Oregon
Theodore R. Kulongoski, Governor

Department of Land Conservation and Development
635 Capitol Street NE, Suite 150
Salem, Oregon 97301-2524
Phone: (503) 373-0050
First Floor/Coastal Fax: (503) 378-6033
Second Floor/Director's Office: (503) 378-5518
Web Address: http://www.oregon.gov/LCD

NOTICE OF ADOPTED AMENDMENT

July 21, 2006

TO: Subscribers to Notice of Adopted Plan
or Land Use Regulation Amendments

FROM: Mara Ulloa, Plan Amendment Program Specialist

SUBJECT: City of North Plains Plan Amendment
DLCD File Number 005-06

The Department of Land Conservation and Development (DLCD) received the attached notice of adoption. Due to the size of amended material submitted, a complete copy has not been attached. A copy of the adopted plan amendment is available for review at the DLCD office in Salem and the local government office.

Appeal Procedures*

DLCD ACKNOWLEDGMENT or DEADLINE TO APPEAL: August 8, 2006

This amendment was submitted to DLCD for review 45 days prior to adoption. Pursuant to ORS 197.830 (2)(b) only persons who participated in the local government proceedings leading to adoption of the amendment are eligible to appeal this decision to the Land Use Board of Appeals (LUBA).

If you wish to appeal, you must file a notice of intent to appeal with the Land Use Board of Appeals (LUBA) no later than 21 days from the date the decision was mailed to you by the local government. If you have questions, check with the local government to determine the appeal deadline. Copies of the notice of intent to appeal must be served upon the local government and others who received written notice of the final decision from the local government. The notice of intent to appeal must be served and filed in the form and manner prescribed by LUBA, (OAR Chapter 661, Division 10). Please call LUBA at 503-373-1265, if you have questions about appeal procedures.

*<u>NOTE:</u> **THE APPEAL DEADLINE IS BASED UPON THE DATE THE DECISION WAS MAILED BY LOCAL GOVERNMENT. A DECISION MAY HAVE BEEN MAILED TO YOU ON A DIFFERENT DATE THAN IT WAS MAILED TO DLCD. AS A RESULT YOUR APPEAL DEADLINE MAY BE EARLIER THAN THE ABOVE DATE SPECIFIED.**

Cc: Doug White, DLCD Community Services Specialist
Meg Fernekees, DLCD Regional Representative
Don Otterman, City of North Plains

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FORM 2

D L C D NOTICE OF ADOPTION

This form **must be mailed** to DLCD **within 5 working days after the final decision** per ORS 197.610, OAR Chapter 660 - Division 18

(See reverse side for submittal requirements)

Jurisdiction: NORTH PLAINS Local File No.: AN-06-0007 (If no number, use none)

Date of Adoption: JULY 17, 2006 (Must be filled in) Date Mailed: JULY 18, 2006 (Date mailed or sent to DLCD)

Date the Notice of Proposed Amendment was mailed to DLCD: 5/3/06

___ Comprehensive Plan Text Amendment
___ Comprehensive Plan Map Amendment
___ Land Use Regulation Amendment
___ Zoning Map Amendment
___ New Land Use Regulation
✓ Other: ANNEXATION (Please Specify Type of Action)

Summarize the adopted amendment. Do not use technical terms. Do not write "See Attached."

ANNEXATION OF 24.33 ACRES INTO THE CITY OF NORTH PLAINS

Describe how the adopted amendment differs from the proposed amendment. If it is the same, write "Same." If you did not give notice for the proposed amendment, write "N/A."

AREA TO BE ANNEXED WAS REDUCED FROM 32.75 ACRES TO 24.33 ACRES

Plan Map Changed from: ___ to ___

Zone Map Changed from: ___ to ___

Location: SOUTH OF WEST UNION ROAD WEST OF JACKSON SCHOOL ROAD Acres Involved: 24.33 ACRES

Specify Density: Previous: ___ New: ___

Applicable Statewide Planning Goals: ___

Was an Exception Adopted? Yes: ___ No: ✓

DLCD File No.: 005-06 (15206)

Did the Department of Land Conservation and Development receive a notice of Proposed Amendment FORTY FIVE (45) days prior to the first evidentiary hearing. Yes: ✓ No: ____

If no, do the Statewide Planning Goals apply. Yes: ___ No: ____

If no, did The Emergency Circumstances Require immediate adoption. Yes: ___ No: ____

Affected State or Federal Agencies, Local Governments or Special Districts: CITY OF NORTH PLAINS, WASHINGTON COUNTY

Local Contact: DON OTTERMAN Area Code + Phone Number: 503-647-5555

Address: 31360 NW COMMERCIAL ST City: NORTH PLAINS

Zip Code+4: 97133 Email Address: don@northplains.org

ADOPTION SUBMITTAL REQUIREMENTS

This form **must be mailed** to DLCD **within 5 working days after the final decision**
per ORS 197.610, OAR Chapter 660 - Division 18.

1. Send this Form and **TWO (2) Copies** of the Adopted Amendment to:

ATTENTION: PLAN AMENDMENT SPECIALIST
DEPARTMENT OF LAND CONSERVATION AND DEVELOPMENT
635 CAPITOL STREET NE, SUITE 150
SALEM, OREGON 97301-2540

2. Submit **TWO (2) copies** the adopted material, if copies are bounded please submit **TWO (2) complete copies** of documents and maps.

3. Please Note: Adopted materials must be sent to DLCD not later than **FIVE (5) working days** following the date of the final decision on the amendment.

4. Submittal of this Notice of Adoption must include the text of the amendment plus adopted findings and supplementary information.

5. The deadline to appeal will not be extended if you submit this notice of adoption within five working days of the final decision. Appeals to LUBA may be filed within **TWENTY-ONE (21) days** of the date, the "Notice of Adoption" is sent to DLCD.

6. In addition to sending the "Notice of Adoption" to DLCD, you must notify persons who participated in the local hearing and requested notice of the final decision.

7. **Need More Copies?** You can copy this form on to 8-1/2x11 green paper only ; or call the DLCD Office at (503) 373-0050; or Fax your request to:(503) 378-5518; or Email your request to Mara.Ulloa@state.or.us - ATTENTION: PLAN AMENDMENT SPECIALIST.

RESOLUTION NO. 1336

A RESOLUTION APPROVING ANNEXATION PROPOSAL AN-06-0007 AND CALLING AN ELECTION FOR CITY VOTERS TO APPROVE THIS ANNEXATION

WHEREAS, Washington County has a policy that unincorporated areas of the County should be annexed to cities so that urban services for those areas can be provided by cities; and

WHEREAS, the City Council agrees with County annexation policy and believes that areas outside the current City boundaries and within the City Urban Growth Boundary should be annexed to the City; and

WHEREAS, the City has received a petition Jackson Union LLC as the property owners meeting the requirements for initiation of annexation to the City under ORS 222.170(1); and

WHEREAS, after legal notices, a public hearing was held on the proposal for annexation by the City Council on July 17, 2006, where comments and testimony were received and considered; and

WHEREAS, the Council reviewed and considered the application for annexation, the staff report and the recommendation of the Planning Commission after its public hearing on June 21, 2006, and the proposed findings and reasons; and

WHEREAS, the property proposed for annexation contains 24.33 gross acres and all the owners of the land proposed for annexation consent in writing to this annexation; and

WHEREAS, Section 3.1 of the City Charter requires City voter approval for annexations.

NOW, THEREFORE, THE CITY OF NORTH PLAINS RESOLVES AS FOLLOWS:

Section 1. The City Council adopts Annexation Application No. 06-0007 and the staff report dated June 28, 2006, and attached to this Resolution as Exhibit A.

Section 2. The City Council approves Annexation Application No. 06-0007, and the annexation to the City of North Plains of the territory legally described in Exhibit B to this Resolution.

Section 3. A City election on this annexation is called for September 19, 2006.

Section 4. The Washington County Elections Department will conduct the election.

Section 5. The precincts for the election are all those that include territory included within the corporate limits of the City.

Section 6. The ballot title will read as follows:

CAPTION: PROPOSAL TO ANNEX 24.33 ACRES TO CITY

QUESTION: Should the City of North Plains annex 24.33 acres on its east boundary?

SUMMARY: Approval of this ballot measure will annex 24.33 acres to the City of North Plains. The land is all within the City Urban Growth Boundary. The land is south/east of the City located south of NW West Union Road and east of McKay Creek. The land is used for agricultural purposes. A legal description and maps of the annexation land are on file at the North Plains City Hall.

Section 7. The City Recorder is authorized to submit an impartial explanatory statement for the Washington County voters pamphlet on behalf of the City.

Section 8. The City Recorder will publish the ballot title as provided by state law.

Section 9. This resolution is effective upon its adoption by the City Council.

INTRODUCED AND ADOPTED this 17th day of July, 2006

CITY OF NORTH PLAINS, OREGON

By: Cheri Olson
Cheri Olson, Mayor

ATTEST:
By: Debbie Owens
Debbie Owens, City Recorder

SEL 802
REV 8/05

NOTICE OF CITY MEASURE ELECTION

ORS 250.035
ORS 250.041
ORS 250.275
ORS 250.285
ORS 254.095
ORS 254.465

NORTH PLAINS, OREGON

(Name of City)

Notice is hereby given that on Tuesday, September 19, 2006
(Date of Election)

A measure election will be held in North Plains, Washington County, Oregon.
(Name of County or Counties)

The following is the true and complete ballot title of the measure to be submitted to the city's voters on this date:

CAPTION (10 Words)

PROPOSAL TO ANNEX 24.33 ACRES TO CITY.

QUESTION (20 Words)

Should the City of North Plains annex 24.33 acres on its east boundary?

SUMMARY (175 Words)

Approval of this ballot measure will annex 24.33 acres to the City of North Plains. This land is all within the City Urban Growth Boundary. The land is south/east of the City located south of NW West Union Road and east of McKay Creek. The land is used for agricultural purposes. A legal description and maps of the annexation land are on file at the North Plains City Hall.

The following authorized city official hereby certifies the above ballot title is true and complete, which includes completion of the ballot title challenge process.

Donald H. Otterman
Signature of authorized city official (not required to be notarized)

7/18/06
Date signed

DONALD H. OTTERMAN
Printed name of authorized city official

CITY MANAGER
Title

WCED VP2 12/01

EXPLANATORY STATEMENT FOR COUNTY VOTERS' PAMPHLET

Election Date: Tuesday, September 19, 2006

Ballot Title Caption: PROPOSAL TO ANNEX 24.33 ACRES TO CITY

Measure Number: _____

Person responsible for the content of explanatory statement	Telephone (home) 503-690-4989 Telephone (work) 503-647-5555 Fax number 503-647-2031
Donald H. Otterman	
Title of above person	**Name of the Governing Body represented**
City Manager	City of North Plains

By signing this document, I hereby state that I am the person responsible for the content of this statement.

Donald H. Otterman
Signature

7/18/06
Date

Instructions

- Total word count must not exceed 500 words.
- The explanatory statement is an impartial, simple and understandable statement explaining the measure and its effect (ORS 251.285).
- The explanatory statement must be typed.
- The explanatory statement must be filed with the County Elections Office in which the administrative office of the electoral district is located.
- The explanatory statement should be filed when measure filing is submitted, or no later than 5:00pm on the measure filing deadline.

EXPLANATORY STATEMENT FOR COUNTY VOTERS' PAMPHLET

Ballot Title Caption: Proposal to annex 24.33 acres to city

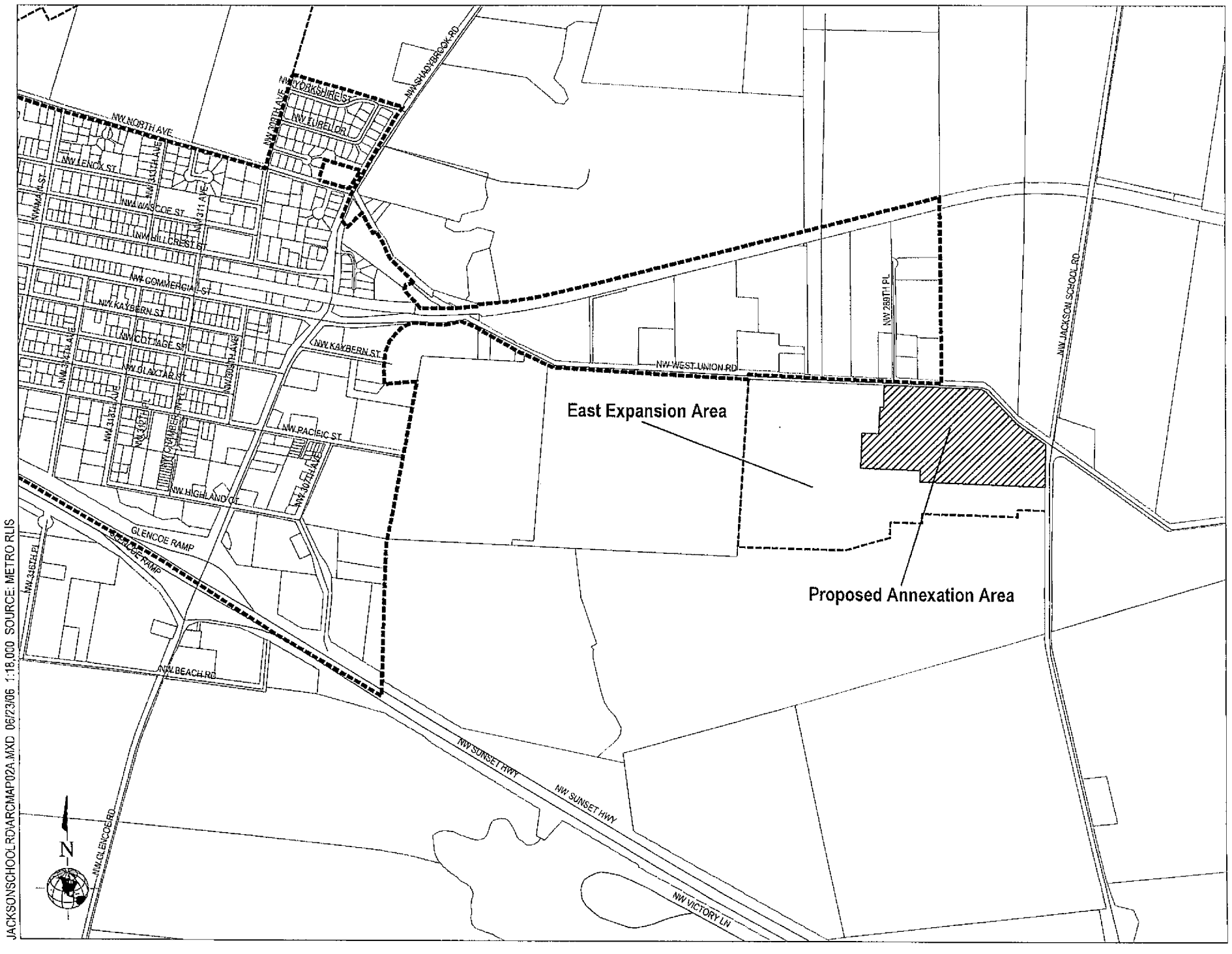
If approved by the voters, this measure will annex 24.33 acres of mostly vacant and agricultural land to the City of North Plains. The City Council found that this annexation proposal meets all applicable land use legal requirements. The City Charter requires voter approval of annexations.

All of the annexation land is within the City Urban Growth Boundary. The major impact of the annexation will be to shift urban planning and services responsibilities from Washington County to the City. The annexation land will be subject to the City's comprehensive plan and land use regulations. The land must develop under City requirements and in coordination with other land uses.

The annexation land will be subject to City property tax rates and will increase City revenue to help finance City services. The City will also gain revenue through development and building fees.

By approving this annexation of land into the City of North Plains, the City voters will require development to comply with City standards. Annexation will increase City revenues at no cost to current residents.

Approval of this ballot measure will annex land south of NW West Union Road, west of Jackson School Road and to the east of McKay Creek. A map of the annexation land and legal description is on file at the North Plains City Hall. The area proposed to be annexed is 24.33 acres of the 69.87 acres of the east expansion area. There is a map of the proposed annexation area in the voters' pamphlet.


East Expansion Area
Proposed Annexation Area
NW NORTH AVE
NW YORKSHIRE ST
NW SHADYBROOK RD
NW LENOX ST
NW WASCOE ST
NW HILLCREST ST
NW COMMERCIAL ST
NW KAYBERN ST
NW COTTAGE ST
NW GLACIER ST
NW PACIFIC ST
NW HIGHLAND CT
NW WEST UNION RD
NW JACKSON SCHOOL RD
NW 289TH PL
GLENCOE RAMP
NW BEACH RD
NW SUNSET HWY
NW GLENCOE RD
NW VICTORY LN
N
JACKSONSCHOOLRD\ARCMAP02A.MXD 06/23/06 1:18,000 SOURCE: METRO RLIS

CITY OF NORTH PLAINS

Revised

Application for Annexation for:

EAST EXPANSION AREA

TAX LOT 100

TAX MAP 1N2-07

Applicant/Contract Purchaser:

POLYGON NORTHWEST
109 East Thirteenth Street
Vancouver, Washington 98660
Contact: *Fred Gast*
Phone: 360.695.7700

Applicant's Representative:

W&H Pacific
9755 SW Barnes Rd, Suite 300
Portland, OR 97225
Contact: Hal Keever, A.S.L.A.
Phone: 503.626.0455

Owners:

Jackson-Union LLC
1440 SW Taylor Street
Portland, OR 97205

April 2006

W&H PACIFIC

APPLICATION FOR ANNEXATION

GENERAL INFORMATION

Owners	Tax Map 1N2-07, Tax Lot 100 Jackson-Union LLC 1440 SW Taylor Street Portland, OR 97205
Applicant/Purchaser	Polygon Northwest 109 E 13th Street Vancouver, WA 98660 Tel.: (360) 695-7700 Fax: (360) 693-4442 Contact: Fred Gast
Applicant's Representative	W&H Pacific 9755 SW Barnes Road, Suite 300 Portland, OR 97225 Tel.: (503) 626-0455 Fax: (503) 526-0775 Contact: Hal Keever
Property Identification	Tax Lot 100 (portion) Tax Map 1N2-07
Site Area	24.33 acres
Requested Approval	Approval to schedule annexation election

Deleted: 32.75

APPLICATION FOR ANNEXATION

ENCLOSURES

Narrative
Exhibit A – Annexation Application
Exhibit B – Legal Description and Boundary Survey
Exhibit C – Tax Maps
Exhibit D – Density / Land Use Plans
Exhibit E – Conceptual Phasing Plans
Exhibit F – Periodic Review Findings
Exhibit G – Letter from Hillsboro School District
Exhibit H – Land Use Need Calculations (from Periodic Review)
Exhibit I – Financial Impact Analysis
Exhibit J – Transportation Impact Study

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I. INTRODUCTION

The applicant, Polygon Northwest, requests annexation application approval resulting in the scheduling of a public vote of the City's electors. The request is to annex 24.33 acres, known as the east expansion area. The property owner is Jackson-Union LLC, (Tax Lot 100). The applicant's representative is W&H Pacific. A copy of the application has been attached and is identified as Exhibit A.

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The purpose of the annexation request is to incorporate a portion of the East expansion area recently brought into the City's Urban Growth Boundary (UGB) during the City's Periodic Review process and allow for the master planning of said areas. The buildout is commensurate with the City's Land Needs Analysis conducted during Periodic Review that determined the City needed to add 149 acres of land to serve its land needs for the years 2000 to 2021.

The annexation of these expansion areas will provide the City with the opportunity to become self sufficient and achieve the vision as stated in the Comprehensive Plan of being a "complete community that provides a place for its citizens to live, work, shop, have convenient access to schools, and maximizes access to fire, life and safety services."

The City has recently adopted new Comprehensive Plan and Zoning District designations (Neighborhood Community and Neighborhood Community Zone, respectively) that would be applied to these annexation areas. The new designations will require the master planning of each annexation area prior to any development occurring within those areas.

II. SITE DESCRIPTION

East

The site is generally located south of NW West Union Road, west of NW Jackson School Road, east of McKay Creek, and north of Highway 26. The property may be specifically identified as a portion of Tax Lot 100 on the attached Washington County Tax Assessor's Map 1N2-07, identified as Exhibit C. The property is 24.33 gross acres in area and is currently in agricultural use.

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NW West Union Road is identified as an arterial on the City's Transportation System Plan (TSP) and would require a three-lane improvement with bike lanes. This road ROW currently measures 60 feet and would require up to 15 additional feet of dedication, (for a total 90-foot ROW) and improved with 48 feet of paving. NW Jackson School Road is identified as an arterial on the Washington County Transportation System Plan (it is not identified on the City's TSP) and would require a three-lane improvement with bike lanes. The Jackson School ROW currently measures 60 feet in width and would require up to 15 additional feet of dedication (for a total 90-foot ROW) and improved to 50 feet of paving.

PUBLIC UTILITIES

Service	Provider	Size	Location	Distance from site
Water (East)	City	14-inch	West Union Road	Adjacent
Sanitary Sewer (East)	CWS	12-inch	West Union Road	Adjacent
Storm Drain East	City	Ditch natural	West Union Road McKay Creek Jackson School Road	Adjacent (north)

III. APPLICABLE COMPREHENSIVE PLAN GOALS, POLCIES AND OBJECTIVES

Section 15.01.030 – Vision Statement Introduction

4. *Striving to be a complete community that provides a place for its citizens to live, work, shop, have convenient access to schools, and maximizes access to fire, life and safety services. All these elements combined will enhance the livability of North Plains.*

5. *Striving also to be a sustainable community by providing jobs and services within the City. Maintaining a compact urban form while having access to jobs and services will reduce the reliance on the automobile and vehicle miles traveled. This will also lead to improvement in air quality and further enhancing the livability of North Plains.*

RESPONSE:
The City, through its Neighbor City Study and Periodic Review process, established a vision whereby the City would grow in a manner that would allow it to be a self-sufficient community, rather than a "bedroom" community to the nearby metropolitan area. The projected growth for the City through infill and development of the expansion areas would provide the population and resources necessary to provide a commercial climate sufficient to accommodate a more robust downtown core area (including a food market) and reduce reliance on neighboring cities for commercial services and employment.

Further, the East Expansion Area would provide a school site for a new elementary school that would be built at such time that enrollment growth requires it.

Section 15.01.050 – The Vision

7. *Growth – We will continue to grow and become a place where jobs, affordable housing, and public services are available and capable of meeting the needs of the evolving urbanizing population. We will become a net importer of jobs. The City will encourage, where possible, expansion to the north and east to maximize connectivity and availability of existing services.*

RESPONSE:
The proposed annexation takes the next step in fulfilling this portion of the City's Vision statement. This request would annex to the City a portion of the non-exception land expansion area as identified during the Periodic Review process and adopted in the City's Comprehensive Plan. The proposed annexation area is adjacent to the existing City limits and can be fully served by existing services.

9. *Density – We will continue to recognize the importance of balancing low, medium and high density land use.*

RESPONSE:
As shown on the Density / Land Use Plans for the proposed east expansion area, a balance of low, medium and high density residential areas would be provided, complying with Section 120 – Urbanization of the City's Comprehensive Plan. Master plans for the expansion areas will be required to be adopted by the City prior to any development occurring within the newly annexed areas. Said master plans would need to demonstrate compliance with this distribution of density ratios.

14. *Workable – Our vision shall be a model for the way we can manage our growth in practical and cost-effective ways so that we ensure we have a viable economic future while preserving our livability.*

RESPONSE:
As noted previously, the population that would be accommodated by this expansion area, as well as infill development within pre-expansion City limits, will foster economic growth to City's downtown core and other commercial areas. Population growth will provide critical mass to inspire economic growth for existing and new businesses. This well-planned growth will help reduce the need to go outside the community for commercial or retail needs.

Section 15.02.120 - Urbanization

Urbanization

1. *Objective: To provide for an orderly and efficient transition of land from rural to urban use through the identification and establishment of areas designed to accommodate the full range of urban uses within the North Plains expansion area.*

RESPONSE:
The City has adopted Density/Land Use Plans for the expansion area. This plan identifies the full range of urban uses that are to be provided and accommodated in the annexation areas. Together these two areas provide for efficient urbanization with a wide range of uses including housing, parks, schools and economic development. Master planning of these areas prior to development will ensure there is an orderly and efficient transition of the land from rural to urban use.

A. *Policies*

(1) New growth areas should be master planned to ensure development of complete neighborhoods and adequate public facilities. Neighborhoods should provide a variety of housing, useable parks and open space, school facilities, and connected streets, generally consistent with the town plan.

RESPONSE:
The City recently adopted a new Comprehensive Plan designation (Neighborhood Community) and new Zoning district (Neighborhood Community Zone) that would be applied to the newly annexed expansion areas. The new zone will require that the non-exception expansion areas be master planned to ensure the provision of complete neighborhoods with adequate public facilities. Said master plans will provide the variety of housing and the other prescribed land uses and facilities. Master planning of these areas will allow them to be reviewed in a comprehensive manner rather than looking at them in a piecemeal approach. Today, the City maintains services that accommodate the expansion area. Additionally, Section 15.02.120 of the Comprehensive Plan provides language that requires the expansion area to develop in the manner prescribed by this policy.

(2) Development standards in the expansion areas shall be used as a tool to achieve densities of 8.4 units per acre. Key components of expansion area design shall include:

- *Pedestrian orientation;*
- *Public amenities, including pedestrian spaces and community facilities;*
- *Linkages within and between neighborhoods;*
- *Convenient access to needed services.*

RESPONSE:
As noted previously, the new Neighborhood Community zone will require demonstration through master plans that the standards and elements identified in subsection (2) are met.

(3) The land use map shall designate the expansion areas to promote varying density residential development and pedestrian-sensitive

mixed-use development so as to provide the opportunity for an overall density of 8.4 units per net acre, and an approximate 40% low density, 40% medium density, and 20% high density split in the expansion areas.

