mail delivery plan, featuring grouped lockable mail facilities, to the City and the USPS for review. Mail delivery facilities shall be provided by the applicant in conformance with 17.84.100 and the standards of the USPS.
15. Submit a revised utility plan to include broadband fiber locations as detailed by the SandyNet Manager.
16. Call PGE Service Coordination at 503-323-6700 when the developer is ready to start the project.

## D. Prior to Final Plat approval, the applicant shall complete the following tasks or provide assurance for their future completion:

1. Submit two paper copies of a Final Plat and associated fee.
2. Pay plan review, inspection and permit fees as determined by the Public Works Director.
3. Pay addressing fees at $\$ 40$ for the subdivision plus $\$ 5$ per lot.
4. Obtain a grant of access for the intersection of Dubarko Road and Highway 26 from ODOT.
5. Install all public and private improvements consistent with this decision and the ODOT improvements consistent with the grant of access, the approved construction plans, and the Sandy Municipal Code, including, but not limited to the following:
a) A walkway along the east side of the park or west side of Lot 7 that connects Fawn Street/Street A to the sidewalk on Highway 26;
b) A 15 foot wide pedestrian easement on the east side of Lot 6 or a tract to the east of Lot 6 with an 8 foot wide concrete walkway with light bollards and landscaping to connect Highway 26 to future development south of Lot 6.
c) Two concrete bus shelter pads and green benches (Fairweather model PL-3, powder coated RAL6028). The required pad size is 7 feet by 9 feet 6 inches and the amenities should be located adjacent to Lot 1 and Lot 5. Engineering specifications are available from the Transit Department.
d) Replace the existing waterline with an 8 inch diameter water line with no more than 42 inches or less than 36 inches of cover.
e) An 18 inch water line in Dubarko Rd. connected to the existing 18 inch water line at the west end of the site and the existing 12 inch line on Highway 26.
f) Extend the existing 12 inch water main in Highway 26 east from the proposed intersection of Dubarko Road and Highway 26 to the east boundary of the site.
6. Clear, grade, and seed the proposed parkland as specified by the City in the construction plans. The applicant shall also provide a Phase I Environmental Assessment.
7. Aerate the planter strips to a depth of 3 feet prior to planting street trees. The applicant shall either aerate the planter strip soil at the subdivision stage and install fencing around the planter strips to protect the soil from compaction or shall aerate the soil at the individual home construction phase.
8. Record a tree protection covenant specifying protection of trees on the subject property and limiting removal without submittal of an Arborist's Report and City approval.
9. Submit a true and exact reproducible copy (Mylar) of the Final Plat for final review and signature.

## E. Conditions related to future development of the lots:

1. Design review approval for Lot 7 shall incorporate storefronts, patios and usable windows facing the parkland.
2. Design review approval for Lot 7 shall incorporate a landscape buffer that provides visibility between Lot 7 and the parkland but provides a visually attractive separation.
3. The future design review application will include a review of development standards (17.40.30), minimum requirements (17.40.40) and additional requirements (17.40.50) for $\mathrm{R}-3$ zoned development.
4. Any future development on the land zoned $\mathrm{C}-3$ will require a design review in accordance to the development standards found in Section 17.46.30 and the Sandy Municipal Code.
5. The dwellings on Lots 3 and 4 shall be designed to meet all of the requirements as specified in Chapter 17.82 and will be assessed in a future design review.
6. Orientation of the future multi-family units that have frontage on both Highway 26 and Dubarko Road will be determined in a future design review process.