RESPONSE:
The new Neighborhood Community Comprehensive Plan Land Use Map designation will require that development within this designation will meet the requirements of subsection (3) above.

Housing

1. *Objective: To provide for the housing needs of the citizens of North Plains by encouraging the construction, maintenance, development, and availability of a variety of housing types, in sufficient number and at price ranges and rent levels which are commensurate with the financial capabilities of the community's residents.*

RESPONSE:
The proposed annexation areas are required to provide a mix of housing densities and types. Densities will be provided, generally, in a mix of 40% low density, 40% medium density, and 20% high density. Housing types may include single family detached, single family attached, duplexes, townhomes, condominiums, apartments, mixed use and ancillary dwellings as required in Policy (1) below. By providing a broad range of housing types and varying densities, the resulting housing choices for the citizens of North Plains will be maximized.

A. Policies

(1) A mix of housing units shall be encouraged throughout the expansion areas for households of varying incomes, ages and living patterns. Such housing should include but not be limited to: single family residences, duplexes, apartments, attached single family residences, condominiums, townhouses, mixed uses, and ancillary dwelling units. Each type of housing should be available at various prices and rents in order to maximize housing choices of the public.

RESPONSE:
The Neighborhood Community Zone will allow all of the above housing types as permitted uses within the annexation areas. Additionally, the mix of density ratios prescribed for the annexation areas will further ensure a range of housing types will be provided rather than a singular homogenous housing type. Additionally, Section 15.02.120 of the Comprehensive Plan provides language that requires the expansion areas develop in the manner prescribed by this policy.

(2) *Within the expansion areas minimum residential densities shall be established to ensure these areas achieve the residential density objective identified in the North Plains Neighbor City Study, while also retaining flexibility for residential development patterns and projects tailored to specific locations.*

RESPONSE:
The Neighborhood Community Zone will have standards assuring the residential densities identified in the Neighbor City Study will be achieved in the expansion areas and will be addressed more fully during the master planning process. Additionally, Section 15.02.120 of the Comprehensive Plan provides language that requires the expansion areas develop in the manner prescribed by this policy.

Recreation

1. *Objective: To design parks and recreation facilities within the expansion areas that:*

    - *Provides a variety of open spaces, parks, and recreation facilities; and*
    - *Links open spaces, parks, recreation facilities, and school via a pedestrian and bicycle trail system.*

RESPONSE:
The expansion areas will be subject to the master planning requirements of the Neighborhood Community Zone. Said master plans will fully address the park and recreation facilities to be provided in these areas. Additionally, the City's Comprehensive Plan requires a prescribed amount of acreage be applied to parks/greenway uses within the expansion areas. The large amount of parks acreage required in the expansion areas was prescribed to offset the current lack of sufficient park land and facilities located within the pre-expansion City limits. The park land that would be provided by the annexation areas would significantly increase the amount of park land currently within the City of North Plains.

The expansion area will provide substantial neighborhood and community parks and greenways. The parks would be dispersed throughout the expansion area providing convenient access for the future residents within those areas as well as the City's existing residents.

A. *Policies*

(1) *In the expansion areas, useable open space shall be provided to mitigate higher overall densities and to provide public and private local parks and recreation opportunities.*

RESPONSE:
The expansion areas are required to provide for neighborhood parks, community parks, and greenways per Section 15.02.120 of the Comprehensive Plan. These multiple and varied park lands will balance the intensity of development required by minimum densities in the expansion areas.

Park land in the pre-expansion City limits was determined to be insufficient to serve the anticipated population of North Plains. To offset this deficiency, sites for parks were analyzed within the existing City. Recognizing there were not enough opportunities to locate all needed parks within the existing City limits, the expansion areas were to provide enough park lands to meet the needs of the entire City. The proposed park lands within the annexation areas would significantly increase the amount of park land currently existing within the City.

Commercial Land

1. *Objective: Provide local shopping opportunities for residents of the expansion areas.*

RESPONSE:
The Comprehensive Plan prescribed 7.8 gross acres for commercial uses within the two expansion areas (3.9 gross acres in each) to provide opportunities for the residents of these areas. The specific distribution of where commercial uses may be located will be addressed during the master planning process for the expansion areas. These neighborhood commercial opportunities are to generally serve the neighborhood in which they are located and promote reduced vehicle use and a sense of place.

A. *Policies*

(1) Commercial land may be located close to or within neighborhoods and residential areas within the expansion areas. The commercial areas shall be located and designed to provide safe and convenient access for pedestrians, bicycles and autos.

RESPONSE:
The Density/Land Use Plans identify those areas where commercial uses may be located in the expansion areas. The master planning process will further refine the locations for these uses and address the design factors associated with provision of safe and convenient access for pedestrians, bicycles and autos.

Schools

1. *Objective: The City shall coordinate with the school district to help assure an adequate level of educational service is provided. Areas of coordination shall include:*

    - *Location of school site; and*

- *Provision of adequate pedestrian, bicycle and bus access from residential districts to school sites.*

RESPONSE:
The applicant has been in coordination with Hillsboro School District. The district has indicated the existing North Plains elementary school can accommodate increased enrollment for the near future. The east expansion area has identified a location for a new school site within the City when it is needed. The School District has expressed significant interest in acquiring property in the east expansion area. Please refer to the letter from the School District in Exhibit G.

IV. APPROVAL CRITERIA

Chapter 16.59.020 of the Zoning and Development Ordinance addresses the Conditions for Annexation as follows:

The following conditions must be met prior to or concurrent with City processing of any annexation request:

A. *The subject site must be located within the North Plains Urban Growth Boundary.*

RESPONSE:
The subject site, totaling 24.33 acres, was brought into the City's Urban Growth Boundary (UGB) during the recent Periodic Review process. The Work Task expanding the City's UGB was acknowledged by the Land Conservation and Development Commission (LCDC) in 2003. This condition is met.

Deleted: 32.75

B. *The subject site must be contiguous to the existing City limits.*

RESPONSE:
The east annexation area is contiguous to the existing City limits along its north boundary (West Union Road). This condition is met.

Chapter 16.59.030 of the Zoning and Development Ordinance addresses the criteria for annexation as follows:

The following criteria shall apply to all annexation requests:

A. *The proposed use for the site complies with the North Plains Comprehensive Plan and with the designation(s) thereon. If a re-designation of the plan map is requested concurrent with annexation, the uses allowed under the proposed designation must comply with the Comprehensive Plan.*

RESPONSE:
The proposed use does comply with the Comprehensive Plan as previously approved by the City and acknowledged by the State and Washington County during the Periodic Review process. As stated previously, the City has recently adopted a new Comprehensive Plan Land Use designation (Neighborhood Community) that would be applied to the proposed annexation area.

B. An adequate level of urban services and infrastructure must be available or made available in a specified time period determined by Council. An adequate level of urban services is defined as:

1. *Municipal sanitary sewer, storm drainage and water service meeting the requirements enumerated in the Comprehensive Plan for provision of those services.*
2. *Rights of way with adequate design capacity for the proposed use and projected future uses.*
3. *Where construction of improvements necessary for delivery of the urban services identified in subsection (1) above or the rights-of-way identified in subsection (2) above are not thought to be immediately necessary, the applicant shall note the methods that are proposed to be used for providing and/or financing those services/improvements including (but not limited to) dedication of right-of-way, granting waiver(s) of remonstrance against possible future local improvement districts created or other approaches/devices to pay for improvement costs.*

RESPONSE:
The 24.33 acres of non-exception expansion land were specifically chosen by the City to bring into its UGB because these lands could be served by existing facilities (water, sanitary sewer, and storm drainage) that were either already in place or were already committed to be upgraded to serve the existing City. The applicant has provided the City's 66-page findings to LCDC (Exhibit F) which addresses this provision and capacity of necessary utilities and services.

Deleted: 32.75

Any additional right-of-way necessary for existing roadways would be addressed during the development of the expansion areas as required by the City's TSP.

The City of North Plains is currently updating their TSP to identify comprehensive multi-modal system improvements to support growth in the community over the next twenty years. The development of the land being considered for annexation has been accounted for in the City's TSP update. At the time development applications are proposed, a detailed study of intersection improvements will be conducted to identify the appropriate timing and funding of needed improvements (if any) in the vicinity of the annexation properties.

Lastly, ODOT has constructed improvements at the US 26 / Jackson School Road interchange and is designing improvements for the Glencoe Road interchange. Both projects will improve accessibility for the North Plains community.

C. *Findings documenting the availability of police, fire, parks, school facilities and all related services shall be made allowing for conclusory findings either for or against the proposed annexation. The adequacy of each of these services shall be considered in relation to each annexation proposal.*

RESPONSE:
The annexation areas will be subject to the City's tax rate of $2.17 / $1,000 of assessed value. Police coverage is included within this tax rate as well as the current police levy of approximately .56 / $1,000 of assessed value. Fire protection is paid for through a separate Fire District tax rate. These newly annexed properties will be subject to the City's tax rate and contribute to the City's operating funds.

The applicant has provided a Financial Impact analysis of the proposed annexation in Exhibit I. This analysis demonstrates the financial impacts to the City over the buildout period based on increased tax revenues and monies generated through System Development Charges (SDCs).

The Financial Impact Analysis addresses all properties within the three annexation applications being submitted for consideration for placement on the September 19, 2006 ballot (Paine Tract, Lone Oak Land and Investment in the north, and Jackson-Union LLC in the east). The absorption rate utilized in the Financial Impact Analysis is for 70 units per year in North Plains.

The City found, during the Periodic Review process, that North Plains is currently under-served for parks. The annexation areas are required to provide park land to eliminate this deficiency. The annexation areas are prescribed to provide a mix of park uses including neighborhood and community parks and greenways. Development of the parks in the annexation areas will more than double the City's current park acreage.

The Hillsboro School District has indicated the existing school in North Plains currently has capacity for additional students. The Hillsboro School District has also been coordinating with the property owners of the east expansion area to obtain land for a future elementary school in that portion of the City that will serve the educational needs of North Plains and the school district in the future.

D. *The burden of providing evidence supporting the findings for Section 16.59.030 A-C is upon the applicant.*

Improvements for needed infrastructure may be secured by a funding mechanism that will place primary economic burden on

the territory proposed for annexation and not on the City of North Plains generally.

RESPONSE:
As noted in the response to item C above, the applicant has provided a Financial Impact analysis of the proposed annexation in Exhibit I. This analysis demonstrates the financial impacts to the City, with a 70 units per year absorption rate, based on increased tax revenues and monies generated through System Development Charges (SDCs).

As discussed within this narrative, and further detailed in the Periodic Review Findings in Exhibit F, the annexation areas can be served by existing infrastructure or infrastructure improvements already planned to serve the existing City. The Master Plans for sewer, water and storm drainage have been recently updated and took development of the expansion areas into account in addressing system capacity.

Chapter 16.59.050 of the Zoning and Development Ordinance addresses the application requirements for annexation as follows:

A. *Applications for annexation shall be made on forms provided by the City Recorder and include, at a minimum, the following material:*

1. *Written consent to the annexation signed by the affected property owners.*
2. *Legal description of the property to be annexed and a boundary survey certified by a registered engineer or surveyor licensed in the State of Oregon.*
3. *Vicinity map and map of the area to be annexed including adjacent City territory.*
4. *General land use plan indicating types and intensities of proposed development, transportation corridors, watercourses, significant natural features, and adjoining development.*
5. *Payment of annexation fees, as the same are set by Council resolution.*

RESPONSE:
The application materials required by this section have been included with this submittal. The property owners have signed the annexation application forms. Legal descriptions and boundary surveys for each area are included in the appendices of this submittal package. Vicinity maps and general land use plans (consistent with those adopted by the City in its Comprehensive Plan) are also included in the appendices of this submittal package. The applicants have paid the requisite fee for this application.

B. *In addition to the information and fees required under subsection (A) above, an applicant shall also be required to provide the following information:*

1. *A statement of overall development concept and methods by which the physical site, surrounding area and community will be affected as well as proposed actions designed to mitigate negative effects from the development, if any.*

RESPONSE:
The proposed annexation areas will undergo a master planning process prior to the development of any portions within those areas. Taking this comprehensive approach to planning for these areas will provide the City with the opportunity to consider any potential negative effects and apply conditions to the future development of these areas to mitigate for any impacts.

It should be recognized that there will be positive impacts to the City as well. Development of the expansion areas will provide the City with economic growth and allow the North Plains to be a self-sufficient community that does not need to rely on surrounding communities for its commercial and service needs.

As discussed previously, the applicant has provided a Financial Impact analysis demonstrating the financial impacts to the City over the buildout period based on increased tax revenues and monies generated through System Development Charges (SDCs).

The expansion areas will provide significant additional acreage of park lands for the citizens of North Plains and eliminate the City's current deficiency in parks.

Exhibit J provides a traffic impact analysis to determine the impacts of development of the annexation areas on the City's transportation system. The construction of the Jackson School Road interchange, coupled with the Interchange Area Management Plan (IAMP) being conducted by ODOT for the Glencoe / Highway 26 interchange, will significantly improve accessibility into North Plains. This analysis determines that only the Glencoe / West Union intersection and westbound left-turn movement at Highland / Glencoe intersection would operate over capacity by 2015. Capacity at the Glencoe / West Union intersection may be mitigated via adding turn lanes on the northbound approach to this intersection or providing a single lane roundabout. The applicant will work with both the City and the County to determine the appropriate mitigation for this location.

Development of the expansion areas will be done in a manner, as prescribed by the Comprehensive Plan, to provide a livable, walkable complete community that will help energize the existing downtown core area which benefits the whole community.

2. *A statement addressing the availability, capacity and status of existing water, sanitary sewer, drainage, transportation, park and school facilities as determined and an analysis as to the anticipated increased demand for said facilities generated by the proposed development.*

RESPONSE:
As noted previously, the applicant has provided a copy of the City's 66-page findings in Exhibit F of this submittal which provide detailed findings addressing availability, capacity and status of needed facilities. The two expansion areas were selected by the City specifically due to the ability to serve both areas by existing or planned facilities.

In response to the School District's input, a school site will be provided in the east expansion area to address future school capacity for the City and district. The current school facility has adequate capacity to serve the growth needs of the City in the immediate future.

3. *A statement analyzing anticipated additional facilities required to meet increased demand and proposed phasing of such facilities in accordance with the projected demand.*

RESPONSE:
As a part of the City's Periodic Review process, the City was required to update all of its Master Plans, including Water, Sanitary Sewer, Storm Drainage, Transportation System Plans. These plans were all updated and anticipated the development of the non-exception expansion land with the uses identified in the Density/Land Use Plans.

4. *A statement setting out proposed method(s) and source(s) of financing required to provide the additional facilities identified in the analysis described in subsection (3) above.*

RESPONSE:
As discussed within this narrative, and further detailed in the Periodic Review Findings in Exhibit F, the annexation areas can be served by existing infrastructure or infrastructure improvements already planned to serve the existing City. The Master Plans for sewer, water and storm drainage have been recently updated and took development of the expansion areas into account in addressing system capacity. The City is currently updating their System Development Charges (SDCs) that would be applied to new development to address funding of system improvements.

The Financial Impact Analysis in Exhibit I details the revenues generated through SDCs that would be generated by development within the annexation areas for system maintenance or improvement.

5. *A narrative demonstrating the need for the urban development proposed for the annexation area analyzing the following:*

   a. *Availability within the City of undeveloped land designed for proposed urban development.*
   b. *Analysis of immediate, short-term (1 to 5 years) demand for proposed urban development.*
   c. *Probable phasing of proposed urban development consistent with projected demand for period in which the annexation area is expected to develop.*

RESPONSE:
During the City's Periodic Review process, the City conducted a thorough and detailed analysis addressing availability of undeveloped land within the pre-expansion City limits to serve the projected population of 4,000. After maximizing infill opportunities, the analysis demonstrated the City needed to expand its UGB by 149 acres to accommodate the projected growth of North Plains. The two non-exception expansion areas provide 144 of those needed acres. A copy of the adopted Land Use Need Calculations from the Periodic Review materials is provided in Exhibit H of this submittal package.

Exhibit E contains a conceptual phasing plan for the expansion area indicating the anticipated sequence of development within the two areas.

V. CONCLUSION

In summary, the proposed annexation of the subject property will allow the City of North Plains to fulfill several elements in its vision to become a self-sufficient and complete community. This annexation request will provide the opportunity for the City to:

- Master plan its future growth in the East Expansion Area
- Reduce the City's current park deficiencies by providing new parks
- Provide revenues to support additional police officers
- Provide revenues to maintain the City existing and expanded park facilities
- Provide a new elementary school site for the City's and Hillsboro School District's future education needs
- Provide the critical mass of residents to support the City's existing businesses and future businesses, thus eliminating reliance on surrounding communities for commercial needs and services

As identified within this application, the proposed annexation request meets the applicable criteria for approval. All required application materials have been submitted allowing the City to move forward with the annexation request and

provide the necessary materials to Washington County for scheduling a September 19, 2006, annexation ballot measure.

CITY OF NORTH PLAINS
APPLICATION FOR ANNEXATION

APPLICANT GENERAL INFORMATION

APPLICANT Polygon Northwest PHONE 360-695-7700

MAILING ADDRESS 109 E 13th St. (Street) Vancouver (City) WA (State) 98660 (Zip)

PROPERTY OWNER Jackson-Union LLC. PHONE _____

MAILING ADDRESS 1440 SW Taylor St. (Street) Portland (City) OR (State) 97205 (Zip)

CONTACT PERSON IF DIFFERENT THAN APPLICANT Hal Keever W+H Pacific

9755 SW Barnes Road (Street) Suite 300 (City) Portland (State) OR 97225 (Zip)

PROPERTY DESCRIPTION

ADDRESS Ø TAX MAP NO. 1N2-07 TAX LOT NO. 100

LEGAL DESCRIPTION (Attach add'l sheet if necessary) See Exhibit 'B'

TOTAL ACRES OR SQ. FT. 24.33 EXISTING LAND USE Vacant

EXISTING ZONING FD-10 PROPOSED ZONING (If applicable) NC

PROPOSED USE Master Planned Community with Mix of Residential, Open Space and Commercial/ Institutional Uses.

An application for Annexation to the City may be recommended to the electorate by the City Council upon adequate demonstration by the applicant that the proposed annexation complies with all of the applicable criteria. It is the responsibility of the applicant to answer the following questions completely. The answers of the applicant will be taken into consideration by the Planning Commission and City Council when making a decision so your answers should be complete. (Attach additional pages if necessary.)

1. Describe the overall development concept and methods by which the physical site, surrounding area and community will be affected as well as proposed actions designed to

mitigate negative effects from the development, if any.

2. Describe the availability, capacity and status of existing water, sanitary sewer, drainage, transportation, park and school facilities and provide an analysis as to the anticipated increased demand for said facilities generated by the proposed development.

3. Analyze anticipated additional facilities required to meet the increased demand and proposed phasing of such facilities in accordance with projected demand.

4. Describe the proposed method(s) and source(s) of financing required to provide the additional facilities identified in the analysis in number 3 above.

5. Provide a narrative demonstrating the need for the urban development proposed for the annexation area analyzing the following:
   1. Availability within the City of undeveloped land designated for proposed urban development.

   2. Analysis of immediate, short-term (1 to 5 years)demand for proposed urban development.

   3. Probably phasing of proposed urban development consistent with projected demand for period in which the annexation area is expected to develop.

ADDITIONAL INFORMATION

In order to expedite and complete the processing of this application, the City of North Plains requires that all pertinent material required for review of this application be submitted at the time application is made. If the application is found to be incomplete, review and processing of the application will not

begin until the application is made complete. The submittal requirements relative to this application may be obtained from the specific sections of the Zoning and Development Ordinance pertaining to this application. If there are any questions as to submittal requirements, contact the City Hall prior to formal submission of the application.
In submitting this application, the applicant should be prepared to give evidence and information which will justify the request. The filing fee must be paid at the time of submission. This fee in no way assures approval of the application and is non-refundable.

I certify that the statements made in this application are complete and true to the best of my knowledge. I understand that any false statements may result in denial of this application.

I understand that the original fee paid is only a deposit and I agree to pay all additional actual costs of processing this application including, but not limited to, planning, engineering, city attorney and administration. I agree to also pay all additional costs above the deposit as invoiced directly to me by the city. I understand that no building permit shall be issued until all actual costs for processing this application are paid in full.

4-20-06
Date

Signature of Applicant

4-20-06
Date

Signature of Property Owner

Received by _____ Date _____

Fee Paid _____ Receipt No. _____ Application No. _____

W&H PACIFIC
AN ASCG COMPANY

9755 SW Barnes Road, Suite 300
Portland, Oregon 97225
503.626.0455
Fax 503.526.0775

APRIL 24, 2006

LEGAL DESCRIPTION FOR
PROPOSED ANNEXATION AREA "1"
TO THE CITY OF NORTH PLAINS

PROJECT NO. 32992

EXHIBIT "A"

A TRACT OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 2 WEST OF THE WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHWEST CORNER OF THE ANDERSON SMITH D.L.C. NO. 64 AND RUNNING ON THE SOUTH LINE OF SAID D.L.C. SOUTH 89°58'53" EAST, 3855.92 FEET; THENCE SOUTH 00°01'07" WEST, 30.00 FEET TO THE SOUTH RIGHT-OF-WAY LINE OF N.W. WEST UNION ROAD (C.R. NO. 2496) AND ALSO BEING THE POINT OF BEGINNING; THENCE CONTINUING ON SAID SOUTH RIGHT-OF-WAY LINE (THE FOLLOWING TWO COURSES) SOUTH 89°58'53" EAST, 785.23 FEET; THENCE SOUTH 56°02'29" EAST, 746.21 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF N.W. JACKSON SCHOOL ROAD; THENCE ON SAID WESTERLY RIGHT-OF-WAY LINE SOUTH 00°10'16" WEST, 410.28 FEET; THENCE LEAVING SAID RIGHT-OF-WAY LINE NORTH 89°58'53" WEST, 1070.41 FEET; THENCE NORTH 00°10'16" EAST, 100.00 FEET; THENCE NORTH 89°58'53" WEST, 510.00 FEET; THENCE NORTH 00°10'16" EAST, 305.00 FEET; THENCE SOUTH 89°58'53" EAST, 145.00 FEET; THENCE NORTH 00°10'16" EAST, 230.00 FEET; THENCE SOUTH 89°58'53" EAST, 30.00 FEET; THENCE NORTH 00°10'16" EAST, 191.91 FEET TO THE SOUTH RIGHT-OF-WAY LINE OF N.W. WEST UNION ROAD AND THE POINT OF BEGINNING.

CONTAINING APPROXIMATELY 1,059,721 SQUARE FEET OR 24.33 ACRES.

THE BASIS OF BEARINGS FOR THIS DESCRIPTION IS THE SOUTH LINE OF THE ANDERSON SMITH D.L.C. AND IS SHOWN AS SOUTH 89°58'53" EAST.

P:\Polygon NW Company\032992\Survey\Documents\annex1b041906.doc

T1N, R2W SEC.6 W.M.

JACKSON SCHOOL ROAD

S 00°10'16" W 410.28'

N

WEST UNION ROAD

S 56°02'29" E 746.21'

DOC.# 200047427

1070.41'

N 89°58'53" W

CITY OF NORTH PLAINS

N.W. WEST UNION ROAD

785.23'

S 89°58'53" E

WASHINGTON COUNTY

ANNEXATION AREA "1"
1,059,721 SQ. FT. OR
24.33 ACRES

N 00°10'16" E
100.00'

N 89°58'53" W 510.00'

N.W. 289th
PLACE

POINT OF
BEGINNING

S 89°58'53" E
30.00'

S 00°01'07" W
30.00'

S 89°58'53" E
145.00'

N 00°10'16" E
191.91'

N 00°10'16" E
230.00'

POINT OF COMMENCEMENT
SOUTHWEST CORNER OF THE
ANDERSON SMITH DLC # 64
FOUND 3 1/2" BRASS DISK
IN CONCRETE

BASIS OF BEARINGS
S 89°58'53" E
3855.92

N 00°10'16" E 305.00'

DRAWN BY: SMG CHECKED BY: GPC
LAST EDIT: 04/24/2008 PLOT DATE: 04/24/08 APPROVED BY:

DATE	BY	REV#	REVISION	CK'D	APPR.

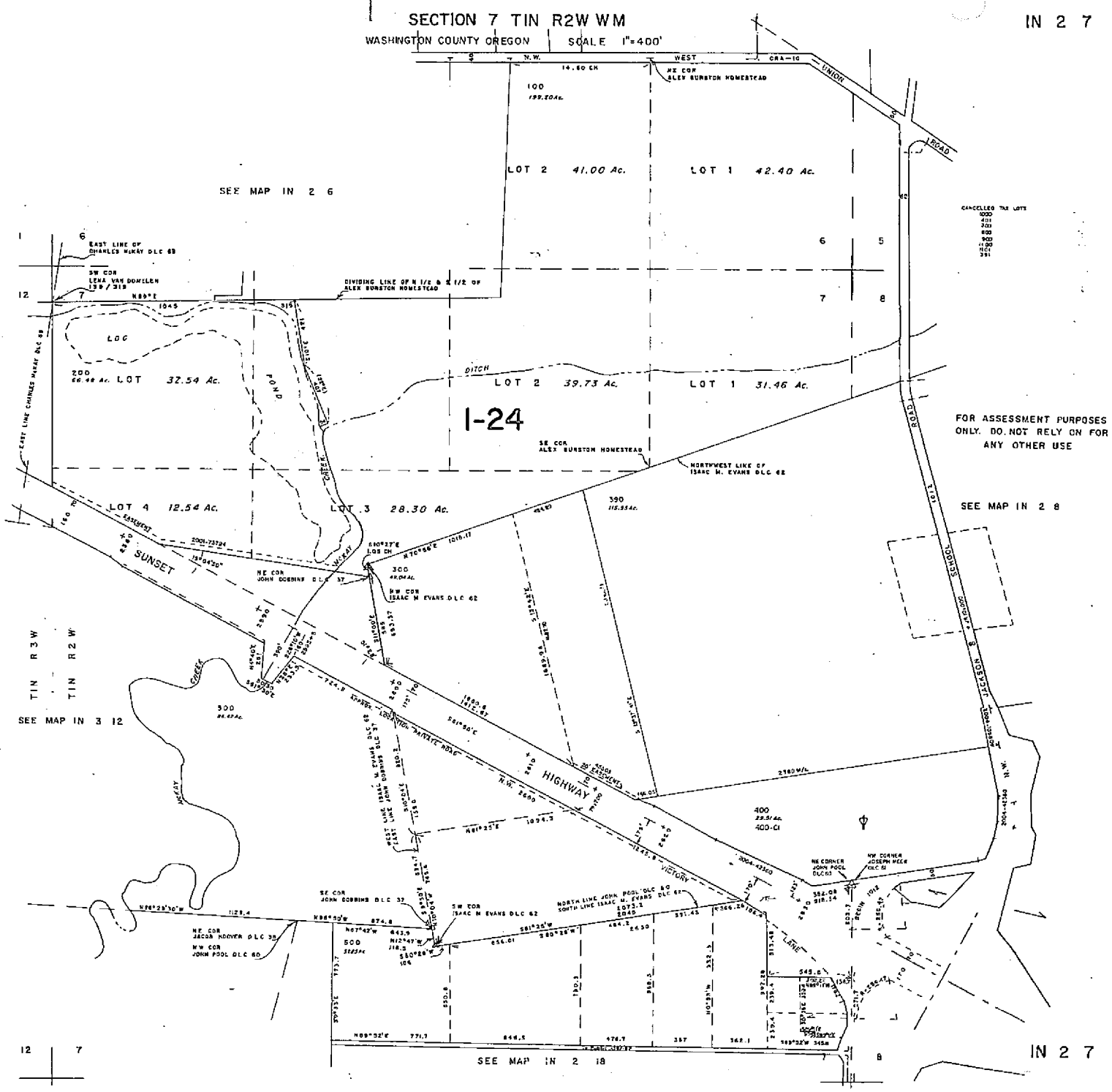
W&H
9755 SW Barnes Road
Suite 300
Portland, Oregon 97225

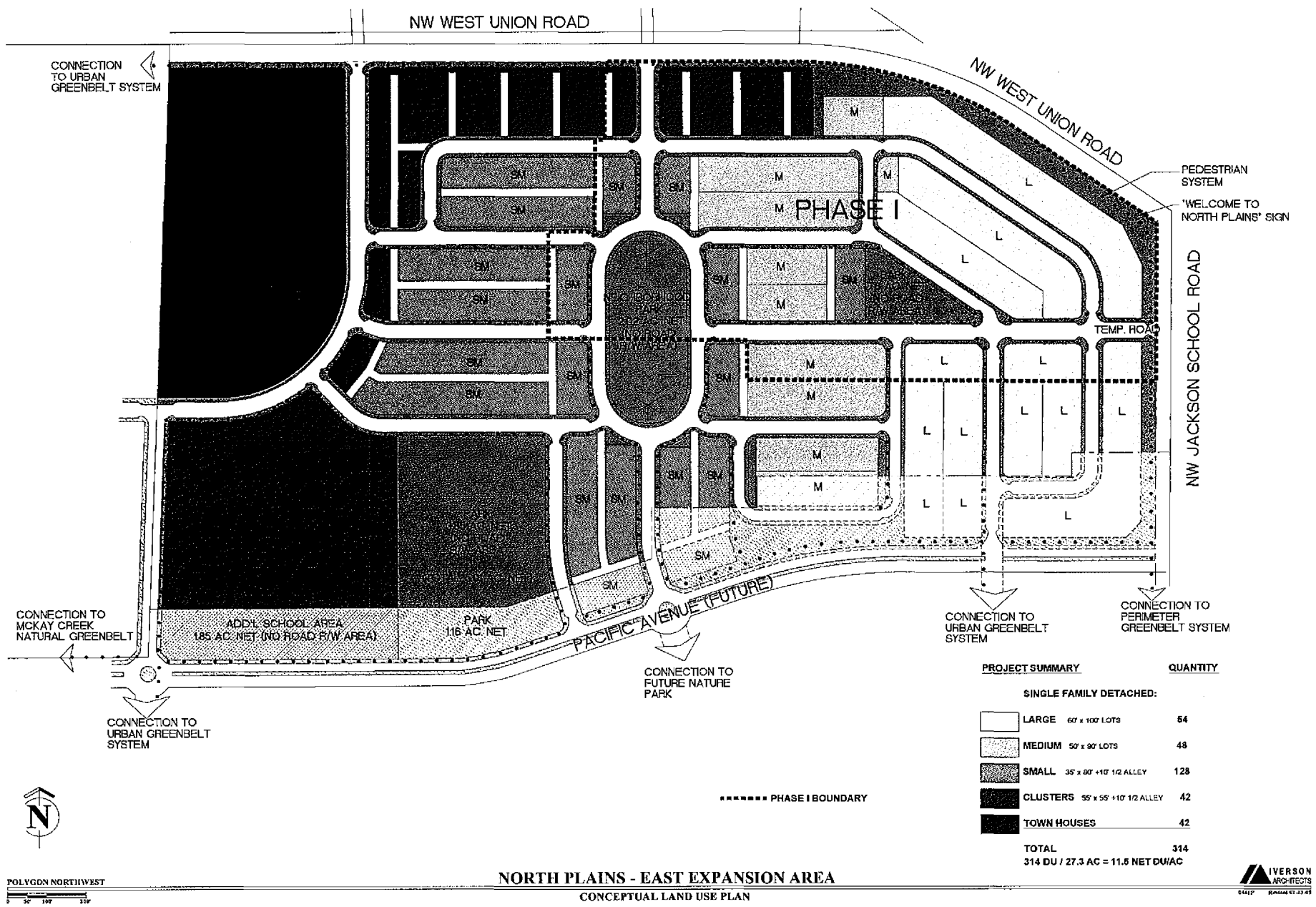
POLYGON NW COMPANY
EXPANSION AREA "1"

NORTH PLAINS

NORTH PLAINS, WASHINGTON CO. OREGON

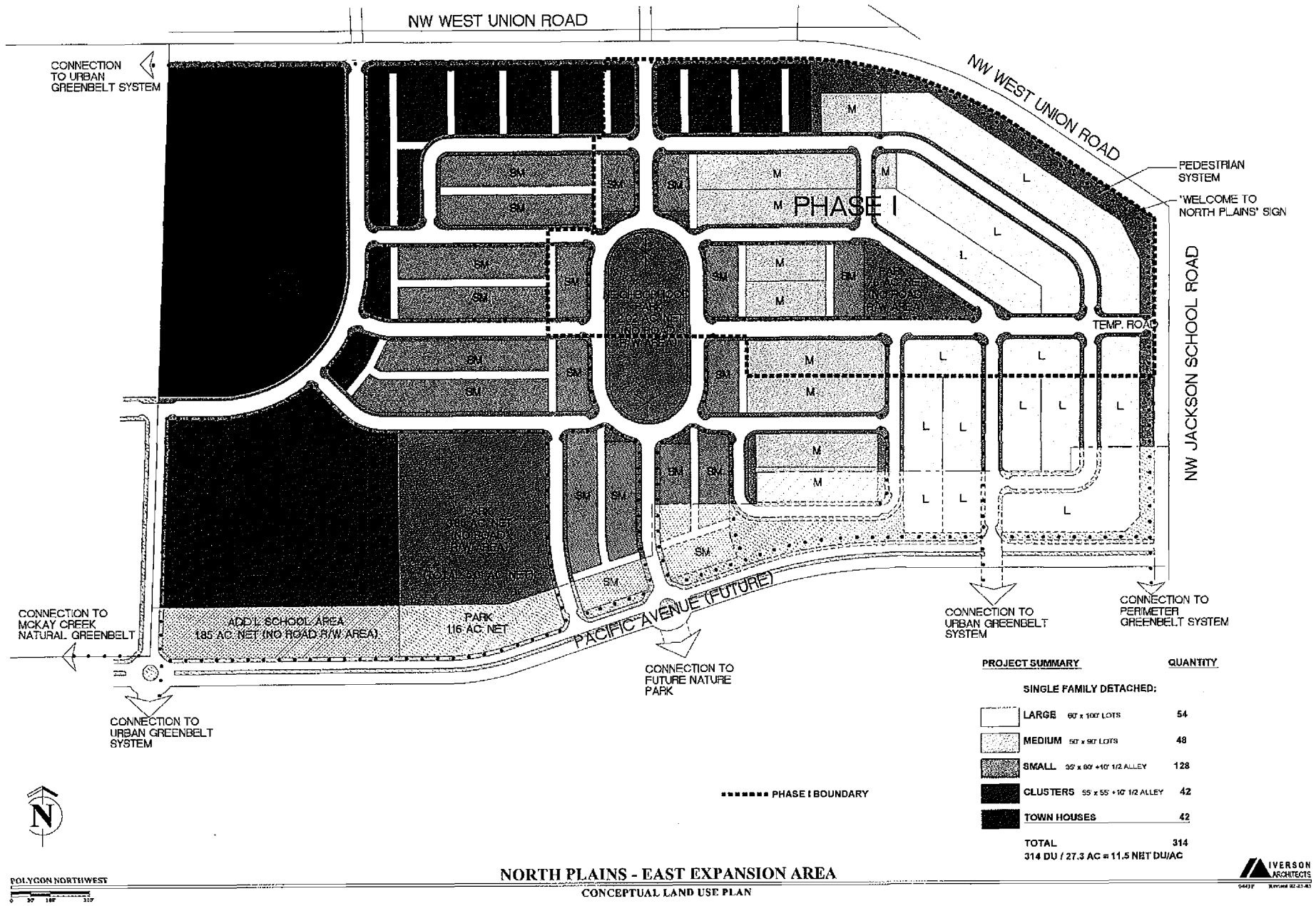
SCALE:	PROJECT NO.	DRAWING FILE NAME:	SHEET
1" = 200'	32992	32992--surv-ex03	1 1


SECTION 7 T1N R2W WM
WASHINGTON COUNTY OREGON
SCALE 1"=400'
IN 2 7
SEE MAP IN 2 6
LOT 2 41.00 Ac.
LOT 1 42.40 Ac.
LOT 4 12.54 Ac.
LOT 3 28.30 Ac.
LOT 2 39.73 Ac.
LOT 1 31.46 Ac.
LOT 32.54 Ac.
1-24
SUNSET
HIGHWAY
JACKSON SCHOOL
FOR ASSESSMENT PURPOSES ONLY. DO NOT RELY ON FOR ANY OTHER USE
SEE MAP IN 2 8
SEE MAP IN 3 12
SEE MAP IN 2 18
T1N R3W
T1N R2W
IN 2 7



NORTH PLAINS - EAST EXPANSION AREA

CONCEPTUAL LAND USE PLAN



PROJECT SUMMARY		QUANTITY
SINGLE FAMILY DETACHED:		
LARGE	60' x 100' LOTS	54
MEDIUM	50' x 90' LOTS	48
SMALL	35' x 80' +10' 1/2 ALLEY	128
CLUSTERS	55' x 55' +10' 1/2 ALLEY	42
TOWN HOUSES		42
TOTAL		314

314 DU / 27.3 AC = 11.5 NET DU/AC

NORTH PLAINS - EAST EXPANSION AREA

CONCEPTUAL LAND USE PLAN

IVERSON ARCHITECTS

I. INTRODUCTION

On August 19, the Land Conservation and Development Commission remanded the City's findings regarding Work Task 4. The remand order directed the City of North Plains ("City") to provide:

> [A] more complete development of both the evidentiary and policy bases for determining, under OAR 660-004-0020, that the exception lands cannot reasonably accommodate the need the City of North Plains has identified under Goal 14. If the City of North Plains determines that adjacent exception lands, including those to the south across Highway 26, cannot reasonably accommodate the need it has identified based on OAR 660-004-0020, it shall then apply ORS 197.298 and other applicable law to determine which lands to include within the UGB.

The City notes that the remand order did not reject the City's previous analysis, nor did it reject the City's articulation of its livability need. Rather, the order requested a more complete development of that analysis, which is provided herein.

II. THE NATURE OF THE CITY'S NEED.

An identified land need is a necessary foundation for any UGB amendment.[1] Oregon law has identified the permissible bases for a UGB amendment in the Factors 1 and 2 of Statewide Goal 14 (appropriately called the "Need Factors"), which provide in relevant part:

> "Urban growth boundaries shall be established to identify and separate urbanizable land from rural land. Establishment and change of the boundaries shall be based upon consideration of the following factors:
>
> (1) Demonstrated need to accommodate long-range urban population growth requirements consistent with LCDC goals;
>
> (2) Need for housing, employment opportunities, and livability.

In this case, the City's land need has two components, arising from Factors 1 and 2. First, the City has a statutory obligation **to maintain a 20-year land supply to accommodate urban population growth.** This is a Factor 1 need.

The City also has an independently justifiable Factor 2 livability need**: To establish compact, sustainable neighborhoods near the existing City downtown and east industrial area.** While this livability need is necessarily related to the Factor 1 numeric need, it would justify a UGB expansion on its own merits. These needs are interdependent, and must be considered together. *Baker v. Marion County*, 120 Or App 50, 54, 852 P2d 254, *rev den* 317 Or 485 (1993)

The City currently faces two significant livability problems. First, there are not enough people within convenient walking distance to maintain a viable downtown core, or the sense of

[1] The only exception to this rule is Metro's locational adjustment process, which is not need-based.

community created by a thriving core area. The voting members of the TGM Study Group reaffirmed the notion that the town center should provide for a focal point of civic life in the City as well as for a vibrant business district for residents, workers and visitors. Without sufficient density within a short walk of downtown, downtown North Plains will decline.

Second, there are no opportunities for housing, parks, schools, churches or neighborhood commercial uses near the City's largest employment center, the East Industrial area.[2] This creates a number of livability problems. Without housing near the employment center, it can be nothing more than an automobile destination. This will increase vehicle miles traveled, exacerbate congestion, and will contribute to urban sprawl and declining air quality. Without housing and mixed uses near the industrial area, the East Industrial area cannot be an integrated part of the North Plains community. City believes this is a significant livability problem.

The city's livability problems exist independently of any mandated land supply requirements. These livability *problems* create a Factor 2 livability *need* to establish compact, walkable sustainable neighborhoods near existing commercial and employment centers.

If the City grows to meets its 20-year land supply needs without meeting its livability needs, the livability problems will worsen, and the City may lose its ability to solve them.

As a fast-growing small town, North Plains has a unique ability to become the kind of compact, sustainable, pedestrian-friendly community that the State of Oregon is striving to create statewide. North Plains can achieve these goals over the whole community, where many jurisdictions now struggle to implement these goals at the margins of the Urban Growth Boundary. The City finds that its land need is to become that kind of community while maintaining the required 20-year land supply.

III. THE ELEMENTS OF A SUSTAINABLE NORTH PLAINS COMMUNITY

A. Oregon's Livability Initiative

Oregon law does not define either sustainability or livability. However, Oregon has a substantial executive, legislative and fiscal record of stating and promoting principles of livability. Most notably, Oregon's Governor issued Executive Order 00-23, "Use of State Resources to Encourage the Development of Quality Communities", which directed several state agencies (including the Department of Land Conservation and Development) to follow seven "quality development objectives" in pursuit of livable communities. The definition of livability included "affordable and well-located housing", "an efficient transportation system that provides transportation choices" and "a vision for its (the community's) future to manage growth and development as well as a plan to deliver it." The Oregon Department of Transportation and the Department of Land Conservation and Development promulgated jointly the "Transportation Growth Management"(TGM) program, which energetically promotes principles of "smart development (a surrogate term for livability).

The Oregon legislature adopted in 1999 and again in 2001 "The Oregon Livability Initiative, which espouses four livability principles:

---

[2] The term "East Industrial Area" refers to the industrially zoned city land along West Union Road east of the downtown core and near Jackson School Road.

1. revitalizing downtowns and mainstreets,
2. rebuilding rural and distressed economies,
3. increasing the development of affordable housing and
4. reducing sprawl and congestion.

These livability principles have been expanded in the Governor's Quality Development Objectives, which articulate, albeit in different words the City's livability objectives as determined in the TGM study:

Quality Developments:

- Are located within urban growth boundaries and within or bordering already urbanized areas to minimize the costs of providing public services and to protect resource land outside urban growth boundaries.

- Incorporate or encourage a mix of uses to stimulate economic vitality in existing and emerging downtowns, neighborhood commercial districts and other mixed-use centers.

- Are designed to be safe, pleasant and convenient for pedestrians, bicyclists and riders of public transportation as well as located within walking or bicycling distance and provide direct routes to housing, employment, a wide range of commercial services, parks, schools and public transportation, if available.

- Are compatible with community environmental concerns, including energy efficiency, respect for existing ecosystems and natural resources, and re-use existing sites, buildings and materials whenever possible.

- Promote the importance of public values by providing a balance of jobs and affordable housing, creating community gathering places and employing regional or local historic and cultural heritage.

- Encourage community sense of place through locally appropriate, human scale design.

The City hereby adopts these objectives as an expansion of its vision for the future.

B. The TGM Study

As a first step in determining the nature and amount of the City's land needs and how and where such land supply needs should be satisfied, the City, in coordination with DLCD, ODOT, Metro, Washington County and others undertook an extensive review. This review resulted in a recommendation to the City for a UGB amendment to the North and East of the City, as well as certain policy objectives for the existing City. For simplicity, this study is referred to in these findings as the "TGM Study."

The TGM Study's recommendations were unanimously recommended to the City by the voting participants in the TGM Study process, including the mayor, City Council member, the Planning Commission chair, Planning Commission member, and representatives of DLCD, ODOT, the Friends of North Plains, Metro and Washington County.

The TGM Study's unanimous recommendation was that the City increase density within the existing UGB, and amend the UGB to enable the City grow to the North and East. The bases for such policy changes are in the infill and development policies developed as a part of Work Task No. 4. After receiving additional public comment in hearings conducted by the Planning

Commission and City Council, the City adopted by Ordinance the infill and redevelopment goals and policies as a part of the City's comprehensive plan along with specific text and map amendments in support of the recommended directions of growth provided in the TGM Study. The results of this work are included in Work Task No. 5.

The South freeway exception area was not recommended by the TGM Study or the City Council because the City's identified land needs are for a connected, walkable and non auto oriented environment, supportive of the town center and East Industrial Area. The South exception area requires the city limits to cross a freeway, creating a disconnected, auto oriented environment in an area that would become nearly one-half of the City of North Plains, irrevocably and physically separated from the rest of the City by the freeway.

Moreover, the South exception area is burdened by restrictive covenants supporting an airport, making the City's livability need impossible to meet in the South exception area. Accordingly, the TGM Study and the City Council herein determine that in addition to the physical barrier created by Highway 26, the existing committed uses in the Southern exception area prohibit the use of this area for the City's purposes of providing a compact, multimodal-oriented urban residential environment.

Accordingly, the results of the TGM Study's evaluation of livability are noted here, as follows:

a. Sense of Place

(i) To create a City of North Plains identity that is clearly apparent and related to North Plains' history and small town character. (Also referred to as Quality, Different and Character in the North Plains' visioning exercise.) TGM Study page 8

b. Housing Variety

(i) To provide a planning program and growth direction that provides for a variety of housing types and densities to promote housing diversity and affordable housing choices. (Also referred to as Diversity and Growth in the North Plains' visioning exercise.) TGM Study, page 8.

c. Orderly and Efficient Public Facilities and Services

(i) To determine a planning program and the direction of growth that is compatible with public facilities and services and the ability to extend those facilities and services in an orderly and efficient manner. (Also referred to as Diversity and Growth in the North Plains' visioning exercise.) TGM Study, page 8.

d. Balanced Transportation System

(i) To determine a planning program and a direction for growth that provides for accessibility through a safe, efficient and balanced transportation system. (Also referred to as Accessibility in the North Plains' visioning exercise.) TGM Study, page 9.

(ii) The TGM Study goal under this consideration is also to determine a planning program and a direction of growth that reduces the reliance on Highway 26 for local traffic.

(iii) To determine a planning program and a direction for growth that ensures that allowed land uses are consistent with the identified function, capacity, and level of service of the transportation system.

(iv) The TGM Study goal under this consideration is also to provide a planning program and a direction for growth that provides the best opportunity for a connected street pattern that provides direct and convenient connections to key destinations.

(v) The TGM Study goal under this consideration is also to provide a planning program and a direction for growth that fosters choices for travel by foot, bike, auto and transit. TGM Study, page 9.

e. Town Center

(i) To provide a planning program and a direction for growth that creates a mixed use, accessible, pedestrian-oriented town center that provides a focal point for the community. (Also referred to as Central Town Square in the North Plains' visioning exercise.)

(ii) The TGM Study goal under this consideration is also to provide a planning program and a direction for growth that reinforces the prominence and accessibility of the town center. TGM Study page 9.

f. Compact Growth

(i) To provide a planning program and a direction for growth that promotes the efficient use of land, including appropriate infill, redevelopment and new development at higher density than currently on the ground in the City. TGM Study page 9.

g. Separation from the Metro Area

(i) To create a planning program and a direction for growth that reinforces and provides a geographic separation between North Plains' and Metro's urban growth boundaries/urban reserves. TGM Study page 9.

h. Urban and Rural Land separation

(i) To determine a planning program and a direction for growth that provides a clear separation between urban and rural land uses. TGM Study page 10.

i. Economic Diversity

(i) To determine a planning program and a direction for growth that encourages and accommodates the development of a diverse and viable natural economy.

(ii) The TGM Study goal under this consideration is also to determine a planning program and a direction for growth that accommodates a variety of parcel sizes to serve needed industrial and commercial land uses.

(iii) The TGM Study goal under this consideration is also to determine a planning program and a direction for growth that recognizes existing businesses in the City and supports their viability and plans for growth.

(iv) The TGM Study goal under this consideration is also to determine a planning program and a direction for growth that enhances the development of community-scale businesses and services (e.g. doctors, dentists, schools, coffee shops, bookstores, etc.) so that more of the needs of local residents are met locally. TGM Study page 10.

The TGM Study concludes that measuring these factors, "the preferred growth direction outside the City is to the North and East." TGM Study page 11.

Development to the North and East enables the City to take advantage of existing public facilities and natural resources, a developing industrial areas for jobs that exists in the East, to create a connected walkable community that celebrates, rather than ignores, important natural and human resources and the town center. The City notes that one of the important findings of the TGM Study adopted herein is that:

> "Any new development outside of the city should be planned in complete neighborhoods, either singularly or in conjunction with adjacent areas."

TGM Study page 11.

The program for ensuring complete neighborhoods requires careful planning of any potential UGB amendment areas close to the existing City. These areas to the North and East have supportive natural and man-made amenities to blend into and complete the vision for the town center core. Accordingly, there was consensus among the TGM Study voting members, as well as concerned citizens, that the City of North Plains should plan for and ensure the revitalization of its town center. The City's vision statement already endorses this concept and that was so noted in the TGM Study. The TGM Study Committee also agreed that the town center should provide an opportunity for additional housing that is close to services.

Therefore, in evaluating alternative areas, important factors for consideration included the potential for integration with the existing city street system and the eventual town center, minimal impacts to natural resource areas as well as the opportunity to integrate natural features into the livable City, the proximity to schools and the potential for economic and efficient serviceability with urban infrastructure. Moreover, areas promoting a sense of place by providing residential neighborhoods near existing and future employment centers and in proximity to the eventual town center were included in identifying the City's needs for livability under Goal 14.

The area South of Highway 26 is separated from the rest of the City by Highway 26, as indicated above. Such separation does not contribute to a desirable "sense of place" and fails to reinforce the town center at Main Street and Commercial Avenue as desired. Moreover, the Southern area is isolated from the community in terms of access. In this regard, there are only two connections (Glencoe Road and Gordon Road) and both are freeway overpasses. There is poor access to the City for all modes of travel from the Southern area. Moreover, a new signal would be required at Glencoe Road if the South were chosen as an area of new City growth. The area South of Highway 26 is unsuitable for planning a new neighborhood, *i.e.* one with pedestrian orientation and access to park and other civic features. The exception land South of the highway includes close to 150 acres of land in a patchwork of parcels committed to rural and semi-rural development such as an airport, grass seed mill, peach orchard and rural residential uses. The size, existing CCRs covering the airstrip and Air Acres subdivision and configuration of these uses (particularly the diagonal orientation of the airfield) prevents efficient urbanization of the South area.

Accordingly, the compact community concept, which celebrates the existing town center and the City's continued livability, is of critical importance to the City. To ensure that the compact community concept the City envisions is implemented, the City Council adopted specific goals and policies incorporating the fundamental planning principles enunciated in the TGM Study as a part of the City's comprehensive plan..

IV. STRUCTURE OF THE ANALYSIS.

Findings supporting a UGB amendment must address a long list of criteria, many of which overlap. These findings address all of the relevant criteria. However, in some cases these Findings express conclusions in the alternative, in order to take into account disagreements about the application of certain criteria. It is clear that a UGB amendment must comply with the relevant Goal 14 and Goal 2 administrative rules, and the City has made appropriate findings on each of those criteria below. A UGB amendment must also comply with the relevant statutory criteria (which in some cases overlap or duplicate rule requirements).

A. The Interplay Between Statutory and Rule Requirements for Prioritization.

The interplay between the statute and the rules creates some ambiguity. The language "[i]*n addition to any requirements established by rule addressing urbanization*" in ORS 197.298 is ambiguous because the statute does not set out at what point in the process the rules are applied. Nor does the statute resolve the question as to what happens in a case where the statutory priorities are inconsistent with the goals, not to mention other statutes. However, in this case, the distinctions make little difference, as the South Exception area cannot accommodate the City's identified land need in any manner, under any analysis.