## F. General Conditions of Approval:

1. The Final Plat shall be recorded as detailed in Section 17.100.60 (I).
2. Public plans are subject to a separate review and approval process. Preliminary Plat approval does not connote approval of public improvement construction plans, which will be reviewed and approved separately upon submittal of public improvement construction plans.
3. If entry signs are desired, the applicant shall submit a detailed plan showing the location of such signage and a sign permit application.
4. All parking, driveway and maneuvering areas shall be constructed of asphalt, concrete, or other approved material.
5. All work within the public right-of-way and within the paved area shall comply with the American Public Works Association (APWA) and City requirements as amended and should be constructed to the City's structural streets standards.
6. All on-site earthwork activities including any retaining wall construction shall follow the current requirements of the current edition of the Oregon Structural Specialty Code (OSSC).
7. All utilities shall be installed underground and in conformance with City standards. The applicant shall install utilities underground with individual service to each lot.
8. The applicant shall be responsible for the installation of all improvements detailed in Section 17.100.310, including fiber facilities. SandyNet requires the developer to work with the City to ensure that broadband infrastructure meets the design standards and adopted procedures as described in Section 17.84.70.
9. All public utility installations shall conform to the City's facilities master plans.
10. The intersection of Highway 26 and Dubarko Road shall be constructed as a full-access intersection in compliance with the TSP.
11. As required by Section 17.98.130, all parking, driveway and maneuvering areas shall be constructed of asphalt, concrete, or other approved material.
12. Water line sizes shall be based upon the Water Facilities Master Plan and shall be sized to accommodate domestic fire protection flows on the site.
13. All new public sanitary sewer and waterlines shall be a minimum of 8 inches in diameter.
14. All stormwater drains shall be a minimum of 12 inches in diameter and shall be extended to the plat boundaries where practical to provide future connections to adjoining properties.
15. All site runoff (including new runoff from the widened surfaces of Highway 26) shall be detained such that post-development runoff does not exceed the predevelopment runoff rate for the $2,5,10$ and 25 year storm events. Stormwater quality treatment shall be provided for all site drainage per the standards in the City of Portland Stormwater Management Manual (COP SWMM).
16. If the applicant chooses to postpone street tree and/or landscaping installation, the applicant shall post a performance bond equal to 120 percent of the cost of the street trees/landscaping, assuring installation within 6 months. The cost of the street trees shall be based on the average of three estimates from three landscaping contractors; the estimates shall include as separate items all materials, labor, and other costs of the required action, including a two-year maintenance and warranty period.
17. If the plans change in a way that affects the number of street trees (e.g., driveway locations), the applicant shall submit an updated street tree plan for staff review and approval. Street trees are required to be a minimum caliper of 1.5 -inches measured 6 inches from grade and shall be planted per the City of Sandy standard planting detail. Trees shall be planted, staked, and the planter strip shall be graded and backfilled as necessary, and bark mulch, vegetation, or other approved material installed prior to occupancy. Tree ties shall be loosely tied twine or other soft material and shall be removed after one growing season (or a maximum of 1 year).
18. As required by Section $17.92 .10(\mathrm{~L})$, all landscaping shall be continually maintained, including necessary watering, weeding, pruning, and replacing. As required by Section
17.92.140, the developer shall maintain all vegetation planted in the development for two (2) years from the date of completion, and shall replace any dead or dying plants during that period.
19. Exposed soils shall be covered by mulch, sheeting, temporary seeding or other suitable material following grading or construction to maintain erosion control for a period of two (2) years following the date of recording of the final plat associated with those improvements.
20. Successors-in-interest of the applicant shall comply with site development requirements prior to the issuance of building permits.
21. All improvements listed in Section 17.100 .300 shall be provided by the applicant including drainage facilities, monumentation, mail facilities, sanitary sewers, storm sewer, sidewalks, street lights, street signs, street trees, streets, traffic signs, underground communication lines including telephone and cable, underground power lines, water lines and fire hydrants.
22. Comply with all standards required by Section 17.84 of the Sandy Development Code. Public and franchise improvements shall be installed or financially guaranteed in accordance with Chapter 17 of the Sandy Municipal Code prior to temporary or final occupancy of structures. Water lines and fire hydrants shall be installed in accordance with City standards. All sanitary sewer lines shall be installed in accordance with City standards.
23. Comply with all other conditions or regulations imposed by the Sandy Fire District or state and federal agencies. Compliance is made a part of this approval and any violations of these conditions and/or regulations may result in the review of this approval and/or revocation of approval.
24. Adhere to all standards and requirements that are defined by ODOT, including the Dubarko Road connection to Highway 26 and all required improvements along Highway 26 constructed as necessary to be consistent with local, ODOT, and ADA standards.

# Bull Run Terrace 

Planning Commission 8/24/2020

## Vicinity Map



Zoning Map
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## Comprehensive Plan Map



## Request

The applicant is requesting the following:

- Zone map amendment (Type IV)
- Comprehensive plan amendment (Type IV)
- Specific area plan (Type IV)
- Subdivision (Type II)
- Tree removal (Type II)


## Zone Map Amendment



## Zone Map Amendment (cont.)

| Zoning District | Existing Acres | Proposed Acres |
| :---: | :---: | :---: |
| R-1 | 8.05 | 0.59 |
| R-2 | 5.01 | 0.00 |
| R-3 | 0.00 | 7.91 |
| C-3 | 2.84 | 3.61 |