1. Any Analysis Must Start With The Goal 14 Need.

There is one common element to any analysis: The application of any prioritization scheme is irrelevant unless and until the City identifies a need that requires expansion of the UGB. The only place in the statutes or rules where need is defined is in Factors 1 and 2 of Goal 14. Thus, the process must begin with identifying a need under Factors 1 and 2 of Goal 14. *Cf. Malinowski Farm.* The prioritization scheme does not trump or pre-empt Goal 14 in that respect. Only when a need is identified can the City evaluate expansion alternatives.

2. Five Modes of Analysis

Once a local government has identified its need, there are (at least) five different ways to analyze the interplay between 197.298, 197.732 and the administrative rules on urbanization.

a. Threshold Finding.

Under this analysis, a local government need not apply 197.298 to lands that have no chance of accommodating its identified land need, even if they are adjacent to the existing UGB. For example, in *1000 Friends of Oregon v. Metro,* __ Or LUBA __, (2000) ("*Ryland Homes*") LUBA upheld Metro's decision to limit an alternatives analysis to areas that were "close enough to also aid in rectifying the identified jobs/housing imbalance in the Beaverton Regional Center." LUBA said "We see no error in limiting the geographic scope of Metro's alternatives analysis to lands that can satisfy the identified needs."[3]

The City finds herein that the South Exception area cannot meet the city's identified land need under any circumstances, and thus is not an alternative to the North, West or East areas. The City's analysis is a small-scale analog to a sub-regional jobs/housing imbalance – only housing in certain geographic areas can meet the city's need.

b. Reasonable Accommodation Screen.

This is the mode of analysis suggested by the current draft subregional housing need rule, and suggested by the remand order and justice department staff. Under the reasonable accommodation analysis, a local government evaluates potential expansion areas under OAR 660-004-0020 to determine whether they can reasonably accommodate the identified land need. The local government then applies the priority scheme of 197.298 to those areas that could reasonably accommodate that need. This analysis is similar to the threshold analysis above, but might bring other factors into the analysis. In other words, a local government need not apply the 197.298 priorities to an area that would not reasonably accommodate the City's identified need. This analysis is based on a reading of 197.298 and 197.732 that gives effect to both provisions. This reading also gives full effect to the "[i]*n addition to any requirements established by rule addressing urbanization"* clause of 197.298.

The City finds that the South Exception Area cannot reasonably accommodate the City's identified land need under OAR 660-004-0020, or any other criteria.

c. Goal 14 As Filter.

Another reading of the "in addition to" language is that Goal 14 remains the primary factor in determining how UGBs are amended. Under this reading, a local government goes through the entire Goal 14 analysis, including the locational factors, to evaluate potential expansion areas. The local government would then apply the priorities as between those areas that make it through the Goal 14 process.

The City finds that, on balance, the North/East expansion option best meets the locational factors (Factors 3-7) of Goal 14. (This finding is expanded on below.) Thus, in the alternative, the City finds that it need apply the priority scheme of 197.298 only to those areas which are selected under the locational factors.

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[3] *1000 Friends of Oregon v. Metro*, 38 Or LUBA 565,

d. 197.298 Trumps All Other Statutes And Rules.

This reading, urged by proponents of the South Exception area, would require a local government to blindly apply the priorities of 197.298 first, then apply the remainder of Oregon's land use statutes, Statewide Goals and administrative rules to evaluate choices between areas of equal statutory priority *if there were any*. The problems with this analysis are legion.

First, such a reading ignores the fact that the analysis must start with an identified land need. *Malinowski Farm.* Without a need, there is no basis to incorporate land into the boundary in the first place.

Second such a reading is inconsistent with the rest of Chapter 197. Chapter 197 is replete with requirements for protection of wetlands, dunes, groundwater resources 197.279; 197.283, 197.230. These requirement would fall by the wayside under the "trump card" analysis. Such a reading is clearly inconsistent with ORS 197.340, which requires the state, and local governments to "give the goals equal weight in any matter in which the goals are required to be applied."

Second, (and the South Exception Area proponents recognize this effect) such a reading would override any and all land use planning considerations. A local government would be required to expand onto exception land even if it violated several statewide goals in doing so. The protection of dunes, estuaries and sensitive Goal 5 resources would fall by the wayside. There would be no consideration of transportation, air quality or the economy.

Third, such a reading would completely eliminate a local government's role in planning for UGB expansions, and eviscerate public participation. This is inconsistent with ORS 197.230(e), which requires flexibility in the administration of the Goals. The citizens of North Plains have spent years, and participated in dozens of meetings, workshops and ice cream socials to come up with a vision of the City's future. The "trump card" reading would render all this work meaningless.

e. Feedback Loop

Under this analysis, a local government would first apply the statutory priorities, then apply the Goal 14 and Goal 2 Rules to evaluate all higher-priority land. If incorporation of higher-priority land would be inconsistent with the rules, the local government would then analyze alternatives under the next statutory priority. This analysis is functionally equivalent to the "reasonable accommodation" screen in that lands which cannot accommodate the need are not incorporated into the UGB.

V. THE AREAS AND ALTERNATIVES EVALUATED.

There are four areas near the city of North Plains that might reasonably accommodate the city's identified need for housing arranged in livable communities, either individually, or in combination:

1. **To the South:** Immediately south is an area of rural residential and rural commercial uses for which Washington County has adopted a built and committed exception of

Goal 3, Agricultural Land. ("South Exception Area") It contains a certified private airstrip. Highway #26 lies between this area and the North Plains city limits/UGB. The area is bordered on three sides by an extensive area of high-quality agricultural land served by a major farm irrigation district. These agricultural lands, located between Highway # 26 and the cities of Hillsboro, Cornelius and Forest Grove, are instrumental to the long-term viability of agriculture in western Washington County.

The City finds that the South Exception Area cannot meet the City's identified land need on its face. However, in order to make alternative findings, the City will evaluate the South Exception Area as an alternative.

2. **To the West:** Predominately an area of large acreage agricultural land adjacent to the North Plains UGB. Further east lies a small exception area surrounded by agricultural and forest lands. This area lies beyond the current boundary of urbanization that is nearby the metropolitan urban area. It extends approximately five miles westward before reaching the city of Banks.

3. **To the North:** An area of large acreage agricultural land that lies between the North Plains UGB and the Pumpkin Ridge Golf Club. Further north beyond the Golf Club lies the Tualatin Mountain foothills that are composed of smaller acreage agricultural and forest lands. Five and ten-acre agricultural and forest Exceptions are scattered throughout these northern foothills.

4. **To the East:** An area of large acreage agricultural land that lies between the North Plains UGB and Jackson School Road and a major interchange linking Highway #26 to Hillsboro-Beaverton, including a complex of regional high-tech industry. The area is wedged between North Plain's most extensive industrial land base ("East Industrial Area") along its north side and Highway #26. McKay Creek floodplain lies along portions of the western boundary of this area.

VI. FINDINGS REGARDING WHICH AREAS MIGHT ACCOMMODATE THE CITY'S IDENTIED LAND NEED.

At several places in the matrix of rules and statutes governing UGB amendments, the criteria set forth priorities for the incorporation of land into an Urban Growth Boundary. The priorities are slightly different in different places. However, in each case a local government must determine whether its need can be met on higher priority land, before incorporating lower priority land.

The City finds, as explained in more detail below, that its need, for compact, sustainable neighborhoods connected to the downtown core and East Industrial area cannot be met in the existing UGB. The City further finds that its need cannot be met on non-resource or exception land in the South Exception area, and thus cannot be reasonably accommodated South of the freeway. As noted above, the City evaluated the potential to expand in four different directions. For each area, the City evaluated whether the area could accommodate all or part of the City's need,

1. The South Exception Area.

The City does not believe that the South Freeway exception area is "adjacent" to the City in any case because it is separated from the City by a freeway. Nevertheless, assuming that it were adjacent to the City, the City finds that the South exception area cannot reasonably accommodate the City's need, which is to create compact, pedestrian-friendly neighborhoods with multi modal connectivity to the city core and East Industrial Area. The City finds that the existence of the airport, parcelization of the southern exception area and its separation from the City by Highway 26 prohibit the development of a compact livable neighborhood connected to the City's downtown core. The City emphasizes that it finds that the South Exception area cannot meet the need *at all*, and is not finding simply that other areas might be better. The Freeway is an insurmountable obstacle to creating neighborhoods supportive of the downtown core and East Industrial Area. The findings regarding conflicts with the existing uses provided below are incorporated herein.

At this juncture it should be clearly understood that the South freeway exception area was created nearly 25 years ago by Washington County and the state. The City had no opportunity for input into this decision or to coordinate regarding the creation of the South freeway exception area and certainly was given no chance to explain it had no wish for the agricultural activities there to be destroyed. Moreover, the City was not put in a position to voice whether it wished the consequence to be that this area would forever constitute the location where the City had to expand to accommodate its future citizens. Nothing in the exception decision stated that it was accomplished so that the city would be doomed to grow across a freeway. The exception is actually specifically limited to the same uses that justified it in the first place. The County's political decision of the early 1980's should not sentence City residents to live in a disconnected, auto-oriented community.

a. Urbanization of The South Exception Area Is Facially Inconsistent With The City's Livability Need.

Urbanization of the South Exception area cannot satisfy the City's need to create compact, pedestrian-friendly communities near the downtown core and East Industrial area. The South Exception Area is separated from the rest of the City by a Freeway, and cannot meet any type of reasonable connectivity standards for pedestrians, bicycles or streets. The South Exception Area is not "near" either the downtown core, or East Industrial Area.

Urbanization of the South Exception Area will contribute to the decline of North Plains' downtown area. This decline will result in a diminished sense of community, as North Plains' residents are forced to travel out of town to shop or gather. The addition of commercial uses to the South Exception area will exacerbate the problem. The "freeway exit" location of the South Exception will lend itself to Highway Commercial uses. These uses will detract from the viability of downtown.

Urbanization of the South Exception Area will exacerbate the problem of the lack of housing near the East Industrial Area. Workers will be forced to drive to and from work, and drive again to go to shop or use services.

Moreover, development of the South freeway area would be isolated from the rest of the North Plains community. Residents would be required to travel North across the highway to visit friends, send children to school and access social and commercial services and participate in other community activities. If a school was not located South of the freeway, school children residing in the South would be required to be bussed to schools located North of the freeway. Conversely, if a new school was situated to the South, any utilization by children in the rest of City of North Plains to the North would be required to be bussed to any such new South school. School policy will not authorize children to be required to walk across a freeway overpass to a school.

Pedestrian and bicycle travel between the South and North areas would be inconvenient because of out-of-direction travel. Even with roadway improvements, walking and bicycling would be unsafe at times, owing to high truck and automobile traffic volumes on Glencoe Road, at the Highway 26 interchange. Development of the South area would also increase reliance on Highway 26/Glencoe Road interchange for local trips and cause greater delays at the interchange. This problem would be more severe if land near the interchange developed for commercial uses.

The freeway (Highway 26) does not lend itself to solving the City's identified 20-year livability problem -- it would create one. In fact, the south freeway exception area detracts from the City's ability to solve its problems. The freeway physically disconnects the North and South from one another and, importantly, disconnects the South from the town center that exists to the North. The City is planning away from the freeway at this location, rather than to make it the geographic center of the City.

We find that expanding across the freeway would create a 2021 North Plains with a stagnant downtown, transportation problems and a poor sense of community.

b. Existing Uses and Development in the South Exception Area Fail to Reasonably Accommodate the City's needs.

In reviewing whether the southern exception area can reasonably accommodate the City's need, the existing uses and development were evaluated as follows:

RR-5 Area: The airport that exists in the South exception area lies diagonally across 18 lots zoned Rural Residential-5. These homesites, landing strip and associated aviation facilities comprise the Air Acres Subdivision. All of the lots are occupied and all the facilities are actively used. The Air Acres subdivision has existed on this site since before the area was zoned in the early 1970's and has had a licensed airport since 1970. Moreover, as indicated below, the presence of the airport has an impact on the residential designation of any surrounding lands. We find that the landing strip and covenants render the R-5 area incapable of reasonably meeting the City's land need, from a numeric or livability perspective.

Existing Industrial Area – The Rural Industrial area to the South of the commercial area is designated "R-Ind" (Rural Industrial). The purpose of that designation is to provide for industrial uses consistent with the County's natural resource base. That site now accommodates grain storage and other related agricultural/industrial uses. That land is committed to those uses by the level of current development, and has a designation appropriate to the development.. The land on which those uses are found was, and is, occupied by those uses and cannot be used for residential or other uses.

The EFU Lands (the 1.4 ac. Parcel North of Beach Rd. and the Triangular Parcel between the Exception Area, Gordon Road and Highway 26) – These lands must be considered the lowest priority lands in any event under ORS 197.298

The AF-5 Lands – There are two categories of AF-5 lands. The first is that immediately adjacent to the airport and the second is that to the East (including that to the East of Glencoe Road). Each category should be treated separately.

AF-5 Lands Immediately Adjacent to the Airport – Just as those lands committed to non-residential uses (i.e., the commercial and industrial lands above) and those lands committed to undevelopable residential uses (the RR-5 lands within Air Acres) are not practically available for the City's future urban residential needs, the Planning Commission and Council must also consider the practicalities of availability of lands immediately adjacent to the Air Acres airport for urban residential needs when dealing with a possible UGB expansion to the South of Highway 26.

The Planning Commission and Council are aware of the land use conflicts between airports and residential uses. Noise, vibration, overflights and other issues arise between airports and their residential neighbors. Many local governments place a buffer on non-sensitive land uses, such as commercial or industrial designations, on such lands to avoid such conflicts. The City of Portland has constant issues of takings because of the residential designations placed around the Portland International Airport and has been required to place an overlay zone on lands surrounding that airport to require those residential uses to include noise insulation to prevent further nuisance suits against both the City and the Port of Portland, which operates Portland International Airport.

ORS 836.600 to 836.630, deals with Local Government Airport Regulation. The policy of these statutes is "to encourage and support the continued operation and vitality of Oregon's airports." ORS 636.600. The City understands that Air Acres Airport qualifies as an "airport" under these statutes. ORS 836.605(2). The statutes declare continued operation and vitality of airports, including the Air Acres Airport, as a matter of state concern, so that state policy is pre-emptive of local regulation. ORS 836.608(1).

The obligations of a local government having jurisdiction over this area, include the following:

(1) To recognize in its planning documents the location of airports such as that in Air Acres, establish a boundary for the same (which, in this case, includes the airstrip, as it is owned in fee by the landowners in Air Acres) so that those airport uses reasonably expected to be devoted to airport uses may be accommodated. ORS 836.608(2).

(2) To not impose limitations on the customary and usual aviation-related activities ("including but not limited to takeoffs, landings, aircraft hangars, tie-downs, construction and maintenance of airport facilities, fixed-based operator facilities and other activities incidental to the normal operation of an airport) and those aeronautic recreational and sporting activities that may occur on the airport site. ORS 836.608(3).

(3) To allow an existing airport use to grow, generally by the issuance of a building permit without a hearing in many instances, so long as certain statutory standards are met. ORS 836.608(4).

(4) To allow a new airport use at an existing airport if certain statutory standards are met. ORS 836.608(5) and (6).

(5) To administer a specialized set of administrative regulations adopted by the Land Conservation and Development Commission to deal with airport expansions and new uses at airports. ORS 836.608(7), .616, and .619. This means that the City must administer height regulations around the airport, as well as the regulation of uses in that area. Those rules are found in OAR 660, Div. 13.

(6) To amend its comprehensive plan and land use regulations in accordance with those rules at the first periodic review following the adoption of an airport list by the Oregon Department of Transportation. That list has been adopted. ORS 836.610(2).

(7) Adopt certain airport compatibility criteria more strict than that found in the LCDC rules if certain evidence is presented and findings made. ORS 836.623.

The City lacks the resources to undertake this level of regulation. The baseline for airport activities must be measured from the point of all activities, which are allowed under state law, whether those activities are currently taking place on the subject site. The City would be required to plan, adopt plan provisions and regulations, and administer the same with the

knowledge that the Legislature has pre-empted the City in the establishment of certain airport related uses at the subject site

The City finds that the AF-5 land near the airport cannot reasonably accommodate the city's land need.

Other AF-5 Lands – There are other AF-5 lands in the South freeway exception area. Some can be considered for residential use, such as those on the East side of Glencoe Road. While these lands may not have the same development constraints as the land near Air Acres, the cost of providing public facilities to this area by itself would be grossly prohibitive. Thus this land cannot reasonably accommodate the City's land need.

c. Urbanization Of The South Exception Area Would Violate Goal 12 and The Transportation Planning Rule.

The City specifically finds that crossing an overpass over a noisy 6-lane freeway is not the type of pedestrian connectivity specified in the City's identified land need, and finds that such a crossing is not practicable in any event

Urbanization of the South Exception Area would create substantial traffic problems in the vicinity of the Glencoe Road Interchange. These traffic problems would discourage residents from traveling to in-city destinations, and would create unacceptable declines in fire and police response times.

Urbanization of the South Exception area would be inconsistent with Goal 12, and particularly OAR 660-012-045(3)(b), which requires "safe and convenient" pedestrian and bicycle circulation. A pedestrian overpass would not change this conclusion. Safe and convenient pedestrian and bicycle circulation requires a network of connections. For example the City of Portland's TSP requires full streets every 530 feet, or pedestrian connections spaced no farther than 330 feet. There is no feasible way for the city to even come close to meeting this standard if it urbanizes the south exception area. The South Exception Area would be a disconnected and independent "South Plains" sharing a zip code, and little else.

ODOT has repeatedly pointed out that creating physical travel connections between the existing City and the 1,210 people to be accommodated in any UGB expansion area to the South is unrealistic and infeasible, given the imposing physical barrier of the freeway that physically separates the two areas. ODOT is strongly opposed to urbanization of the South Exception Area.

d. Urbanization of the South Exception Area Would Create Unacceptable Impacts On Nearby Uses, In Violation of ORS 197.732(1)(d).

The City finds, based on the record herein, that the South Exception cannot reasonably accommodate the City's need, because it will create unaccepatable impacts on nearby and adjacent uses.

The City finds, based on the Farm Impact Study, the Urbanization of the South Exception area would be incompatible with nearby agricultural activities. The City incorporates by reference its findings Goal 14, Factors 5, 6 and 7, infra.

Development near the South exception area airport would conflict with flight operations because of noise and crash hazards. Due to the orientation of this airstrip, as indicated above, development of the area as a neighborhood would necessitate abandoning the facility, which is shared by over 20 property owners (many who own plane hangars abutting the airfield). The

airport is licensed by the state, and subject to deed restrictions governing its use and maintenance. Abandoning the airport requires a majority vote of the property owners, and a vote may not occur more than once every 10 years. The current property owners within the air-acre subdivision at issue have expressed their desire to maintain use of the airfield.

This constraint has a direct bearing on the ability of this South freeway exception area to reasonably or appropriately accommodate urban development. It has even larger bearing on the ability of the South exception area to accommodate the City's need for developing a livable community. That there are property owners who own and love aircraft who have acquired homes in this area, does not invite the City to establish in and around Air Acres a new City of 1,210 people, who do not own aircraft The existence of the airport and Air Acres subdivision in an exception area does not require all new development to be oriented there. It certainly does not mean the City must force the City's 20-year population not accommodated in the existing City, to be clustered around this airport or that the city must ignore its identified needs or the health, safety and welfare of its anticipated newcomers.

The City finds that urbanization of the South Exception area would be incompatible with the operation of the Air Acres airport.

2. ORS 197.732(1)(c)(D) and OAR 660-04-010(1)(c)(B)(iv)

"*The proposed uses are compatible with other adjacent uses or will be so rendered through measures designed to reduce adverse impacts.*"

This criterion is explained at OAR 660-04-020(2)(d):

"*The exception shall describe how the proposed use will be rendered compatible with adjacent land uses. The exception shall demonstrate that the proposed use is situated in such a manner as to be compatible with surrounding natural resources and resource management or production practices. 'Compatible' is not intended as an absolute term meaning no interference or adverse impacts of any type with adjacent uses.*"

In the context of UGB amendments (it is understood that here we are evaluating the direction of growth feasibility findings), this criterion is functionally the same as the "compatibility with adjacent uses" factor under Goal 14, Factor 7. *But see D.S. Parklane*, 165 Or App at 24. The City acknowledges that LUBA stated in a footnote that exceptions criteria (iv) may in some cases warrant a broader analysis than Goal 14, Factor 7, because exceptions criteria (iv) address the compatibility of the proposed use with <u>all</u> adjacent activities, not just agricultural uses. *Id.* at 565 n 33. Of course, it is also noted that under ORS 197.732(2) the term "compatibility" (as used in subsection (1)(c)(D)) "is not intended as an absolute term meaning no interference or adverse impacts of any type." We note that a broad analysis of compatibility has been performed and it is determined to be feasible for the preferred North/East alternative to comply with this provision.

The compatibility of urbanization with the uses in the area is most jeopardized regarding (1) agricultural uses, (2) existing residential uses, (3) existing CCRs and the airstrip.

We have discussed in other parts of this document the compatibility problems regarding agricultural as well as other urban activities and the airstrip and Air Acres subdivision and the freeway. Those findings are incorporated here. Regarding compatibility between the North and East preferred locations for urbanization compatibility is feasible for the reasons previously discussed. Additional reasons are that the East area in particular helps to blend the City's industrial and commercial area with the rest of the City. Design solutions will help to emphasize

the connections between this area and the rest of the City and the important McKay Creek natural area, which is at the confluence of the North, and East preferred alternative areas and the city core. Instead of the physical center of the city area being the freeway, it is McKay Creek and the city center. The Northern area will be compatible with the existing City because it is located in such a way as to blend easily with the rest of the City, and is well positioned to ensure strong pedestrian and multi modal connections with the rest of the City. As with the East, design solutions will ensure all connections are appropriately made when the city's planning process is completed. However, it is clear that the physical location of the North/East alternative is the most logical alternative to bind and connect all parts of the existing City.

3. West, East and North Areas

The City finds that the West, East and North areas could each potentially accommodate at least a portion of the City's needs. The City will thus evaluate each area under ORS 197.298 and the locational factors of Goal 14 to determine which areas should be rendered urbanizable.

VII. ORS 197.298 PRIORITIZATION SCHEME

ORS 197.298 provides, in part:

> *"(1) In addition to any requirements established by rule addressing urbanization, land may not be included within an urban growth boundary except under the following priorities:*
>
> > *"(a) First priority is land that is designated urban reserve land under ORS 195.145, rule or metropolitan service district action plan.*
> >
> > *"(b) If land under paragraph (a) of this subsection is inadequate to accommodate the amount of land needed, second priority is land adjacent to an urban growth boundary that is identified in an acknowledged comprehensive plan as an exception area or nonresource land. Second priority may include resource land that is completely surrounded by exception areas unless such resource land is high-value farmland as described in ORS 215.710.*
> >
> > *"(c) If land under paragraphs (a) and (b) of this subsection is inadequate to accommodate the amount of land needed, third priority is land designated as marginal land pursuant to ORS 197.247 (1991 Edition).*
> >
> > *"(d) If land under paragraphs (a) to (c) of this subsection is inadequate to accommodate the amount of land needed, fourth priority is land designated in an acknowledged comprehensive plan for agriculture or forestry, or both.*
>
> *"(2) Higher priority shall be given to land of lower capability as measured by the capability classification system or by cubic foot site class, whichever is appropriate for the current use.*

> *"(3) Land of lower priority under subsection (1) of this section may be included in an urban growth boundary if land of higher priority is found to be inadequate to accommodate the amount of land estimated in subsection (1) of this section for one or more of the following:*
>
> *"(a) Specific types of identified land needs cannot be reasonably accommodated on higher priority lands;*
>
> *"(b) Future urban services could not reasonably be provided to the higher priority due to topographical or other physical constraints; or*
>
> *"(c) Maximum efficiency of land uses within a proposed urban growth boundary requires inclusion of lower priority lands in order to include or to provide services to higher priority lands."*

a. There Are No First Priority Urban Reserves.

The City finds that there are no urban reserves near North Plains. The City further finds that the only land of potentially higher priority than the lands included in the North/East option is the South Exception Area. The small exception area to the North will be included in the North/East Applying Goal 2.

b. The South Exception Area Cannot Accommodate The City's Needs.

As noted above, the City does not believe the South Freeway Exception area is adjacent to the City because it is separated from the City by a freeway. Nevertheless, even assuming adjacency, the City finds that because the South Exception Area cannot accommodate the City's Identified Land Need, as noted above, the City need not include the South Exception Area in its prioritization under 197.298.

In making this finding, the City is not ignoring the statute, is it applying the statute according to its terms. The language of the statute itself states that the priorities apply *in addition to any requirements established by rule addressing urbanization."* The rules addressing urbanization are Goal 14 (the Goals are rules), Goal 2 and the Goal 2 exception rules, ORA 660-004-0000 *et. seq.* Presumably, 197.298 also applies in addition to other land use statutes as well.

c. The South Exception Area Cannot Be Incorporated Into The UGB Under Goal 14 Factors 3-7.

As noted below in these Findings, the City has done an exhaustive analysis of the applicability of the locational factors to all potential expansion areas and concluded that, on balance, the North/East option is preferable. Those findings are incorporated herein by reference. The City finds that the priority scheme need only be applied to those areas which make it through the Goal 14 analysis, and that the city need not incorporate the South Exception area before other potential expansion areas.

d. The South Exception Area Is Not Second Priority Land Because It Is Not Adjacent To The UGB.

The City finds that the South Exception area is separated from the existing UGB by Highway 26, a 6-lane freeway. The City thus finds that the South Exception area is not "adjacent" to the City within the meaning of ORS 197.298, and is thus not higher priority land than the preferred North/East option.

As discussed above, ORS 197.298 (1997) sets forth the priorities for land to be included within the UGB. ORS 197.298(b) gives second priority to exception land that is "adjacent" to the UGB. The term adjacent is not defined in ORS 197.298, and there are no cases that interpret "adjacent" as used in ORS 197.298.

The context in which "adjacent" and "adjacent and nearby" are used in land use rules and statutes shows that the meaning of "adjacent" here should mean adjoining, contiguous, or abutting. Specifically, the term "adjacent" is not only used in ORS 197.298, but in other land use statutes and administrative rules as well. The point of the priority analysis is to look at land next to a City to accommodate 20 years worth of urbanization and if reasonable to do so, use land already lost to resource uses ahead of land still capable of active resource use. The analysis related to urbanization was never intended to force a city to engage in leapfrog development or create disconnected communities separated by impenetrable barriers like including freeways.

LCDC recently underscored that adjacent meant adjacent, by amending the text of the urban reserve rule regarding its alternatives analysis to reflect this common sense definition. The administrative rules regarding Urban Reserves clarify that "adjacent" lands for purposes of urban long term land supply, are limited to those that are "abutting." OAR 660-021-0010(6) (March 22, 2000). The rule now defines the term "nearby" as land that "lies wholly or partially within a quarter of a mile of an urban growth boundary." OAR 660-021-0010(7) (March 22, 2000).

Similarly, Statewide Planning Goal 3 states that agricultural lands include "lands in other classes which are necessary to permit farm practices to be undertaken on *adjacent or nearby lands*." Likewise, Goal 4 states that forestlands include "*adjacent or nearby* lands which are necessary to permit forest operations or practices." In *DLCD v. Coos County*, 32 Or LUBA 403 (1997), shows that the context of land use statutes drives a conclusion that "adjacent" as used in ORS 197.298, means adjoining, contiguous, or abutting. The issue in *DLCD v. Coos County* was whether the county had correctly interpreted the phrase "adjacent or nearby," as it appears in Goal 4. The county had defined "nearby" to mean contiguous. The board agreed with the petitioner that to define "nearby" as contiguous was contrary to the plain language of the goal, and eliminated a requirement of the goal. The board stated: "the county has effectively eliminated the requirement that it consider not only *adjacent or contiguous* parcels, but also nearby parcels."

Similarly, OAR 660-004-0020(4)(a), the rule for expansion of unincorporated communities, speaks to the first priority being "lands *in proximity* to an unincorporated community boundary. It seems clear that when LCDC wishes to describe abutting land versus land further from land that abuts, it well knows how to say so. This interpretation of "adjacent" makes common sense in the planning context. In an era when planning goals are intended to create livable, compact communities, to define "adjacent" to mean "nearby" is an invitation to gerrymandered, disjointed urban growth boundaries, and resultant disconnected growth patterns.

e. Consistent with ORS 197.298(2), The Lowest Capability Soils Are Incorporated In The Proposed UGB.

Pursuant to ORS 197.298(2), the City finds that the East area can accommodate a portion of the City's land need. The City further finds that the East area includes soils of a lower capability class than either the West or North directions. The City has thus incorporated the lower-capability soils into its UGB. However, the lower-capability soils, by themselves, are not sufficient to meet the city's 20-year population need.

f. The North, West, and Portions Of The East Areas Are Of Equal Priority Under 197.298.

Having determined that the City's need might be reasonably accommodated to the North, East and West, the City will apply the locational factors of Goal 14 to determine which areas should be incorporated into the UGB. Of those areas which might reasonably accommodate the City finds that, on balance, and including all alternatives, the North/East alternative best meets the locational factors of Goal 14. Detailed analysis and findings on the locational factors are found below.

The City of North Plains has a livability problem – how to have a 20-year land supply without splitting the town by a freeway. Thus, we find that to the extent the priorities apply to the South exception area, given that the south freeway exception area is not adjacent to the existing City UGB, there is no land of higher priority to accommodate the identified City 2021 need.

VIII. ORS 197.732(1)(C), GOAL 2, AND OAR 660, DIVISION 4.

A. Introduction to the Goal 2 Exception Process and Criteria.

Goal 14 requires that in adopting a UGB amendment, a local government must apply the procedures and requirements of Goal 2 and the LCDC "exceptions process" as provided under the administrative rules. *See* Statewide Planning Goal 14.

4. ORS 197.732(1)(c) and OAR 660-04-010(1)(c)(B); ORS 197.732(1)(c)(A) and OAR 660-04-010(1)(c)(B)(i)

OAR 660-04-010(1)(c)(B)(i), the so-called "reasons" criterion, states, in relevant part:

> "*Reasons justify why the state policy embodies in the applicable goals should not apply*;"

This criterion is explained in OAR 660-04-020(2)(a), which states:

> "*the exception shall set forth the facts and assumptions used as a basis for determining that a state policy embodied in a goal should not apply to specific properties or situations including the amount of land for the use being planned and why the use requires a location on resource land.*"

In the context of a UGB amendment, the rule provides that "this factor can be satisfied by compliance with the seven factors of Goal 14." OAR 660-004-0010(1)(c)(B)(i).

Under this standard, a sufficient "reason" for an exception exists if the local government establishes a need for a UGB expansion and a location that balances in favor of inclusion under the Goal 14 locational factors. As noted herein, these findings establish that on balance, the locational factors of Goal 14 tip in favor of the East and North combined alternative.

5. ORS 197.732(1)(c)(C) and OAR 660-04-010(1)(c)(B)(iii)

> "*The long-term environmental, economic, social and energy consequences resulting from the use at the proposed site with measures designed to reduce adverse impacts are not significantly*

more adverse than would typically result from the same proposal being located in areas requiring a goal exception other than the proposed site."

This criterion is explained in OAR 660-004-0020(2)(c):

"*The long-term environmental, economic, social and energy consequences resulting from the use at the proposed site with measures designed to reduce adverse impacts are not significantly more adverse than would typically result from the same proposal being located in areas requiring a Goal exception. The exception shall describe the characteristics of each alternative areas considered by the jurisdiction for which an exception might be taken, the typical advantages and disadvantages of using the area for a use not allowed by the Goal, and the typical positive and negative consequences resulting from the use at the proposed site with measures designed to reduce adverse impacts. A detailed evaluation of specific alternative sites is not required unless such sites are specifically described with facts to support the assertion that the sites have significantly fewer adverse impacts during the local exceptions proceeding. The exception shall include the reasons why the consequences of the use at the chosen site are not significantly more adverse than would typically result from the same proposal being located in areas requiring a goal exception other than the proposed site. Such reasons shall include but area not limited to, the facts used to determine which resource land is least productive; the ability to sustain resource uses near the proposed use; and the long-term economic impact on the general area caused by irreversible removal of the land from the resource base. Other possible impacts include the effects of the proposed use on the water table, on the costs of improving roads and on the costs to special service districts.*"

We incorporate by reference the findings under Goal 14, Factor 5, below. That analysis concludes, and we so find here, that the ESEE consequences of the proposed North/East expansion area are the most positive of any option studied, and certainly no more adverse than any other option. The "ESEE consequences" criterion here is similar to Goal 14, Factor 5, in that it requires a *comparative* evaluation of the environmental, economic, social and energy consequences associated with a given land use alternative, as opposed to other suitable areas that also require an exception. .

B. Findings Under OAR 660-0002-0010, 020 and 022.

1.

In making Findings of feasibility regarding direction of growth, local government should demonstrate that no property within the existing UGB could reasonably accommodate the need. *BenjFran Dev'l v. Metro*, 15 Or LUBA 319, 322 (1987) (citing *Still v. Board of Commissioners, Marion County*, 42 Or App 115, 600 P2d 433 (1979). If the City finds that the needs cannot be reasonably accommodated within the UGB, the City must also consider alternative areas on nonresource land that would not require a new exception.

Based on the materials, work product and findings in Task 3, the City finds that the land within the existing UGB cannot reasonably accommodate the city's need. The City has taken into account all practicable infill opportunities consistent with the City's comprehensive plan,

and has determined that it still needs to expand the UGB by 149 acres to meet its 20-year population projections.

IX. GOAL 14 – Factors 3-7

A. Goal 14 - Introduction

Under Goal 14, a determination regarding direction of growth requires first determining the City's need for urban land under Factors 1 and 2. Here the city identifies this need as providing a 20-year land supply in a pedestrian scale, well connected community, supportive of the existing downtown and East Industrial Area. It has identified a livability problem over the 20 year planning horizon – the lack of housing and mixed uses near the city's downtown core and East Industrial Area. The problem is exacerbated by the existence of the freeway that threatens to bisect the community if growth is not appropriately managed by the city.

Separation of the community by the freeway, as ODOT points out, makes reasonable connectivity between "North Plains" and "South Plains" impossible. North Plains is not Boston, and can't sink the Freeway in a "Big Dig." Nor is North Plains Portland, which is considering roofing over I-405 to resolve connectivity problems created by that Freeway (which has street crossings every block).[4] The city hopes to be allowed to manage its own destiny to enable it to plan to avoid making the freeway the City's centerpiece. The City's new downtown revitalization policies will be impossible to implement if the downtown were not allowed to play the focus role the City envisions. Accordingly, the freeway poses a serious livability problem that the City wishes to overcome over the 20 year planning horizon.

After being clear about its needs for land, the City can then begin the process of balancing the Goal 14 locational factors to determine the most appropriate locations to serve that need. The City views its task under the Goal 14 factors to require consideration of all relevant factors, without necessarily giving more weight to one factor over the others. When two factors compel opposite conclusions, one factor must, to some extent, give way to another based on local discretion. We note that the balancing process *can lead to more than one correct result.*

Therefore, the next inquiry is to determine what land, on balance, can feasibly meet the City's needs. The city must evaluate the exceptions process and the priorities to establish that the direction of growth it ultimately chooses, can feasibly meet all the required standards under its periodic review work task program.[5]

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[4] The city has noted that a pedestrian bridge crossing over the freeway to connect South and North Plains is not feasible and is not the kind of close compact connection that unites communities. It would be a bridge to essentially nowhere. What the city is looking for is the possibility of adding land to foster and facilitate numerous connections between critical features of the community and among and between neighborhoods and that unites the existing City configuration, enabling it to grow into itself in a compact, efficient way.

[5] Even assuming the UGB expansion process begins first with the priority scheme before considering Goal 14 the results of the City's findings remain unchanged. To require an expansion into the southern exception area based on the priority scheme without considering the locational factors (i.e. once a need is identified it must be provided on exceptions land if available) would be to ignore the requirements provided by Goal 14. Nor is it possible to objectively review the proposed direction of growth under the locational factors without engaging in an alternatives analysis. Even assuming that the priority scheme prevents comparison of alternative areas that are not of the same priority, without established objective thresholds there is no basis for determining whether the locational factors are satisfied. Even assuming the southern exception area must be evaluated first, that alternative areas of a lower priority may not be included in determining an alternative location, and that the locational factors are satisfied, the

B. Factor 3: Orderly and Economical Provision for Public Facilities and Services

Factor 3 of Goal 14 requires the "[O]rderly and economic provision for public facilities and services." An adequate factual base for findings for Factor 3 generally requires (1) showing that facilities and services can feasibly be provided; and (2) that extension of those services to the proposed property will not impair the existing system. *Hummel v. LCDC, supra* 152 Or App 404, 414.

In *D.S. Parklane,* LUBA summarized how Metro addressed Goal 14, Factor 3. Specifically, Metro created four subfactors to assist in the inquiry:

> "(1) Utility feasibility study examines the relative cost of urban water, sewer and stormwater facilities;
> (2) Road network analysis looks at the current network of local and regional roads and compares it to future needs;
> (3) Traffic congestion analysis considers likely improvements to the road system and then rates the resulting road system and its congestion for each site;
> (4) School analysis determines the distance to existing public schools and vacant school lands."

Id. at 573.

LUBA agreed that cost evaluation and need for transportation improvements are relevant inquiries in determining whether facilities and services can be reasonably provided over the planning horizon. *Id.* at 573-75.

Case law also makes clear that it is unnecessary to quantify the costs of providing public facilities and services to alternatives sites under Factor 3, especially when the alternative sites cannot "reasonably accommodate" the proposed use for other reasons. However, the local government may, in fact, make relative comparisons between various sites. *1000 Friends of Oregon v. Metro*, __ Or LUBA __ (LUBA No. 2000-002, September 6, 2000) slip op at 16-17. The City does so here, and finds that the South Exception area is the most expensive area to provide with Urban Services.

Detailed public facilities plans have been or will be adopted under a separate work task in periodic review. As noted, the City's goal here involves the selection of general directional locations for which the orderly and efficient provision of public facilities and services is both feasible and best assured.

1. Types and Intensities of Uses

The types of uses to be served by an eventual UGB amendment to serve the City's identified needs, will be those uses necessary to serve an urban population of more than 2000 additional people over a 20-year planning horizon. This includes providing 538 residential dwelling units in a combination of single-family homes, duplexes and multi-family structures. The City, as a part of Work Task 6, is committed to accommodating approximately 100 of those residential units within existing exception areas to the East and any remaining residential units within the existing UGB by encouraging additional infill and redevelopment. In the case of the North/East expansion option, each of the two non-exception areas would accommodate

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expansion area is still required to comply with the Goal 2 exceptions process. As provided under Section VI(A)(2) the City finds that the southern exception area does not reasonably accommodate the City's needs. As such the remaining findings and analysis of other alternative areas is a valid and necessary inquiry in determining the overall direction of growth.

approximately half of the total development for the remaining 484 residential units. In addition, any proposed UGB expansion would provide the following net acres: (1) approximately 6.25 acres of land for commercial uses, (2) parks and green-space totaling 29.5 acres, (3) a ten-acre school site serving 500-600 elementary school students, and (4) ten acres for institutional uses such as road maintenance facilities, places of worship, private schools, and fraternal organizations.

System improvements common to all general direction expansion options include sanitary sewerage pump station facility, sanitary sewer force main, water supply, water storage, and Glencoe Road/Highway 26 interchange facilities.

The sizing of water lines in a city the size of North Plains and with the existing zoning and densities is based on a fire flow established by the National Fire Protection Association (NFPA) and state recommendations. The David Evans & Associates "City of North Plains Water System Master Plan, September 25, 1999" (the "WSMP") established a "backbone" of 12-inch pipe completing large loops with smaller pipe completing smaller loops within the larger loops. The fire flow requirements dictated and established the pipe size, as the flow is much larger than for domestic use. In the commercial area there are additional 12-inch mains to accommodate high quantities of water need for these areas where structures may be side by side and cover the entire block.

The existing plans and analyses of the City's public facilities and services serve to identify (1) those system improvements within the different geographic areas that the City requires to serve those within its existing boundary, and (2) improvements required for any expansion of the UGB.

2. Sanitary Sewer Systems

a. Baseline for Comparison

When considering providing sewer and water facilities to an expansion area to accommodate the 2021 population, the City must establish the relative cost and feasibility of providing public facilities and services to serve each of the four cardinal directions and the combined North/East expansion area.

To establish a baseline for comparison of costs, it was necessary to equalize the various areas for comparison. This included segregating the costs of fixing existing deficiencies within existing City limits so that the Goal 14 factor 3 inquiry is focused on analyzing costs related to each expansion area, and not focused on analyzing existing system deficiencies.

The WRG/Welborn memorandum, "*Infrastructure Analysis - South,*" ("WRG memo") challenges the use of these "criteria," arguing that AEI's two engineering questions necessarily result in a situation in which "all areas simply fail." WRG memo at 1. However, this statement reveals a fundamental misunderstanding of the reason for a particular starting point. With the exception of the proposed East expansion area and the Eastern half of the North expansion area, AEI generally agreed with the WRG memo's observation that "[t]here is not existing infrastructure in place to serve the proposed areas" (WRG memo at 1), and WRG's related observation that "if there are facilities near these areas they are not currently adequately sized" (WRG memo at 1). However, one of AEI's analyses chooses the existing infrastructure as the basis for further analysis in order to segregate—and thereby eliminate—costs unrelated to expansion of the UGB.

Stated differently, the question whether existing infrastructure can support expansion proves to be a misleading question; instead, the core "question" actually requires a dual analysis for purposes of Goal 14, Factor 3: First, will it be feasible for the City to achieve a build-out

infrastructure that will meet current needs? Second, will it be feasible to thereafter extend services to proposed expansion areas without adversely impacting the existing City services?

Thus, the objective of the AEI report was to identify costs associated exclusively with an expansion area, as distinguished from costs associated with solving existing infrastructure deficiencies. That is not to say that existing deficiencies will not be solved. Rather, they are a cost that is equally a cost to all areas because the existing City must be served. Accordingly, it is redundant, for purposes of this comparison, to build in those costs to improve the existing City infrastructure, including its capacity as well as its delivery systems. Under this approach, costs incurred by the City to improve the infrastructure within the existing City limits was appropriately excluded; those costs will be born by all citizens—new and existing alike regardless of where, when or how, or even if a UGB amendment occurs. AEI eliminated costs directly associated with improvements required within the existing City limits in order to apply a consistent cost analysis and begin with a "level playing field" for all areas.

Thus, whether existing City infrastructure must be improved—which is WRG's focus—does not address the ultimate inquiry under Goal 14, Factor 3. These findings assume that existing infrastructure deficiencies must be resolved and this is a cost coequally required for the City to thrive regardless of the UGB expansion area. The expansion makes it most feasible to solve these identified deficiencies because of the larger tax base over which costs can be distributed; but that is not a factor of the direction of growth.

b. Cost Estimates (Infill Costs)

The more recent of the estimated project costs discussed below include the estimated costs to upsize proposed City facilities and extend them to a proposed expansion area in order to specifically serve that area. The cost estimates do not include those costs necessary to either extend or upsize lines to accommodate infill growth within the existing UGB. For instance, the upsizing of the existing North Plains sewage pump station, located at the intersection of Highland Court and 307th, is required for anticipated growth inside the existing City and, thus, has the same cost regardless of which of the five alternative directional areas are chosen. Further, the McKay Creek Trunk sewer, located as shown in Figure A to the study entitled "Evaluation of North Plains UGB Expansion, Sewer Water and Storm Drain Improvements," to West Union Road and West Trunk sewer to Main Street, located as shown in Figure A to the study entitled "Evaluation of North Plains UGB Expansion, Sewer Water and Storm Drain Improvements," will have to be replaced to handle anticipated infill within the current UGB. Thus, some sewer infrastructure improvements needed for infill growth within the existing City, that also benefits the UGB expansion are not included in the cost comparison.

When AEI reviewed the cost figures provided in previous reports (such as the April, 1997, David Evans and Associates study), it found those estimates didn't reflect present day costs. Two reasons seem to account for the differences.

First, historical cost projections should be inflated to year 2000 costs in order to ensure a proper comparison. A typical inflation factor should be 3.5% to 5% per year. Second, previous reports (such as the April, 1997, David Evans and Associates study) do not appear to have included costs such as engineering, administration, and contingencies, which can typically increase construction costs by 40%.

By comparison, the 1999 David Evans and Associates "*Water System Master Plan*" ("WSMP") included engineering, administration, and contingencies of 40%, which is the same factor AEI used. The AEI cost estimate also assumed public bidding of all improvements.

c. Existing sanitary sewer facilities/services

Constructed in 1983, the City's sanitary sewer system is owned and operated by the Unified Sewerage Agency ("USA"). The entire sanitary sewerage system is under the jurisdiction of USA.[6] The service area is primarily served by gravity sewers that drain to a 1.547 cubic-feet-per-second (cfs) pump station at the intersection of Highland Court and 307th just North of the Sunset Highway in the South/East corner of the City. From the pump station, sewage is transported via an existing 10-inch force main to the East, then under Highway 26 to the North edge of the City of Hillsboro where it is transported via USA's gravity collection system and ultimately discharged to the Hillsboro Wastewater Treatment Plant.

The expected peak flow for the North Plains service area at anticipated build-out for the existing City will be 0.92 cfs. The most recent estimate (1995) estimate of peak flow is estimated to be 0.55 cfs. Existing gravity sewer mains and laterals inside the service area are adequately sized to accommodate existing flows, with some remaining capacity. However, the McKay Creek and West trunk sewers have some capacity deficiencies. Regulations for funding of the original system did not allow future capacity beyond the initial service area to be added to the system, the utilization of standard sizes for the mains and lateral sewer pipes and pumps resulted in some capacity beyond the original service area requirements. However, any significant growth will require an expansion of the affected trunk sewer system components. Specifically, development to serve the City's needs to serve a population of 4,000 may require upsizing some of the relatively small diameter existing lines depending on the phasing of expansion to the North. A pump station force main can typically accommodate velocities up to 10 ft/sec and still provide energy efficient operation. Under this assumption, the existing 10-inch force main under the Sunset Highway may be able to accommodate flows up to 2,360 gallons per minute. However, to achieve this maximum limit new pumps and mechanical modifications to the pump station will be required.[7]

d. Feasibility of Expanding Sanitary Sewer Facilities/ Services—Infill (Existing Deficiencies)

Future capacity bottlenecks in the North Plains system include the existing pump station at the intersection of Highland Court and 307th (1.55 cfs), the existing 10-inch force main from the pump station under the Sunset Highway (5.26 cfs estimated), and various interceptors within the existing gravity collection system. More specifically, the North Plains pump station, West Trunk to Main Street, and portions of the McKay Creek Trunk are undersized for build-out within the existing City limits. The upsizing of the North Plains pump station will be required for anticipated infill within the existing City. Representatives from USA have stated that this improvement will be funded and constructed at the time it is needed. The McKay Creek Trunk sewer to West Union Road, and the West Trunk sewer to Main Street will have to be replaced to handle build-out in the absence of any expansion beyond the existing UGB. The West Trunk Upgrade project is now committed for construction by CWS.[8]

USA has confirmed that there remains some capacity in the pump station and force main, and that the Hillsboro wastewater treatment facility can accommodate additional sewerage. However, USA sees growth in North Plains and the neighboring communities as justifying development of a master plan titled "*Banks - North Plains Sanitary Sewer System Service Area Study*" in the near future. Discussions with USA representatives indicate that expansion of the existing capacities to accommodate future growth may include the following options: increasing the capacity of the existing pump station; increasing the capacity of the 10-inch force main at its current location; replacing the existing facility with a new pump station on the East side of

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[6] David Evans and Associates, Inc., "*City of North Plains Infrastructure Report*" (hereinafter "Infrastructure Report") (March 3, 1997), at 1; David Evans and Associates, Inc., "*City of North Plains Growth Alternatives*" (hereinafter "Growth Alternatives") (April 21, 1997), at 3.

[7] Infrastructure Report (March 3, 1997), at 2.

[8] Alpha Engineering, "*North Plains UGB Expansion - Sewer, Water, and Storm Drainage Improvements*" (hereinafter "UGB Expansion") (October 4, 2000), at 2 and 6.

McKay Creek; adding a second pump station on the East side of McKay Creek; or improvements to various USA gravity system interceptors. It is likely that USA will maintain the existing configuration of facilities and that future capacity will be achieved by upsizing affected system components.[9]

The area generally West of NW 321st Avenue (including a northerly and southerly extension of NW 321st) do not have sewers, thus sewer service must be provided to serve that area in the course of infill within the City. When those sewer facilities are installed and upgraded they will also provide a route to serve potential expansion areas beyond the existing UGB. The present capacities of the North Plains pump station and West and/or North Plains trunk sewers will have to be increased by one diameter to accommodate additional flow from any potential expansion area. The North Plains pump station is also a USA station. The cost to increase the capacity of the North Plains sewage pump station is common to all proposed expansion areas and the cost for that infrastructure improvement will be the responsibility of the USA.[10]

CSW has designed the West trunk and extending it to Gordon road on the West. This will provide access to existing sewers for the West expansion and short extensions to serve the un-sewered portion of the Northwest portion of the City. The projects are considered committed and extension under Highway 26 will serve the un-sewered south.

e. Feasibility of Sanitary Sewer Expansion in North Area

The North expansion area can be serviced by adjacent existing sanitary sewer lines in North Ave and NW 309th. Presently, the Central and Eastern portions of the North expansion area, East of N.W. Timeric, abut existing City sewage facilities. Sewage can feasibly flow to the West Trunk sewer, via Main Street, from the South central area or to the McKay Creek Trunk service area. The Eastern portion can feasibly flow to the McKay Creek Trunk service area. The Northerly part of the central area can feasibly be served either from the McKay Creek Trunk service area or West area sewer trunk extension. The West portion, West of N.W. Timeric, will be served from an extension of the West Trunk sewer from Main Street to the vicinity of Gordon Road and North Road. The West Trunk extension to Gordon Road will be required, regardless of expansion, in order to provide for main extensions in Gordon Road and North Avenue to serve the Northwest area of the City. Upsizing of the existing West Trunk from the CWS-sponsored North Plains pump station to Commercial Street and McKay Creek Trunk sewer to West Union Road will be required to accommodate infill growth within the existing City limits regardless of UGB expansion.[11]

Some additional development in this area could be accommodated within the existing 10-inch West Trunk sanitary sewer, which extends West from the pump station, then North in Main Street to North Avenue. However, ultimately the existing gravity sewer from the pump station upstream to the intersection of Main Street and North Avenue will need to be upsized. In all likelihood to accommodate the existing grade, this sewer will be 18 inches in diameter or larger.

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[9] Infrastructure Report (March 3, 1997), at 2; Growth Alternatives (April 21, 1997), at 3.
[10] UGB Expansion (October 4, 2000), at 2 and 6.
[11] UGB Expansion (October 4, 2000), at 3.

Recent analysis places the estimated costs for sanitary sewer improvements associated with development in the North area at $204,400.[12] An older analysis which projected a cost of $497,250[13] omitted some essential cost elements necessary for expansion into the proposed North area (e.g., the completion of the West Trunk extension from Main Street to Gordon Road, as well as the replacement of a portion of the existing sewers from Cottage to Main street to allow grade for extension to Gordon road).

f. Feasibility of Sanitary Sewer Expansion in South Area

The South expansion area lacks any adjacent, in-place, public facilities to collect sewage and transmit it to the City/USA system. The area would, therefore, have to be sewered with a stand-alone system; sewage may[14] have to be pumped to the existing City system North of Highway 26, requiring a bore[15] under Highway 26 for the pressure pipe. The existing West Trunk sewer and North Plains pump station would have to be upsized in order to accommodate any expansion in the South area. However, the existing West Trunk to Main Street and the North Plains pump station are scheduled for upsizing regardless of UGB expansion.