## Comprehensive Plan Map Amendment

- Required in Village area when maximum density changes by more than $20 \%$.
- Will result in the following changes to UGB land inventory:

| Land Type | Current Acre Surplus | Proposed Acre Surplus |
| :---: | :---: | :---: |
| Commercial | 1.13 | 1.90 |
| Low-Density Residential | 19.20 | 11.74 |
| Medium-Density Residential | 17.10 | 12.09 |
| High-Density Residential | 12.60 | 20.51 |

## Comprehensive Plan Map Amendment (cont.)

- Goal 1: Citizen Involvement
- Notice and two public hearings
- Goal 2: Land Use Planning
- Staff has reviewed this application against zoning district amendment and comprehensive plan amendment code requirements, and have notified relevant state agencies.
- Goal 5: Natural Resources
- Staff recommends a condition to install fencing to protect the site's retention trees.
- Goal 8: Recreational Needs
- Dedication of 1.426 acres of parkland to the City for Deer Point Park. Future design review will require that buildings on Lot 7 face the park.
- Goal 9: Economic Development
- Requires adequate surplus of buildable commercial and industrial land. Proposed changes allow for this surplus.


## Comprehensive Plan Map Amendment (cont.)

- Goal 10: Housing
- Providing mixed housing types, including multi-family, offers more options for residents.
- Goal 12: Transportation
- The connection of Dubarko Road to Highway 26 is a goal in the TSP. Traffic impact study projects that the change in traffic is negligible compared to existing zoning.*
- Goal 13: Urbanization
- The proposed development accommodates additional residential and commercial uses within the UGB.
* See 8/21/2020 ODOT comments.


## Low Density Residential (R-1)

- Lots 1-4
- Meets density requirements
- Staff questions to building potential on lots 3 and 4; these lots will have reduced buildable area as a result of required setbacks and easements. Staff has recommended that the applicant submit a building footprint plan prior to City Council hearing.



## High Density Residential (R-3)

- Lots 5-6
- Density requirements allow for a maximum of 158 units
- The future design review application will include a review of development standards, minimum requirements, and additional requirements.



## Village Commercial (C-3)

- Lot 7
- Allows for mix of commercial and residential uses
- The future design review application will include a review of development standards, minimum requirements, and additional requirements.



## Specific Area Plan Overlay

"Shifting of the underlying zoning district boundaries to accommodate development constraints and land divisions for specific development proposals may be allowed through approval of a Specific Area Plan....[Specific Area Plans] are intended to promote coordinated planning concepts and pedestrian-oriented mixed-use development."

## Park Dedication

- Requires 1.41 acres, and applicant is proposing 1.426 acres
- Staff recommends that the design review approval for Lot 7 shall include activated frontages facing the parkland
- Staff recommends that the applicant install a walkway along the east side of the park or west side of Lot 7 that connects Fawn St to the sidewalk along Highway 26.



## Park Dedication (cont.)

- Staff recommends that the design review approval for Lot 7 incorporate a landscape buffer that provides visibility between Lot 7 and the parkland but provides a visually attractive separation.



## ODOT Comments

- Applicant will require a Grant of Access through ODOT to connect Dubarko to Highway 26.
- Since a future year traffic analysis is necessary to make TPR findings as well as for the Grant of Access submittal, ODOT recommends that the applicant be required to provide an updated Traffic Impact Study to ODOT for review and comment prior to the October City Council Hearing and a decision is made on the land use action.


## Public Comments

- Loss of trees, thus lowering the aesthetic quality of the area as well as privacy for existing homes.
- The capacity of the police to effectively patrol multi-family dwelling areas.
- The possibility of criminal activity at multi-family dwelling areas.
- Being previously told that the land would not develop as residential.
- Concerns about effects of multi-family housing on property values.
- Relevance to Comprehensive Plan and potential for "spot zoning."


[^0]:    1 Portland State University Population Research Center

[^1]:    2 Metro, RLIS system

[^2]:    Bull Run Terrace Subdivision 2022 Background Plus Site Trips PM RIRO

[^3]:    ${ }^{1}$ Section 17.102.50 of the City of Sandy Code requires three onsite trees over 11-inch DBH that are in good condition to be retained.

[^4]:    Teragan \& Associates, Inc.
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[^10]:    Bull Run Terrace Subdivision 2022 Background Plus Site Trips PM RIRO

[^11]:    Shelley Denison
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[^12]:    Sent from my iPhone