The South expansion area presents unique problems since it is not adjacent to the existing UGB. Thus, the first task was to identify costs to extend City services to the edge of the South freeway exception area. The second task was to establish costs to get infrastructure adjacent to or within a reasonable distance of the many tracts of land within public rights of way in the South freeway exception area.

Accordingly, a gravity main under Highway 26 was assumed to be situated at the low elevation area in the South expansion area to serve all of that area. A line, running from the existing City to the South, was assumed in order to extend sewer service to a reasonable distance within the urbanizable area.

As a possible alternative, AEI discussed the issue of connecting a smaller pump station into the 10-inch pressure main South of Hwy 26 twice with Terry Chamberlin, USA, prior to the Wednesday October 11th Planning Commission meeting. Mr. Chamberlin stated that USA

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[12] UGB Expansion (October 4, 2000), Appendix at 2-3, as revised on October 10, 2000, as revised on October 10, 2000, and revised on September 7, 2001.:

Cost Estimate	North Area	South Area	East Area	West Area	North East Area
Sanitary Sewer	$204400.00*	$378,000.00	$457,100.00	$0	$126,000.00

*$112,000 for the East portion of the North area; $92,400 for the West portion of the North area. (*Id.* at 3.)

The cost to provide services for the North expansion includes (1) upsizing the proposed West Trunk sewer to Main Street, (2) replacing the West Trunk from Main Street to Commercial Street, and (3) upsizing the McKay Creek Trunk sewer replacement to West Union Road. Extending the West Trunk sewer from Main Street to Gordon Road, replacing the West Trunk and McKay Creek Trunk sewers, and replacing the North Plains pump station will be required for infill growth within the existing UGB, thus those costs have not been included. UGB Expansion (October 4, 2000), at 3.

[13] Growth Alternatives (April 21, 1997), at 6-7. [The cited 1997 study by David Evans and Associates, cited throughout this document, fails to make it clear whether its cost estimates included solely construction costs, or whether it added contingency costs to construction costs.]

[14] A detailed field survey would be needed in order to determine whether the South area could be served with gravity sewer.

[15] Regardless whether the South area might be served via pump or gravity, a bore under Highway 26 would be required in any event in order to serve that area.

would not allow two pump stations to connect to a single line. He questioned whether the South could be served off of the new West trunk main that USA has under design. During a subsequent conservation with Mr. Chamberlin on Friday, October 13, 2000, he further stated USA's opposition to connecting to the existing pressure main. He also stated USA's opposition to having a second major pump station on the South side of the Sunset Highway (Hwy 26).

Thus, provision of sanitary sewer services to the South area would require additional costs that would not be required to serve development North of the highway. Investment in public sanitary sewer systems for the South area would, therefore, have limited benefit to the existing UGB, since such systems in the South provide no improved capacity to service properties within the existing City. Additionally, the implementation of sewer service infrastructure under Highway 26 to connect the South area with the existing facilities could not be achieved in an economically feasible manner. Based upon available data, an expansion to the South might require a pump station to be installed to service that area or a gravity system bore under Highway 26.

The cost of providing sewer service to the South expansion area is more complex than the other three proposed expansion areas. Any expansion to the South area requires costly crossing(s) of Highway 26 for sewer facilities; Highway 26 not only presents a barrier to sewer service, but it also limits the location of the sewer and water line extensions to the service area. There are no accessible public right-of-ways available along the North side of a South expansion area for the sewer lines and pump station. The cost of serving the South expansion area would be split into two segments; the first segment would require an upgraded facility within the City limits (otherwise not needed if the South expansion option is rejected) and an extension across Highway 26 in order to provide access to City services, while the second segment would provide a looped water system in Gordon and Beach roads and 113th and, at a minimum, a sewer line in 313th to Beach Road to provide for expansion of service into the area. These improvements provide City services adjacent to the South expansion similar to City services adjacent to the other three proposed expansion areas.[16] (*See* discussion in Section II(B)(2)(a)).

Using the two existing overpasses crossing Highway 26 (e.g., Glencoe Road and Gordon Road) to carry sewer lines is not considered a viable option for several reasons. Neither of the overpasses has been seismically upgraded to meet current codes. The Glencoe Road overpass will have to be rebuilt to handle addition traffic lanes regardless of expansion and especially if expansion occurs to the South area. The lines should be installed after any necessary expansion(s) and upgrade(s) of the overpasses have been completed. Placing the lines on the existing overpasses would expose them to damage during earthquakes and the cost of relocating during rebuilding of the overpasses.[17]

Recent analysis places the estimated costs for sanitary sewer improvements associated with development in the South area at $378000. An older analysis, by DEA, which projected a cost of $265,000,[18] utilized lower unit costs and omitted essential cost elements necessary for expansion into the proposed South area (e.g., apparently included only a pump station and pressure main; omitted the upsizing of the West Trunk, the bore under Highway 26, and the backbone of sewer service for that area). Not only did the DEA report omit some of the items; it was a 1997 report and has to be updated to year 2000 costs. AEI could not determine if the DEA cost was construction cost with a contingency or if it included contingency, engineering and City administration, which are in the current AEI costs.

An undated report titled "Infrastructure Analysis-South" prepared by Darren M. Welborn, P.E. of WRG Design, Inc., has raised questions surrounding the analysis in the AEI October 4, 2000 report titled "Evaluation of North Plains UGB Expansion, Sewer Water and Storm Drain

[16] UGB Expansion (October 4, 2000), at 5.
[17] UGB Expansion (October 4, 2000), at 5.
[18] Growth Alternatives (April 21, 1997), at 6-7.

Improvements." Although the Council has carefully evaluated and considered the WRG Design, Inc. report, the Council finds that, on balance, is not as persuasive as the October 4, 2000 AEI report, for the reasons set forth below.

First, the WRG report states:

> "the force main from the City's pump station currently travels under Highway 26 to the South and eventually East. This force main is adjacent to the South exception area." *Id.* at 2.

However, WRG's information is factually incorrect. In order to understand and address the issues associated with sewer service for a proposed South expansion, one must first understand the existing City sewerage system at its terminus.

The City sewage is currently collected in two gravity mains in or near to either the unnamed creek or McKay Creek. Those mains flow to an existing citywide pump station in the South/East corner of the City to the North of Highway 26. From that point, the City's sewage is pumped via a force main to the gravity sewer system located at the intersection of Jackson School Road/Evergreen Road. Like the North Plains pump station, this force main also lies North of Highway 26 to a point approximately 450 feet East of the City limits. At that point, the sewer main crosses to the South of Highway 26 and runs in the Southerly right-of-way of Highway 26 to Jackson School Road. At no time does the North Plains force main abut any portion of the proposed South expansion area, rather, it is approximately 1000 feet East of the proposed South expansion area. Thus, when the WRG memo declares that the force main is "adjacent to the south evaluation area" (*id.* at 2), it is incorrect.

Second, the WRG report states that an interceptor pump station could be used to:

> "collect all of the sanitary sewer from the south expansion area via pump station and send a force main to this interceptor which is constructed over the existing force main. The Pump station would then send it to the existing force main in Glencoe Road. This would reduce the cost of the overall system to the south by eliminating the need to utilize a force main to convey sewage under the freeway to the existing station then out of that station to the McKay trunk."

Id. at 2.

The WRG report assumes the need for a *small* pump station located in the same location as the AEI analysis: at a low spot in the vicinity of the North/East end of the existing airport runway. A pressure main would then run 4,800 feet East (mostly in public right of way) to the existing USA pressure main on the South side of Highway 26, at a projected cost projected by AEI to be $280,000.

However, the pressure main cannot connect directly to the USA pressure main because the pressure and flow differentials are not comparable. USA will not allow such a connection as a matter of policy. In any event, large differences in flows and pressures would have to be resolved even if USA allowed the connection. A failure of the check valves in the smaller station could result in a sewerage spill in the vicinity of the NE end of the existing runway and subsequent sewerage flowing overland to the unnamed creek.

Thus, a new pump station would need to be built at the existing pressure main under the scenario advocated in the WRG memo. In addition, the proposed new pump station at the existing pressure main, which forms the mainstay of the supposition in the WRG memo, would need to be *larger* than the existing North Plains station. Thus, it would not merely replace the

existing citywide pump station in the existing City; rather, it would add a second citywide major pump station South of Highway 26 just to serve a particular area. In addition, there would be the operation and maintenance costs associated with the addition of a region-sized pump station.

In the scenario envisioned in the WRG memo, the sewage from the existing City service area (as well as any proposed South expansion area) would be collected then be pumped to Hillsboro from the new pump station located South of Highway 26. This would result in two new pump stations: one for an estimated $210,000—a cost projected by both the WRG memo and the AEI analysis—and another much *larger* city-wide station with an estimated cost of approximately $400,000 to $500,000 in order to serve the projected Year 2020 City population of 3,750. This scenario puts the expansion cost either at or greater than the projected cost for South area sewer service identified in the AEI analysis.

Finally, the fact that the entire system remains owned and operated by USA means that the City would have to strike an agreement with USA for any new City-wide pump station. USA has an ultimate goal of eliminating or combining existing pump stations, rather than adding multiple in-line major facilities. Terry Chamberlain of USA has stated that USA is opposed to this second major city-wide pump station.

In the final analysis, the system configuration assumed within the WRG memo is neither a feasible nor effective proposal. The configuration incorporated within the AEI analysis would pump or gravity drain the sewage from the proposed South expansion area to an existing (upgraded) gravity main in the unnamed creek within the City, which would then flow to the existing City-wide pump station North of Highway 26—a planning scenario that would require only one pump station to handle the total City sewage.

g. Feasibility of Sanitary Sewer Expansion in East Area

The East expansion area is the only area that has sewer lines sized to serve full development of a portion of that particular expansion area. All other proposed expansion areas require completion of in-fill infrastructure improvements within the present City limits in order to provide adequate facilities to those areas.[19] The orderly development of the sanitary sewer system in relationship to the City pump station and force mains will be facilitated by the use of existing system improvements, a circumstance not otherwise shared by either the North, South, or West areas.

The East expansion area has adequate sewage main systems in place as constructed as part of the recent East industrial area local improvement district (LID). Expansion to the Northern portion of the East area can feasibly be constructed and maintained using existing sewer facilities in West Union Road. A gravity sewer, pump station, and pressure main to the McKay Creek Trunk will serve the Southern portion of the East area.[20]

The proposed pump station can feasibly be sized to provide capacity to replace the existing LID pump station, thereby eliminating the operational and maintenance costs associated with the LID station.

The North Plains pump station will need to be upsized to accommodate all expansion areas. The East Area also offers the opportunity to replace the inadequate existing North Plains pump station with a new pump station on the East side of McKay Creek or adding a second pump station on the East side of McKay Creek and minimizing the amount of improvements relative to upgrade of the existing pump station. The North Plains pump station, the McKay

[19] UGB Expansion (October 4, 2000), at 1.
[20] UGB Expansion (October 4, 2000), at 4.

Creek Trunk sewer to West Union Road, and the West Trunk sewer to Main Street are scheduled for upsizing to meet growth within the existing City limits without expansion.[21]

The gravity system in West Union Road was designed to service the Northern Portion of the East expansion area South of West Union for the projected year 2020. The pump station installed as a part of those improvements will require an upgrade of the pumps [from a five-horsepower pump to a 50-horsepower pump.] The provision for pump capacity changes was designed into the existing public sewage facilities.

Orderly expansion can be made using extensions from adequately sized lines that exist in West Union Road. All other proposed expansion areas require completion of infrastructure improvements within the present City limits in order to supply adequate facilities near to the proposed expansion area(s). Some of the proposed improvements within the City may require upsizing to accommodate expansion outside of the present City limits.[22]

Recent analysis by AEI places the estimated costs for sanitary sewer improvements associated with development in the East area at $457,100. An older analysis, which projected a cost of $462,250,[23] incorporated a number of costs for sewer improvements that have already been completed, and further included costs associated with build-out within the existing UGB (e.g., mainline replacement). The more recent cost estimate is only fortuitously close to the older analysis; the cost elements are distinctly different (e.g., the post-1997 geographical configuration of the proposed East expansion area necessitates a new pump station, although a number of the improvements discussed in the 1997 analysis have been completed).

h. Feasibility of Sanitary Sewer Expansion in West Area

The West expansion area will receive a new sanitary sewer. Expansion to the West area would be served by an extension of the West Trunk sewer from Commercial Street to Gordon Road. The West Trunk would also have to be extended in Gordon Road in order to provide service to the Northwest quadrant of the City.[24]

Recent analysis places the estimated costs for sanitary sewer improvements associated with development in the West area at $312,200. An older analysis, which projected a cost of $717,000,[25] assumed the necessity of a new pump station, incorporated costs associated with build-out within the existing UGB, and incorporated costs for replacement of existing lines instead of upsizing.

The June 17, 1997, "*West Area Position Paper*" authored by Greg Winterowd comments that:

> "DEA mistakenly concluded that this area cannot be served by gravity flow and will require a pump station. However, subsequent analysis undertaken by LDC has determined that most of the area can be served by gravity flow sewer." (*Id.* at 10.)

The more recent analysis agrees with the excerpted comment, and has assumed the availability of gravity sewer in its cost estimates.

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[21] UGB Expansion (October 4, 2000), at 4.
[22] UGB Expansion (October 4, 2000), at 1.
[23] Growth Alternatives (April 21, 1997), at 6-7.
[24] UGB Expansion (October 4, 2000), at 5.
[25] Growth Alternatives (April 21, 1997), at 6-7.

i. Feasibility of Sanitary Sewer Expansion in a Combined North/East Area

A combined North/East expansion can easily use existing facilities with some upsizing. The cost to provide services for a North/East expansion area is $126,000.

As discussed above, expansion in either the North or East areas—or both—proves superior to other alternatives because the East area LID has been built and can now serve the North side and a portion of the South side of West Union Road with sewer mainlines.[26] The East LID pump station will have to be upsized with larger pumps at build-out within the existing City limits. The Southern boundary of a proposed East expansion area would parallel West Union Road and extend in a Southerly direction, limited by the availability of gravity sewer service to the existing line in West Union Road.[27]

Under the North/East growth scenario, the eastern half of the North expansion area will be urbanized and developed. This portion of the North area is the easiest to serve, since existing sewer infrastructure exists in North Ave. and 309th. Since no off-site (SDC creditable) improvements will be needed under this scenario, this is a least-cost alternative for direction of growth. It provides the city, which has limited resources, to fund needed city-wide improvements with SDCs from expansion area development to the extent that these improvements are related to impacts caused by growth.

j. Comparative Rankings of Proposed Expansion Areas Based Upon Sanitary Sewer Costs of Serving Those Areas

The recently-determined projected costs of extending sewer service into the proposed expansion areas provides the following comparative rankings:

North/East area:	$126,000
West area:	$0
East-only area:	$457,100
North-only area:	$402,400
South area:	$378,000

For these reasons, the City finds that the best expansion option from a sanitary sewer perspective is the North/East alternative.

3. Water Systems

a. Planning Assumptions

The following discussion answers two engineering questions in its evaluation of the water system infrastructure in order to assess needs and costs: (1) Is existing utility infrastructure in place to serve the proposed expansion area?; and (2) Are the existing facilities adequately sized to serve the proposed expansion area?

In addition, for purposes of this analysis it has been assumed that future source and storage construction will be the same for all five alternatives and that ultimate buildout will not

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[26] UGB Expansion (October 4, 2000), at 4; OTAK, Inc., "*North Plains Neighbor City Study - Final Report*" (hereinafter "Neighbor City Study") (August, 1997), at 36.
[27] UGB Expansion (October 4, 2000), at 4.

include dead-end configurations. An alternatives analysis follows that builds into the comparative analysis the costs of correcting existing deficiencies within the existing City.

In an earlier draft of these findings, the City assumed that for all directions of growth, the City would avoid dead end configurations and provide looped systems. The reasons for this assumption were two-fold. First, a dead-end configuration is undesirable because such a configuration results in larger diameter piping to handle fire flows. The City's 1999 water master plan states that looping and up sizing piping to provide adequate fire protection is a first priority task. The piping and reservoir work together. The City needs the supply (in this case adequate storage) and the ability to deliver the water. Dead-end pipe systems hinder the ability to accomplish these requirements and when installing new infrastructure it is preferable to avoid them. When they exist in existing systems, the lines must be oversized to compensate for what looping will provide.

Second, a dead-end system does not provide for redundancy in the system. System redundancy is required for backup and is a well-recognized element of a properly engineered new municipal water system infrastructure according to well-recognized, sound engineering principles.

However, in response to these planning assumptions, the proponents of the South expansion area pointed out that the earlier draft findings appeared to impose the costs of a looped system only on the South. *See* WRG memorandum at 1. The WRG memo states that the AEI Report incorrectly evaluated the South expansion area because "[I]n no other expansion area did [AEI] assume that a looped system around the area would be required." *Id.* at 1. In fact, the City's earlier analysis did assume that water systems in the North, West, and East would be looped, but that these systems would be provided at no expense to the City since they were all "on-site" improvements. In this regard, the South differs from the other alternatives since there are many properties in the South expansion area that need to be served with municipal water but which are not located in the vicinity of the land proposed by the proponents of the South for high density urbanization. This results in the distinct possibility that developers in the South would not be providing sufficient off-site improvements to provide all existing residents with municipal water. The burden would then fall on the City to provide these services.

Nonetheless, in response to this criticism, the City has added the costs of providing looped main lines to each of the five growth options. It was assumed that City will provide main line service adjacent to each tax lot in the expansion area, but that developers would be responsible for providing smaller on-site water improvements to their individual sites. Thus, smaller on-site improvements were not considered in this analysis, because without specific plans having been developed for the five expansion areas, the costs are somewhat speculative. In addition, it is fair to assume that such costs would be similar for each of the five expansion areas given the similarities in the proposed developments.

For these reasons, the City has performed three alternative analyses with regard to water infrastructure costs. One cost estimate analysis includes estimated project costs only representing costs to upsize proposed City facilities and extend them to a proposed expansion area in order to serve that area. This cost estimate considers the costs of proving each property in an expansion area with an adjacent looped water system. This estimate focuses only on the costs to serve the needs of new urbanization over the 20 year planning horizon. Accordingly, these cost estimates do not include those costs necessary to either extend or upsize lines to accommodate infill growth within the existing UGB. For example, there are several water system improvements that benefit the UGB expansion—viz, short waterline upsizings proposed in the City's "*Water System Master Plan*" ("WSMP"), but that are required for infill in the existing UGB in any case.

The second cost estimate is similar to the first, but it does not consider the cost of providing access to a looped water system adjacent to every property in the proposed expansion

areas. Rather, this estimate assumes that the city can provide a dead-end connection to the expansion area. This estimate does, however, assume that sufficient water pressure for fire-fighting capabilities will be maintained in these dead-end lines. This methodology was exactly that used to serve the East LID. This estimate also assumes that each property within an expansion area will be served to its border with municipal water.

The third cost estimate analysis includes estimated costs both to serve the needs of the existing as well as infill City, as well as the costs to serve the 2021 population in any expansion area. For this analysis, the costs to upgrade all City water infrastructure facilities is included, as well as the costs to serve particular expansion areas. In this estimate, the City does not assume a looped system on each site.

b. Existing water system facilities/services

(i) Existing Water Sources

The City's water source comprises a single 485-foot deep well that draws from the Columbia River Basalt aquifer and produces 625 gallons per minute under ideal conditions.[28] The City has a standby well at the same location (150 gallons per minute) and an unused well next to City Hall.[29] If growth and land development occur as projected within existing City limits projected peak daily demand will likely outstrip pumping capacity by 2005,[30] requiring an additional source such as a new well or a connection to water purveyors (such as the City of Hillsboro or Tualatin Valley Water District), in order to meet future needs.[31]

(ii) Existing Storage

The City constructed a one-million-gallon reservoir in 1990 with a new booster pump capable of providing over 3,000 gallons per minute (gpm).[32] This storage and peak pumping capacity is sufficient to provide adequate flows to the distribution system to accommodate current development.[33] However, an additional storage reservoir will be needed to provide system redundancy in order to avoid reliance upon a single source or upon single facilities, and in order to meet basic storage requirements for projected growth.[34] The City's WSMP forecasts the need for additional storage in year 2000 sufficient to satisfy storage requirements until 2020.[35] The City's WSMP estimates the cost of an alternative storage reservoir to be between $679,000 to $1,554,000.[36]

(iii) Existing Transmission/Distribution

The City has a relatively well-balanced distribution system. The current system can provide adequate fire flows and meet domestic demands to most of the City, but the Northwest corner of the City has a number of deficiencies that produce relatively low flows; no distribution systems exist within the Northwest third of the City, and the City remains unable to provide required adequate two hour fire flows to that area. Future development or redevelopment of

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[28] David Evans and Associates, Inc., "*City of North Plains Water System Master Plan*" (hereinafter Water System Master Plan") (September 23, 1999), at 3, 9, and 17.
[29] Water System Master Plan (September 23, 1999), at 3, 9, and 17; Infrastructure Report (March 3, 1997), at 2.
[30] Water System Master Plan (September 23, 1999), at 3, 9, and 17; Infrastructure Report (March 3, 1997), at 2.
[31] Growth Alternatives (April 21, 1997), at 3.
[32] Water System Master Plan (September 23, 1999), at 3 and 19.
[33] Infrastructure Report (March 3, 1997), at 3.
[34] Water System Master Plan (September 23, 1999), at 3.
[35] Water System Master Plan (September 23, 1999), at 45. As mentioned earlier, the City's WSMP assumes the following population forecast: it begins with a 1998 estimated population of 1,760 and projects an average annual population increase of 3.5% for the next 20 years wholly within the current City limits. (*Id.* at 2-3.)
[36] Water System Master Plan (September 23, 1999), at 60.

property in this region will require modifications and extensions to the existing system to produce flows, which are adequate for the existing City, as well as increased development density within it.[37]

c. Feasibility of Expanding Water System Facilities/ Services—in General

(i) Capacity of Existing System

The capacity of a water system is typically defined by two engineering criteria: (1) ability to meet domestic flows, and (2) ability to deliver fire flows at a rate and duration recognized by fire life safety providers as adequate and at a rate and duration that is also recognized by insurers as adequate to keep fire insurance costs within a reasonable range. In North Plains, as in most cities, fire flow requirements control the sizing of key components. When evaluating the City's ability to deliver required fire flows, it is important to analyze both the distribution system and the existing reservoir capacity.[38]

The capacity of the current water system is limited by the existing well which has a rated capacity of 625 GPM (0.9 MGD), existing booster pump which can deliver 3,000 GPM, and existing 1.0 million gallon reservoir. Growth in any direction will require modifications and up-sizing of the distribution system components to provide adequate peak fire flows and duration to resolve current, existing deficiencies. It is certain that as growth occurs, additional reservoir capacity will be required. The exact location of the new reservoir will be determined in part by the availability of land.[39]

The reservoir capacity, well yield, and portions of the water mains are undersized for build-out within the existing City limits. A source of additional water must be acquired by the City to accommodate the build-out of the existing City, as well as any expansion of the present UGB, as well as capacity to serve the needs of the City within its current boundaries at build-out—including infill and redevelopment. Moreover, the City is currently deficient in its ability to provide adequate water to support two-hour fire flows. The additional water source must be acquired either by drilling an additional City well, the City of Hillsboro or obtaining water from the Tualatin Valley Water District.[40]

The Northwest corner of the City, bounded by the existing City limits, NW Gordon Road, and NW North Avenue, does not have water service. When the necessary source and conveyance facilities are installed or upgraded they will provide a base for service to areas both inside the existing City, as well as outside the existing UGB. The mains as upgraded will be sized for adequate fire flows and will accommodate the City's Year 2021 needs. The proposed second reservoir and new additional water supply source must be adequate to accommodate not only the existing City at eventual infill build-out in the existing City, but also the population to be served within the UGB expansion area(s). The cost of upsizing a second water reservoir and increased supply source are common to all proposed expansion areas..[41]

(ii) Identified Needed Water System Improvements

The City has identified specific water system improvements within a one to five-year timeline that will be necessary in order to assure the City's ability to adequately provide for the health, safety, and welfare of the existing community. Additionally, the WSMP identifies additional water system improvements required for infill build-out of the City's current UGB.

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[37] Water System Master Plan (September 23, 1999), at 4 and 21.
[38] Infrastructure Report (March 3, 1997), at 3.
[39] Growth Alternatives (April 21, 1997), at 3.
[40] UGB Expansion (October 4, 2000), at 2.
[41] UGB Expansion (October 4, 2000), at 2.

The City has three different options for future water sources:

Option No. 1 - Drill a New Groundwater Well: A new well and booster station would be constructed within or adjacent to the planning area and water rights obtained sufficient to meet the anticipated demand.[42] The City's WSMP estimates the cost of this option to be $408,800.[43]

Option No. 2 - 16 Inch Transmission Main Intertie to Hillsboro: This option consists of constructing a 16-inch inter-tie transmission line along Glencoe Road and connection to the City of Hillsboro's Evergreen Road transmission line. An intergovernmental agreement would be required to secure sufficient water rights.[44] The City's WSMP estimates the cost of this option to be $2,695,000.[45]

Option No. 3 - 16 Inch Transmission Main Intertie to Tualatin Valley Water District: Under this third option, a 16-inch inter-tie transmission line would be constructed along West Union Road to the Tualatin Valley Water District water line at Cornelius Pass Road. An intergovernmental agreement would be required to secure sufficient water rights.[46] The City's WSMP estimates the cost of this option to be $3,811,500.[47]

In terms of initial capital cost, groundwater sources are the least expensive source for water when an adequate aquifer is available. Construction of an inter-tie transmission line will provide the most reliability and redundancy to the existing water distribution system without relying on the existing groundwater aquifer. However, construction of a new transmission main inter-tie will not replace or eliminate the need for additional reservoir capacity.[48]

At this juncture it is noted that the WRG memo incorrectly states, "water supply from Hillsboro along Glencoe Road is inevitable." (*Id.* at 1.) As noted above, the WSMP identifies three options for additional water sources for the City. While the City has yet to make a decision with respect to future supply sources, and no evaluation of service requirements can presume what option might be selected, it is true that obtaining water from the Tualatin Valley Water District is feasible

In addition, it is noted that the WRG memorandum presumes the use of transmission lines for local service. There is inadequate data to support a conclusion that a transmission line can feasibly be utilized directly for local service. In order to assume the feasibility of the use of transmission lines for local service, two issues must be resolved. First, it must be established that the pressure would be adequate to provide local service without installing pressure-reducing facilities each time local mains were connected to the transmission line. Second, given the length of any transmission line, it must be established that there are methodologies to avoid the water becoming "stale" (viz, the chlorine residual falling below acceptable levels). Those uncertainties, plus other "unknowns" (such as reliable fire storage and pressures), explain why standard engineering practice regarding reliable municipal water systems provide treatment, storage, and pressure regulation from a reservoir, and not from a transmission (supply) main as presumed by the WRG memorandum.

The City's WSMP recommends three levels of water system improvements within the existing UGB, grouped by immediacy:

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[42] Water System Master Plan (September 23, 1999), at 40.
[43] Water System Master Plan (September 23, 1999), at 59.
[44] Water System Master Plan (September 23, 1999), at 40.
[45] Water System Master Plan (September 23, 1999), at 59.
[46] Water System Master Plan (September 23, 1999), at 40.
[47] Water System Master Plan (September 23, 1999), at 59.
[48] Water System Master Plan (September 23, 1999), at 40.

Level I represents improvements to resolve potential immediate health and safety hazards. The recommended timeline for construction is 1 to 5 years. Total estimated costs for Level I improvements are $1,862,900.[49] The following prioritization has been established:

(1) New well and booster pump station;

(2) New 0.5 MG reservoir with capacity to expand to 1.0 MG;

(3) Seismic retrofit of existing well house and reservoir;

(4) Portable diesel generator at existing pump house to power duty and deepwell submersible pumps;

(5) Miscellaneous distribution system improvements; and

(6) Begin on-going meter replacement program.[50]

Level II generally represents components of the current system that are at or near the end of their useful life. These improvements represent system elements requiring replacement with increased capacity to accommodate projected growth and development over the planning horizon. Total estimated costs for Level II improvements are $636,100.[51] The following prioritization has been established:

(1) Install new duty pumps and purchase backup pump at well house;

(2) Replace fire pump gas motor with diesel motor;

(3) Miscellaneous waterline improvements; and

(4) Miscellaneous instrumentation modifications at well house.[52]

Level III generally consists of improvements to current facilities that will add reliability and redundancy to the system. These improvements are necessary to serve undeveloped portions of the currently configured UGB. Total estimated costs for Level III improvements are $3,190,200.[53] The following prioritization was established in the WSMP:

(1) Construct new transmission main to Hillsboro. The City notes that the water study mentions the three water source options. Wells are the least expensive option by a considerable margin. The WSMP states that the source from wells needs to have further study. *See* WSMP, Ch 8 p 39. The premise set forth in the WSMP is that obtaining water via a transmission line system may be more certain than relying on finding and developing an adequate aquifer to supply needed water. However, given the cost saving involved with the groundwater option, including the reduced treatment costs associated therewith, the City has decided to explore the ground water source by drilling a new well before resorting to either of the two transmission line options; and

(2) Construct 12-inch mains in Glencoe, Gordon, Commercial and North Avenue.[54]

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[49] Water System Master Plan (September 23, 1999), at 54.
[50] Water System Master Plan (September 23, 1999), at 4.
[51] Water System Master Plan (September 23, 1999), at 55.
[52] Water System Master Plan (September 23, 1999), at 4-5.
[53] Water System Master Plan (September 23, 1999), at 56.
[54] Water System Master Plan (September 23, 1999), at 5.

The levels of improvements described and planned within the WSMP qualifies as an orderly phasing of the requisite water system improvements needed within the existing City limits. As reflected in Figure 13-2 of the City's WSMP, when completed, the Level I and II improvements within existing City limits will be supportive of the North/NorthEast expansion areas; the West/Northwest expansion areas remain unaccommodated by any improvements until Level III improvements. The South expansion area will not be served by any of the water system improvements as identified within the WSMP.

The per capita costs of the Level I, II, and III improvements summarized above, which the City presently needs within the current City limits, can be reduced significantly if distributed among a larger population. All of the proposed expansion areas provide such a population. The implementation of those improvements within the present City limits upon build-out would also facilitate future development within the proposed expansion areas. Thus, expansion of the UGB would serve to reduce the financial impact of the Level I, II, and III improvements while capitalizing on those improvements to allow necessary growth beyond existing City limits.

The Burlington Northern railroad tracks run through the City limits. The City's well and reservoir are located approximately one block South of the railroad tracks at the Western end of the service area. The North side of the system is connected to the South end of the system at two separate points with 10-inch and 8-inch water mains crossing from the Northern part to the Southern part of the existing City. Although this configuration provides adequate flow from the South to the North regions, the system would benefit significantly by extending an additional loop from the North region to the South under the tracks in the vicinity of the Glencoe Road/Commercial Street intersection.[55]

d. Comparative Analysis if Costs to Resolve Existing Deficiencies are Included

Obtaining a rough determination of the costs of each potential direction of growth is part of the determination of the feasibility of efficient water system infrastructure to serve the City. One of the water system cost comparison methodologies includes all capital system improvements required to service each expansion area. This results in including all Level I and Level II costs in each direction and the cost of Level III mainline improvements required to serve the specific expansion area. That cost comparison is:

Cost Estimate*	North Area	South Area	East Area	West Area	North/East Area
Water System	$2,942,904	$4,026,900.00	$2,633,100.00	$2,942,904	$2,633,100.00

*In year 2000 dollars.

In addition to the above, common to all direction of growth is the cost for water source by either groundwater well construction ($423,100) or by transmission main from Hillsboro ($2,789,300) or by transmission main from TVWD ($3,944,900).[56]

Applying this comparison supports a determination that it is most efficient to extend water services to the area to the North and East or to the East alone, with the next alternative being the North or the West area. The South is the most expensive.

e. Comparative Analysis if Looped Systems are Assumed, But Costs to Resolve Existing Deficiencies are Not Included.

(i) Feasibility of Water Service Expansion in North Area[57]

[55] Water System Master Plan (September 23, 1999), at 21.
[56] Water System Master Plan (September 23, 1999), at 56.

The North expansion area would use the Level I and II water improvements identified as existing system upgrades. The existing system upgrades will provide a strong network, storage and distribution system to allow the extension of mains off North Avenue and to the existing City system in the North/East.

Advantages to development in this area include that for other utilities (viz, sanitary sewer and stormwater management) the North is located at an elevation higher than the existing City limits.[58] However, the higher elevation will require some additional improvements to the existing water distribution system which will likely include extending the existing 12-inch water line in North Avenue from Main Street to Gordon Road, and extending the existing 12-inch water line in Commercial Street from its West end to Gordon Road, then North to the North Avenue.[59]

Proposed water system extensions in Gordon Road and North Avenue to serve the Western portion of the existing City will provide water service to the proposed North expansion area. Existing lines must be upsized to provide capacity for domestic and fire protection within the existing City limits. The proposed improvements within the City limits will also have the tangential efficiency of facilitating expansion to the North area.[60]

Recent analysis indicates that there are no independent costs for water system improvements associated with expansion into the North area. As noted, this is because the basic improvements required to serve the North area are those improvements also required to serve the City's build-out within the existing City limits. Specifically the required new water mains that already abut the existing UGB, can serve the proposed North expansion area without further City infrastructure improvements. Each individual tax lot will be able to access a completely looped system without further City-financed improvements. The remaining infrastructure needed will be on-site related water lines, the cost of which will be borne by the individual property owners/developer and are not considered herein.

If the cost to resolve existing deficiencies is built into the costs of serving the existing UGB, then the costs to serve all areas increases substantially. As noted above, this increase across all options regarding specifically the North are, as noted above, to be $2,942,904. It is noted that the 1997 analysis projects a cost of $260,250[61] These costs are associated with build-out within the existing UGB as a cost to serve the North area. It is noted that this 1997 figure did not build in the full spectrum of costs as has been accomplished in the alternative analysis above.

(ii) Feasibility of Water Service Expansion in South Area

No City water facilities exist adjacent to the South area. Regardless of the source of additional water for the City, no water distribution mains exist in the South area that would provide service to any South expansion area, and the City's WSMP does not contemplate service to the South expansion area.[62]

Provision of water services would require additional costs to serve the South area that would not be required to serve development North of the highway. For example, two crossings

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[57] The balance of the comparative analyses assumes, but does not show, the costs of resolving existing infrastructure deficiencies because the costs would apply to each area accordingly to the formula noted above. However, when the costs of resolving existing deficiencies are included in the calculus, it remains clear that the North and East alternative is one for which a determination that it will be feasible to provide orderly and efficient provision of public facilities and services.

[58] Growth Alternatives (April 21, 1997), at 4.

[59] Growth Alternatives (April 21, 1997), at 4.

[60] UGB Expansion (October 4, 2000), at 3.

[61] Growth Alternatives (April 21, 1997), at 6-7.

[62] UGB Expansion (October 4, 2000), at 5.

of Highway 26 would be required in order to implement system redundancy and thereby assure adequate fire protection.[63] In addition, a new looped main system would be required to be extended across Highway 26 either by extending a new transmission main across the Gordon Road and/or Glencoe Road overpasses, or boring under Highway 26, effectively requiring either a "double-back" system across Highway 26 from a North-side reservoir or the construction of a new South-side reservoir just to serve the South area.[64]

Main extensions from the existing and proposed City system will be required in order to serve the proposed South expansion area. To maintain a consistency with the City's WSMP, the AEI analysis presumed two extensions in order to provide the ability for a "looped" system. The AEI analysis also placed the extensions within public right-of-way in order to ensure ease of public access (viz, eliminating at the outset the costs of obtaining easements or the need to condemn property).

A memorandum from the proponents of the South freeway area (WRG memorandum) projects the pipe length and related pipe cost for water extension to the proposed South area. Its analysis conforms to the analysis in the AEI report and does not represent a significant difference with respect to that particular element. However, this WRG memorandum errs by omitting the cost of the required highway bores.

Initial development in the South expansion area would also require up-sizing a portion of the existing distribution system in order to extend required fire protection flows through what would be initially a dead-end line. The existing 8-inch line in Commercial Street from 318th to 321st would need to be replaced with a 12-inch diameter pipe. Additionally, a 12-inch water line would need to be extended from the dead-end point at the West end of Commercial Street to Gordon Road, then South along Gordon Road to Cottage Street (thereby completing the in-fill extension), from which extensions could be made to serve the South area. As with other alternatives, ultimately a new reservoir and source would need to be developed to serve the City for its existing needs as well as its needs to 2021, to serve the City's 2021 population of 4,000.[65]

As noted above, this analysis does not attribute to any one area, the costs of resolving deficiencies to serve the existing City boundary over the 20 year planning horizon. If these costs are figured in, the cost of serving all areas roughly triples, including the costs to serve the South. Recent analysis by AEI places the estimated costs for the independent water system improvements associated with expansion into the South area at $1,341,200,[66] a cost that assumes a connection to a City system operating off a City reservoir, and further assumes the necessity for a right-of-way loop South of Highway 26.[67] The 1997 DEA analysis projected a cost of

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[63] The Level I and II improvements identified in the City's WSMP would implement a system redundancy necessary to ensure both adequate fire protection and continuity of service.

[64] UGB Expansion (October 4, 2000), at 5; Growth Alternatives (April 21, 1997), at 5; Neighbor City Study (August, 1997), at 44.

[65] UGB Expansion (October 4, 2000), at 5; Growth Alternatives (April 21, 1997), at 5.

[66] UGB Expansion (October 4, 2000), Appendix at 2-3, as revised on October 10, 2000, as revised on October 25, 2000:

Cost Estimate	North Area	South Area	East Area	West Area	North/East Area
Water System	$0.00	$1,341,200.00	$564,500.00	$474,250.00	$564,500.00

The cost to provide services for the South expansion includes the cost to get water service to the south of Highway 26, as well as separate costs to provide a looped water system. UGB Expansion (October 4, 2000), at 5. A looped water system implements system redundancy, which, in turn, assures adequate fire protection and continuity of service should flow be disrupted in one line.

[67] A right-of-way loop would be necessary to assure that the abutting properties will have access to water. Other alternatives have not shown as feasible to ensure public access.

$329,500[68] to serve the South, but it assumed the possibility of a tie-in to a transmission main. Contrary to the assumption in the DEA report, there has been no showing that it will be feasible to overcome this concern that this would result in a "dead-end" system terminating in the vicinity of the Glencoe/Beach intersection that would put the South area at a comparative disadvantage to the other proposed expansion areas. The disadvantage is a consequence of multiple properties being left without access to additional water mains. Moreover, this impairs and compromises critical system redundancy. This is especially problematic for the South expansion area because of its physical separation from the rest of the City infrastructure and services.

As discussed above, the City's WSMP incorporates two basic criteria in its discussion of water service within existing City limits: pipe size and location. The proposed improvements identified in the WSMP up-size lines to provide fire flows and either provide or complete loops in the system in order to assure the redundancy of service necessary for fire flows and continuity of service. The WSMP discusses "looping" in more detail in Chapter 12, page 52.

When analyzing the three options to the North of Sunset Highway, the City determined that all three of the potential expansion areas North of Hwy 26 would have a large diameter water mains adjacent to those properties. This main would provide adequate fire protection capacity and the ability to provide adequate domestic water individually for the three expansion areas. There were approximately two to five parcels comprising each of the three North expansion areas. None of the parcels in the South expansion area would have this advantage for connecting to nearby lines. In order to replicate the service options available North of the highway, the City proposed that a line be built in public right-of-way fronting the many (developed and undeveloped) properties in the proposed South freeway area. The City also broke out the cost to serve the South freeway area into the cost to get from the existing City lines across Sunset Highway to the area, and the cost of providing comparable pipe size and locations to the area North of that highway. As noted above the costs of providing water transmission piping to the South freeway area is considerably higher than the other three options.

The WRG Memorandum also notes that the WSMP "shows a water main along Glencoe Road to Evergreen Road from the City of Hillsboro. This main could more than adequately serve the entire South area and a loop system could be constructed through the private projects of the South expansion area as it develops as in the other comparison expansion areas." *Id.* at 2. There is nothing to establish the feasibility of constructing the suggested system improvements off of what would be a transmission line. Moreover, because it is a transmission line it would still have to reach the City and then be returned to the South freeway area. It is not consistent with standard engineering practice to feed off of a transmission line in the manner suggested. There is substantial concern with lack of redundancy; lack of pressure as well as water becoming "stale" requiring re-chlorination from a reservoir. If a reservoir were established in the South to serve only the South with rechlorination facilities and a separate main were established off of the transmission main and redundancy were ensured, this is most likely continue the requirement for double bores in any case and, because of the need for a reservoir as well is likely to increase costs associated with serving the South freeway exception area. The costs of such an alternative system are not known and have not been presented. Because the system suggested is unusual and not consistent with standard engineering practice it is not evaluated here beyond this analysis.

Accordingly, if costs to resolve existing deficiencies within the existing City at 2021 build-out are included, the cost to serve the South freeway area is $4,026,900.00. If the costs to resolve existing deficiencies is not built in, the cost to serve the South freeway area with a looped water system, based on the application of sound engineering practices, is $1,341,200.00.

(iii) Feasibility of Water Service Expansion in East Area

[68] Growth Alternatives (April 21, 1997), at 6-7.

Expansion to the Northern portion of the East area can be accomplished taking advantage of efficiencies in the existing water facilities in West Union Road. Water service to this area has been made available via the East Industrial LID. Proposed upsizing of water lines to increase capacity and service area within the City will provide adequate service for a proposed East expansion[69]

Recent analysis indicates that if the costs of resolving the existing City water infrastructure deficiencies is not included, the only additional costs associated with providing for water system improvements into the East area is the cost of providing a looped system for redundancy. In order to provide redundancy in the water system to the East expansion area, a second water main needs to be constructed. This water main would parallel the existing main in West Union Road, but would be located further South. The preferred location would be an extension of the Pacific Street twelve inch water line, as the Pacific Street right-of-way extends all the way to the existing city limits. The cost of extending a 12 inch water main from West Union Road South into the East expansion area and then looping it in a Westerly direction to a connection with Pacific Street is estimated to be $564,500.

As with the other sites, if the cost to resolve existing deficiencies is built into the costs of serving the existing UGB, then the costs to serve all areas increases substantially. As noted above, this increase across all options to resolve existing deficiencies affects the East as it does all areas and makes the estimate of costs to serve the East $2,633,100.00. The 1997 analysis projected a cost of $158,750[70]. It is noted that this evaluation did not build in the full spectrum of costs as has been accomplished in the alternative analysis above. It is also noted that the 1997 estimate of costs regards improvements that have already been completed as part of the above referenced LID.

The proposed Pacific Street connection discussed above raises the issue of whether bringing water lines across EFU land to serve urbanizable land in a UGB violates Goal 11 or other laws related to the provision of public facilities and services. A review of the applicable goals and statutes results in the conclusion that it does not.

Goal 11, entitled "Public Facilities and Services," generally prohibits the establishment or extension of water systems to authorize a higher residential density in rural lands than would otherwise be authorized without the existence of such a water system. Subsection A (Planning) of the Goal 11 guidelines suggests that "public facilitates and services for rural areas should be provided at levels appropriate for rural use only and should not support urban uses." The goal's guidelines also suggest that utility lines and facilities should be located on or adjacent to existing public or private right-of-way to avoid dividing existing farm units. However, nothing specifically in Goal 11 prevents the transfer of water services from one urbanizable area to another urbanizable area, even if that requires that water lines traverse EFU land.

Furthermore, state statutes state that utility facilities necessary for public service are a permitted use in an exclusive farm zone. *See* ORS 215.213(1)(d). A utility facility is deemed "necessary" if it is determined that EFU land must be used to site the facility due to one or more of the following factors: (1) technical engineering feasibility, (2) the proposed facility is locationally dependant, which means that it must cross land in one or more areas zoned for exclusive farm use in order to achieve a reasonably direct route or to meet a unique geographical need that cannot be satisfied on other land, (3) lack of available urban and non-resource land, (4) availability of existing right-of-way, (5) public health and safety, (6) other requirements of state or federal agencies. *See* ORS 215.275(2). The statute further states:

> "Costs associated with any of the factors listed in Subsection (2) of this Section may be considered, but costs alone may not be the

[69] UGB Expansion (October 4, 2000), at 3-4.
[70] Growth Alternatives (April 21, 1997), at 6-7.

> only consideration in determining that a utility facility is necessary for public service. Land costs shall not be included when considering alternative locations for substantially similar utility facilities."

ORS 215.275(3).

Finally, LCDC regulations codified at OAR 660-011-0065 follow Goal 11 by stating that local governments may not allow an increase of density on rural lands as a result of the presence, establishment, extensions or availability of water systems. However, the administrative rules do not prevent local governments from serving one urbanizable area from water supply located on another urbanizable area, even if it requires that EFU land be transversed in the process.

(iv) Feasibility of Water Service Expansion in West Area

The West/Northwest expansion area lacks service from existing water mains. Level III improvements would be required to provide services to that Northwest sector of the existing City and expansion to the West/Northwest. The specific main extensions would be within North Avenue to Gordon Road and within Gordon Road to Commercial. The City's WSMP identifies this distribution loop as "Level III improvement"; a new loop would provide service to the existing City area to the Northwest as well as to the expansion area to the West/Northwest. The expansion areas to the West/Northwest would require looping back to North Avenue as a part of the system within the expansion area or back to the North/NorthEast expansion area.

Water line extensions in Gordon Road and North Avenue would serve the West area. These lines would also have to be extended to provide service to the Northwest quadrant of the City. The proposed size of the lines should be adequate for the West expansion without upsizing.[71]

If the costs for water system improvements associated with resolving existing deficiencies are omitted, then expansion into the West area takes advantage of the water improvements required for build-out within the existing City limits (new water mains that already abut the existing UGB). The West area would require a 12 inch main line to be installed to provide all property owners in the West expansion area access to a looped system. The cost to provide this additional infrastructure is estimated to be $474,250.0. If the costs for system improvements to resolve existing deficiencies are built in, then the cost to serve the West is $2,942,904, as noted above. It is noted that the 1997 analysis, which projected a cost of $260,250,[72] did not incorporate all costs for resolving deficiencies.

(v) Feasibility of Water Service Expansion in a Combined North/East Area

A combined North/East expansion can be done using existing facilities and some upsizing to lines inside the existing City limits.

Proposed upsizing of water lines to increase capacity and service within the City provide adequate service for a proposed North/East expansion. As discussed above, the service area in the South portion of that area would be along West Union road so the water extension in Pacific Street proposed for an East expansion are not needed.[73] However, for planning purposes the City has assumed looped systems serving all existing properties in the five expansion areas. As with the other alternatives, provision of looped service adds costs to the North/East expansion option. However, due to the unique nature of the North site, the only additional costs associated with

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[71] UGB Expansion (October 4, 2000), at 5-6.
[72] Growth Alternatives (April 21, 1997), at 6-7.
[73] UGB Expansion (October 4, 2000), at 4.

providing looped water system improvements associated with expansion into the North/East area are those costs that are germane to the East expansion area, which, as discussed above is $564,500.

f. Comparative Rankings of Proposed Expansion Areas Based Upon Dead-End Main Water Lines.

If one removes the assumption that all properties in the expansion areas will have a looped system adjacent to their boundaries, and instead assume that the City allow a dead-end connection, then a different set of cost estimates are produced. As discussed above, looped systems are the preferred system. However, the City has in the past permitted the construction of dead-end systems in the short term, as the West Union LID demonstrates. Wherefore, it is reasonable to analyze the feasibility of providing water service via dead end connections. In this scenario, however, the City continues to assume that water mains will be run to all properties in an expansion area.

Under this comparison, the South expansion area is assumed to have a dead-end system with a single feed. The second boring used to complete the loop across Hwy 26 is not needed under this scenario. In addition, the bore across Gordon Road is used for the main feed, since it requires a shorter boring distance as compared to the other HWY 26 bore. However, because the system is not looped, the water main needs to be oversized in order to accommodate fire flows and maintain adequate water pressure over the entire system. All told, the South expansion area proves to be the most expensive site to serve, with a total cost of $1,519,498.

The North and East areas fair better under this scenario: each of these sites experience no additional costs, since dead-end or looped water systems are already adjacent to every tax lot in these proposed UGB expansion areas. The West expansion area would require an extension of a dead-end system to serve the furthest west tax lot which is not adjacent to Gordon Road. This project would cost $255,850.

g. Conclusions

If costs to resolve existing deficiencies are not included, the projected costs of extending water service into the proposed expansion areas with looped systems provides the following comparative rankings:

North/East area:	$564,500
North area:	$0
East area:	$564,500
West area:	$474,250
South area:	$1,341,200

If costs to resolve existing deficiencies are built in, the projected costs of extending water service into the proposed expansion areas provides the following comparative rankings:

Cost Estimate	North Area	South Area	East Area	West Area	North/East Area
Water System	$2,942,904	$4,026,900.00	$3,197,600.00	$3,417,154	$3,197,600.00

4. Storm Drainage Systems

a. Existing Storm Drainage Facilities/Services

The City of North Plains is located within the McKay Creek Watershed, which is part of the Tualatin River Watershed. McKay Creek originates about nine miles North of the City of North Plains, and meanders in a Southerly route until its final discharge into Dairy Creek about five miles South of the City of North Plains at the East end of the City of Hillsboro. About 34% of the City discharges stormwater directly into McKay Creek, with the majority of that area located East of NW Glencoe Road. The balance of the City discharges stormwater to a sub-basin of McKay Creek referred to as the "unnamed tributary" to McKay Creek. The confluence of this tributary and McKay Creek is located at the Southeast corner of the City.[74]

McKay Creek and the unnamed tributary dominate the existing storm sewer and drainage system. Both of these streams provide significant drainage capacity but also experience occasional flooding and have floodplains that impact nearby properties.[75]

The developed portions of North Plains are served by a combination of roadside ditches, drainage ditches, pipes, driveway culverts, and drain tiles, all of which ultimately discharge into either McKay Creek or the unnamed tributary of McKay Creek.[76] The ditches and culverts are a collection of improvements that have been installed or evolved over a long period of time to address specific problems, and are not the result of a comprehensive effort to address basin-wide or city-wide problems;[77] they have occurred because of the absence of a city-wide master plan.[78]

As a general pattern, properties in the North/East and East end of the UGB drain to McKay Creek. There are two well defined discharges: a 36-inch diameter pipe located approximately 100 feet North of the intersection of North Avenue and Shadybrook Road, and a 48-inch diameter pipe located on the Southeast corner of the West Union Road bridge. These two discharge points accommodate most of the recent development in these parts of the UGB. In addition to these two significant discharges, there are a number of additional but relatively smaller pipes or swales that discharge into McKay Creek along the West bank of the creek.[79]

Generally, properties located in the central, West and South portions of the UGB drain to the unnamed tributary via several widely dispersed points of discharge. As noted previously, the drainage ways are predominantly roadside ditches and driveway culverts that follow the general topography of the City, which slopes to the South or North from a relative high point located at approximately the intersection of 311th Street and Wasco Avenue.[80]

Undersized culverts and ditches create some localized flooding during heavy precipitation due to the fact that many of the ditches use 12-inch diameter culverts along their entire length to convey water under driveways. A 12-inch diameter culvert is adequate for basins in the range of one or two city blocks, but inadequate to serve a larger service area or the lower reaches of a drainage basin. An additional problem is the maintenance of ditches that are not sized large enough to accommodate peak flows up to and including a 25-year storm event. Additionally, there is a concern about properties with drainage ditches along road frontage seeing ditches fill over time with yard debris.[81]

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[74] David Evans and Associates, Inc., "*City of North Plains Storm Water Master Plan*" (hereinafter "Storm Water Master Plan") (Draft) (November 1, 1999), at 7.
[75] Storm Water Master Plan (Draft) (November 1, 1999), at 2.
[76] Storm Water Master Plan (Draft) (November 1, 1999), at 11.
[77] Storm Water Master Plan (Draft) (November 1, 1999), at 2.
[78] Growth Alternatives (April 21, 1997), at 2; Infrastructure Report (March 3, 1997), at 3.
[79] Storm Water Master Plan (Draft) (November 1, 1999), at 11.
[80] Storm Water Master Plan (Draft) (November 1, 1999), at 11.
[81] Storm Water Master Plan (Draft) (November 1, 1999), at 2.

Localized flooding also occurs in the existing culverts and bridges in McKay Creek and the unnamed tributary. In addition to being major drainage facilities for North Plains, these are streams that are subject to a number of regulatory restrictions. In particular, the unnamed tributary has several culverts that restrict flow and create backwater flooding upstream. Modifying this drainage pattern may reduce high water in one stretch of the creek, but create additional problems downstream. Solutions to this type of flooding will require comprehensive modifications to the creeks and drainage structures.[82]

Several locations have been identified where flooding is observed during storm events. These locations are:

NW Commercial and NW 324th: Three concrete culverts provide passage of the unnamed tributary just downstream from two 36-inch corrugated metal pipe culverts that provide passage of the creek beneath a road on private property near to the railroad.[83]

Near NW Cottage and NW 318th: A 48-inch concrete culvert provides passage of the unnamed tributary beneath a private driveway. The culvert appears to be undersized and likely constricts flow at the crossing.[84]

West of NW Main and NW Hillcrest: The City's drainage system crosses private property, which contains a demolition yard. According to City staff, stormwater is conveyed through the property via old hot water heaters laid end to end.[85]

West of NW 309th and NW Hillcrest: The City's drainage system crosses private property through an 8-inch concrete pipeline that appears to be undersized.[86]

NW 314th and NW Pacific: A 12-inch concrete culvert crossing NW Pacific Street restricts flow traveling toward the unnamed tributary along the ditches on the East side of 314 Street.[87]

South end of 314th Street: An 84-inch corrugated metal pipe culvert provides passage for the unnamed tributary beneath NW 314th Street. The culvert appears to be undersized for the crossing.[88]

West Ridge: Properties in the South part of the West Ridge residential subdivision have noted surface water runoff from the agricultural property West of the subdivision. During heavy precipitation, runoff from the fields reportedly bypasses the ditch inlet on the West side of 309th Street then flows down Brooking Court at times inundating properties at the East end of the cul-de-sac.[89]

Brooking Court: The properties along the South and East sides of Brooking Court have reported poor drainage of the properties, foundations, and crawl spaces. Although the City's Storm Water Master Plan is not intended to address drainage problems or deficiencies for specific tax lots, in this instance it appears that the cause may be due to a high hydraulic grade

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[82] Storm Water Master Plan (Draft) (November 1, 1999), at 2.
[83] Storm Water Master Plan (Draft) (November 1, 1999), at 12.
[84] Storm Water Master Plan (Draft) (November 1, 1999), at 12.
[85] Storm Water Master Plan (Draft) (November 1, 1999), at 12.
[86] Storm Water Master Plan (Draft) (November 1, 1999), at 12.
[87] Storm Water Master Plan (Draft) (November 1, 1999), at 12.
[88] Storm Water Master Plan (Draft) (November 1, 1999), at 12.
[89] Storm Water Master Plan (Draft) (November 1, 1999), at 12.

line of the nearby detention pond. Long term solutions may require basin-wide storm sewer improvements.[90]

There have been a limited number of publicly-funded projects to improve existing drainage facilities to a modern standard sufficient to accommodate flows associated with a 25-year storm.[91] Similarly, there are relatively few detention or treatment facilities of the kind now required by USA;[92] few of the existing stormwater system components meet current design standards and numerous local areas are undersized, resulting in frequent localized flooding from intense storms.[93]

Recently constructed residential subdivisions have been developed using piped storm sewers, concrete catch basins, and manholes. Since North Plains falls under the jurisdiction of USA, water quality treatment and detention facilities were included in the design and construction of recent developments. There are some additional storm sewer improvements scattered around the City, but most are undersized with respect to current design standards.[94]

Industrial property at the East end of the UGB was annexed into the city limits in 1996. Shortly after the annexation, the property owners formed the East Local Improvement District (LID) to construct and pay for infrastructure improvements including a storm water conveyance system. As part of the storm sewer design a hydrologic analysis of the LID properties was prepared and presented in a Preliminary Design Report titled Hydrology and Hydraulic Report, City of North Plains, East Local Improvement District Storm Sewer Design, August 20, 1997. The Preliminary Design report was reviewed and approved by USA prior to beginning construction of the LID improvements. The report and associated analysis determined that on-site or regional detention was unnecessary if the LID properties were served by a dedicated storm sewer sized to accommodate the peak hydraulic load associated with a 25-year storm event discharging directly into McKay Creek at the West Union Road bridge. However, on-site treatment facilities would be required for each site within the LID and the design would be site-specific as the sites are developed. The storm sewer was constructed as recommended in the Preliminary Design Report.[95]

b. Feasibility of Expanding Storm Drainage Facilities/Services—in General

Current USA standards require that new developments (1) detain storm water runoff to insure that runoff magnitudes are at or below their pre-development levels if downstream facilities lack sufficient capacity, and (2) implement water quality treatment. For this reason, even if additional areas are annexed into the City's UGB, it is likely that the proposed facilities will accommodate the associated flows.[96]

As a result of USA's design requirements, detention facilities have been required for most recent developments within the North Plains UGB. USA regulations require detention of all new development unless an upstream and downstream analysis of the receiving stream or drainageway indicates that there is sufficient hydraulic capacity to accommodate projected peak flows. Most of the detention facilities constructed in North Plains serve individual properties or subdivisions.[97]

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[90] Storm Water Master Plan (Draft) (November 1, 1999), at 12.
[91] Storm Water Master Plan (Draft) (November 1, 1999), at 2.
[92] Storm Water Master Plan (Draft) (November 1, 1999), at 2.
[93] Growth Alternatives (April 21, 1997), at 2; Infrastructure Report (March 3, 1997), at 3.
[94] Storm Water Master Plan (Draft) (November 1, 1999), at 11.
[95] Storm Water Master Plan (Draft) (November 1, 1999), at 11.
[96] Storm Water Master Plan (Draft) (November 1, 1999), at 1, 9, and 17.
[97] Storm Water Master Plan (Draft) (November 1, 1999), at 1, 2, 11, and 12.

In addition to the improvements aimed at correcting specific system deficiencies, the City will eventually implement a citywide system of improvements identified in the City's master plan. Constructing new storm sewers to the standards and configurations identified in the master plan will allow the City, over time, to replace existing aging and inadequate facilities in a manner that enhances the values of properties in North Plains.[98] The City anticipates that water quality treatment facilities will be required regardless of what geographic area is to be developed in order to maintain the drainage-way water quality.

c. Feasibility of Storm Drainage Expansion in North Area

The North/NorthEast expansion area contributes to the existing drainage system within North Avenue and (ultimately) McKay Creek. McKay Creek remains a major drainage course with a defined flood plain and channel capacity. The development of the expansion areas to the North can accommodate retention and detention facilities, if required in order to ameliorate the capacity constraints of the particular existing pipe systems or downstream facilities on McKay Creek.

The Westerly portions of the North expansion area drain into the unnamed tributary of McKay Creek. - a drainage course known to have flooding occurrences at major crossings (such as Gordon Road) as well as properties downstream within the existing City. Extensive stormwater facility improvements would be required within the existing City in order to meet USA's minimum capacity standards and prevent negative impact from existing surface runoff. Further improvements would be required in order to accommodate additional surface runoff that would occur with the development of the West expansion area. The provision of detention or retention within these particular expansion areas will not by themselves resolve the inadequacies of the existing storm drainage facilities.

Storm drainage in the North expansion area could be developed using on-site detention. The existing storm drainage system within the City limits needs to be upsized to meet current conditions. The City's Storm Water Master Plan refers to the use of on-site detention to eliminate substantial upsizing and to accommodate additional service area within the exiting City limits.[99] .[100] Thus, it is feasible to provide storm-water facilities in the North expansion area without increasing the demand on the existing drainage systems or impairing other properties in the existing City limits or surrounding area.

d. Feasibility of Storm Drainage Expansion in South Area

Storm drainage in the South follow existing drainage patterns. Most of the South Expansion area drains to the North and middle of the site, with the lowest point in the expansion area being located in the vicinity of the Northeast end of the Air Acres airfield and 316th. The most Southwestern portion of the site drains to the west, and the eastern most portion of the site (located east of Glencoe Road) drains to the east. Development in the South Expansion area would be required to provide on-site storm water runoff detention of to limit flow quantities under Highway 26.

Currently, there exists a culvert under Hwy 26 which is capable of carrying limited quantities of storm water runoff. However, that facility could not support the increased flows associated with urbanization to the South. In addition, the cost associated with upgrading this culvert would be prohibitive, and ODOT and USA would not likely support such an expansion in any event.

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[98] Storm Water Master Plan (Draft) (November 1, 1999), at 27.
[99] UGB Expansion (October 4, 2000), at 3.
[100] UGB Expansion (October 4, 2000), at 4.

The City concludes that if the South expansion area plans can be modified to support on-site drainage, no upsizing or modification to the existing City or ODOT storm system is required.[101] Otherwise, the provision of adequate storm-water drainage to the South is questionable.

e. Feasibility of Storm Drainage Expansion in East Area

This area discharges directly to McKay Creek, and, unlike other areas, remains unaffected by the inadequacy of existing facilities. Adequate and orderly provision of storm drain facilities can be provided as development occurs through stormwater quality facilities and downstream analysis and impacts of the McKay Creek flood plain.

Storm drainage would use existing lines in West Union Road and new facilities which would direct runoff to McKay Creek. Storm drainage improvements in the East area could include detention as proposed in the City's Storm Water Master Plan.[102] Thus, it is feasible to provide Storm-water facilities in the East expansion area without increasing the demand on the existing drainage systems or impairing other properties in the existing City limits or surrounding area.

f. Feasibility of Storm Drainage Expansion in West Area

The West expansion area drains to the unnamed tributary of McKay Creek - a drainage course known to have flooding occurrences at major crossings (such as Gordon Road) as well as properties downstream within the existing City. Extensive stormwater facility improvements would be required within the existing City in order to meet the minimum capacity standards and prevent negative impact from existing surface runoff, and further improvements would be required in order to accommodate additional surface runoff that would occur with the development of the West expansion area. The provision of detention or retention within these particular expansion areas will not resolve the inadequacies of the existing storm drainage facilities.

g. Feasibility of Storm Drainage Expansion in a Combined North/East Area

A combined North/East expansion can be done using existing facilities. Some upsizing to existing facilities inside the existing UGB may be required, if on-site detention is not used. The North/East growth option presents the most feasible and orderly development of storm drainage facilities, since the East site and the North site drain directly into McKay creek. Nonetheless, if on-site storm detention facilities are required, these can feasibly be provided. In either event, storm drainage would use existing lines and new facilities would include detention as proposed in the City's Storm Water Master Plan.[103]

h. Conclusion

With regard to storm water drainage, the City finds that all of the potential sites can potentially be developed with on-site stormwater drainage facilities, in order to minimize the or negate the impact to downstream properties. Nonetheless, the North and East expansion areas are the best alternatives because their stormwater runoff flows directly into McKay creek, thereby avoiding the unknown tributary, which experiences more flooding and

5. Transportation

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[101] UGB Expansion (October 4, 2000), at 5.
[102] UGB Expansion (October 4, 2000), at 4.
[103] UGB Expansion (October 4, 2000), at 4.

The City is currently considering a Transportation System Plan (TSP), which is incorporated herein by reference. The TSP shows it is feasible to provide transportation infrastructure to the North/East expansion area.

a. Existing Transportation Facilities/Services

The City's and County's major collectors, Glencoe Road, West Union Road, Gordon Road, North Avenue, and Commercial Street, are intended to carry traffic from the City to the Sunset Highway or the County's road system. All of the major collectors have posted speeds of 45 mph within the North Plains city limits (except for Commercial Avenue, which has a posted speed of 35 mph), and most operate under the Basic Rule outside the City. With the exception of Glencoe Road, which has sidewalks and a shoulder bikeway nearby to a few recent developments, no major collectors have sidewalks, bike lanes, or on-street parking.[104]

The City's minor collectors, Main Street, Hillcrest Street, Pacific Street, and Highland Court, are intended to carry traffic from local streets to major collectors. All have posted speeds ranging from 25 to 35 mph. No minor collectors have sidewalks, bike lanes, or on-street parking.[105]

As of early 1997, all eleven intersections within the City operated at acceptable levels of service.[106] With the exception of the Highway 26/Jackson School Road intersection and the Hwy 26/Glencoe interchange, all thirteen North Plains-area intersections within Washington County jurisdiction also operated at acceptable levels of service.[107] Since 1997, safety improvements to Jackson school Road have been funded under ODOT's current STIP, making this an intersection for which it is feasible to determine will operate in an orderly and efficient manner.

The Glencoe interchange currently requires improvement. Existing deficiencies exist at the interchange, resulting in Level of Service (LOS) E and F at the intersections eastbound ramps at the peak hour. There is an adequate level of service at the western ramps. Eventually, this interchange will need to be reconstructed.

b. Feasibility of Expanding Transportation Facilities/ Services—in General

For certain identified intersections in proximity to the proposed expansion areas,[108] a projection of year 2015 "background" conditions (*viz*, conditions which assume only growth external to the City and unrelated to any UGB expansion) reflects that the Highway 26/Jackson School Road interchange, the Highway 26/Glencoe Road interchange, and the Glencoe Road/Beach Road interchange will all deteriorate to failing levels of service as a result of

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[104] Kittelson & Associates, Inc., "*North Plains Neighboring Cities Project Summary of Existing Conditions*" (hereinafter "Summary of Existing Conditions") (January 3, 1997 / March 5, 1997), at 4.
[105] Summary of Existing Conditions (January 3, 1997 / March 5, 1997), at 4.
[106] Summary of Existing Conditions (January 3, 1997 / March 5, 1997), at 5-6.
[107] Summary of Existing Conditions (January 3, 1997 / March 5, 1997), at 5-6.
[108] The intersections evaluated for Year 2015 transportation conditions comprise:

Highway 26 Eastbound / Jackson School Road interchange;
Highway 26 Eastbound / Glencoe Road interchange;
Commercial Street / West Union Road / Glencoe Road intersection;
Glencoe Road / Beach Road intersection;
Highway 26 Westbound / Glencoe Road interchange.

Study Area Evaluation (April 21, 1997), at 10.

background traffic alone unless mitigation can be implemented. However, the only intersection where improvements are currently funded to avoid such failures is at Jackson school road.[109]

Mitigation in the form of a traffic signal will be needed at the current four-way stop—controlled Commercial Street/West Union Road/Glencoe Road intersection. This mitigation will be required for all of the proposed expansion areas except the East area.

With the recommended mitigation, the comparative levels of service and volume/capacity ratios for the study intersections/interchanges by the year 2015 would be as follows:

Intersection	Mitigation	Proposed Expansion Area LOS and V/C Ratio						
		1997	Back-ground	North	South	East	West	North West
Unsignalized Intersections								
Highway 26 EB / Jackson School Road	None	D (0.16)	F (0.86)	F (1.28)	F (1.28)	F (1.72)	F (1.28)	F (1.28)
Highway 26 EB / Glencoe Road	None	D (0.09)	F (*)	F (*)	F (*)	F (*)	F (*)	F (*)
	Traffic Signal / NB Right-Turn Lane / SB Left-Turn and Through Lanes			B (0.70)	B (0.71)	B (0.69)	B (0.69)	B (.70)
Commercial Street / West Union Road / Glencoe Road	None	A (0.49)	B (0.66)	F (1.22)	F (1.50)	C ** (0.90)	F (1.19)	F (1.22)
	Traffic Signal / WB Left-Turn Lane			C (0.94)	B (0.78)	**	B (0.78)	B (0.84)
Glencoe Road / Beach Road	None	D (0.21)	F (1.10)	F (1.39)	F (7.50)	F (1.45)	F (1.30)	F (1.52)
	Traffic Signal / SB Through Lane			***	B	***	***	***
Signalized Intersections								
Highway 26 WB / Glencoe Road	None	B (0.64)	F (1.41)	F (1.89)	F (2.50)	F (1.82)	F (1.68)	F (1.90)
	WB Left-Turn Lane / NB Left-Turn Lane			C (0.79)	C (0.88)	C (0.94)	D (0.76)	D (0.82)

(Source: Kittelson & Associates, Inc., "*North Plains Neighboring Cities Project Study Area Evaluation*" (April 21, 1997), at 10 [with "South" and "East" columns reversed for consistency].)

* = no capacity available

** = assumes connection to Pacific Street; otherwise, LOS F (1.53) unmitigated and LOS B (0.88) mitigated

*** = no mitigation recommended since signal warrants not met

In response to these increased impacts, the proponents of the West expansion area argued that the West area can be accessed by the Dersham Road interchange. They further argued that the Dersham Road interchange provides the only viable, long-term alternative for accessing the West Area, and to a lesser extent, the South and North Areas, from the Sunset Highway. The proponents of the West expansion area also argued that the West area has the least impact on the two limited freeway intersections from the Sunset Highway - Glencoe Road and Jackson School. The proponents of the West noted that Dersham Road interchange will operate at "LOS C," without major improvements. They further stated that if the West area is selected, that the need

[109] Study Area Evaluation (April 21, 1997), at 9-10.

for improvements to the Glencoe Road and Jackson School intersections would be delayed and mitigated. Thus, these proponents argued that the Dersham Road access would delay requirements for improvements to these intersections and would provide a 'safety valve' in case funding is not available for Glencoe Road and Jackson School interchange improvements.

However, increased usage of Dersham road would cause its current LOS rating to fall dramatically, and would trigger the need for additional improvements to that interchange. Since there are no current plans to upgrade Dersham Road, the City does not believe it to be a viable alternative. If funding is not available to upgrade Glencoe Road, it is exceedingly likely that funding for Dersham Road would also not be available. Finally, since the majority of traffic originating in the City of North Plains travels to the East and South, the Dersham Road interchange is not well located as a primary access route to and from the City.

Proponents of the South expansion area have argued that the South expansion area has no worse transportation disadvantages than do any other area. However, ODOT differs with the South expansion area proponents. Specifically ODOT stated:

> "It is recognized that the South Study area would direct future development to an area designated by Washington County as Exception lands. However, from a transportation planning perspective, the Steering Committee cannot support the South growth scenario. US Highway 26 would bisect the future growth in this scenario, making North-South connections extremely difficult. It would also have the greatest direct effects on the long-term functioning of the highway. Experience elsewhere in the state indicates that development on both sides of state highways ultimately adversely affects travel times and results in requests for improvements such as overpasses, signalization, pedestrian cross-walks, etc."

Letter from Timothy Wilson, ODOT, July 11, 2000

The North/East alternative is the preferred alternative and the City determines it is feasible to establish an orderly and efficient transportation system to serve this area if urbanized to serve the needs of the City in 2021. West Union Road, which is designated as one of the City's main transportation routes in the infill and downtown revitalization policies, will provide an alternative transportation route that the City foresees developing over time and connecting traffic to Shute Road.

C. Factor 4: Maximum Efficiency of Land Uses Within and On the Fringe of the Existing Urban Area

Goal 14, Factor 4 requires consideration of the "[m]aximum efficiency of land uses within and on the fringe of the existing urban area." Urban services already exist to serve much of the East and North to a large extent as explained under Factor 3 above. With regard to the East expansion area, the City has, through an LID, established urban services already in this area adequate to accommodate the expansion needs as well as the industrial and commercial land that exists within the UGB/existing City in the Eastern area—out to Jackson School Road. Expanding to the East simply allows efficient utilization of those urban uses already established there, increasing the efficiency of utilizing this area for the City's urbanization needs. Moreover, the larger population base added to the City in the area to the North/East provides the financial basis for a large enough city to finance needed infrastructure improvements for the existing City, spread over a large enough area to connect the City in an orderly, efficient way that promotes an efficient land use pattern that will build on the strengths of the existing City.

The East as a direction of growth allows the City to infill its existing City, which extends in a finger to Jackson School Road. Expanding to the East will connect this important part of the City to the rest, completing the existing pattern of development into a pattern of efficient urbanization at a pedestrian scale.

The particular location to the East, containing the lowest quality agricultural soils that still maintains a connection to the Eastern finger of the City as shown on the soil survey provided in the TGM Study. The area of land to the North/East preferred for urbanization is also able to achieve maximum efficiency under Goal 14, Factor 4 because these areas lack development constraints that typify the South and the West.

In the City's proposed infill and redevelopment and downtown revitalization policies, also adopted by the City as part of Work Task 4, the City establishes the manner in which it will implement intensification of uses within the existing UGB through rezoning or redevelopment to achieve additional densities. *Turner v. Washington County*, 8 Or LUBA 234, 258 (1982).

In all, providing land for urbanization to the North and East will result in a net improvement in the efficiency of public facilities and services in the adjoining areas in the existing UGB because it will enable upgrading and utilizing existing urban infrastructure. It also maximizes the efficiency of the City's urban form, creating the compact walkable community, consistent with citizen input, the desire to maintain a small town feel and a rural atmosphere.

The City also notes that as a general rule, it is often efficient to extend urban development into areas where development has already begun, some urban services already exist, and additional services are planned. Here, the South freeway exception area while developed, does not have urban services such as water and sewer and is already developed with land use patterns that are contrary to the urban form which marks the City's livability needs described in the TGM study and herein. Also, restrictive use covenants and an airstrip limit development to the South freeway exception area. On the other hand, the East expansion area already has new, adequately sized urban infrastructure available to serve any UGB expansion in this area. Moreover, the North expansion area is located next to existing urban infrastructure and is situated in such a way as to make urban infrastructure extension efficient.

As noted under Factor 3, the costs associated with the provision of urban services favor expansion to the North and East. Certainly, an analysis of the costs associated with the provision of public services to a site is important to determining the development pattern that is the most efficient under Goal 14, Factor 4. The cost of service is an important consideration in evaluating the efficiency of land uses, because measuring cost is one way to measure efficiency.

D. Factor 5: Environmental, Social, Energy and Economic (ESEE) Consequences

Accordingly, this analysis evaluates comparatively the ESEE consequences of the four alternative directions of growth as a predicate to a UGB expansion, and then summarizes benefits from expanding the UGB in the directions selected. As noted in other parts of these findings, the direction selected, is the direction of growth recommended unanimously under the TGM Study.

1. ESEE Consequences Analysis of the Four Alternative Directions of Growth

a. Environmental Consequences

The environmental resources to protect were determined by, among other things, examining the Washington County Rural/Natural Resource Plan in the vicinity of North Plains. Specifically, the Count's **'Significant Natural Resource Plan'** was reviewed for mapped resources in the vicinity of the UGB expansion options.. For purposes of this evaluation, the county's inventory is an acknowledged source document for the City to use to determine environmental consequences of urbanization within the County.

In the county's plan, there are three categories of Significant Natural Resources noted in the potential expansion areas: Water Areas and Wetlands; Fish and Wildlife Habitat; and Historic and Cultural Resources.

The location of the county's mapped Significant Natural Resources were overlaid onto the North Plains Direction of Growth Alternatives Map and presented to the Planning Commission. The resources mapped include: 'Water Areas and Wetlands', described as 100-year floodplain, drainage hazard areas and ponds (excluding those already developed; 'Water Areas and Wetlands that are also Fish and Wildlife Habitat'; and 'Historic and Cultural Resources', including sites, structures, objects and buildings. Historic buildings and structures are protected by regulations in the county's Historic and Cultural Resource Overlay District. This presentation map showing the outcome of this analysis is in the record of this work product.

In respect to the location of these resources they are viewed as an asset to the City to have within its potential planning area. None of the resource areas are an impediment to expansion of the City in any of the growth area alternatives. Some of the county's inventoried significant resources are located in the cardinal directions for growth, but none are located on the expansion lands chosen for eventual UGB amendment. In the cardinal directions, McKay Creek stream and riparian area are in the City's general eastern direction. The identified historic and cultural resource of the historic Glencoe is to the North and East.

The City's parks master plan and the Washington County Goal 5 program, identifies McKay Creek as an important amenity to be protected over time. McKay Creek is not included in the proposed expansion area, but it is within the eastern direction of growth established in the TGM Study, the City's decision under periodic review and in these findings. The eastern direction of growth enables the City to enter into an intergovernmental agreement with Washington County to create this area as a mutual area of interest. It also allows the City to plan over the long planning term for protection of the riparian resource. Additionally, the North and East alternative is consistent with protection of McKay Creek because it and its riparian area can be integrated as both a county and City amenity in the county's and City's parks planning for both the rural and the urban population. It is feasible to grow to the North and East and institute measures to protect these important Goal 5 amenities.

Regarding potential wetlands located in the cardinal eastern direction, they are identified as nonsignificant on the inventory and have no appreciable impact on the proposed expansion area which includes none or almost none of these areas. To the extent that there are insignificant wetlands in the expansion area, there is ample room for mitigation, as necessary. We note that mitigation can take place outside the UGB. No wetland in the proposed expansion area makes it infeasible to expand the City's UGB as proposed in this decision and the TGM Study.

To the north east of the existing City is the exception area for the Old West Union Road town of Glencoe. This exception area is partially included in the proposed UGB expansion under the North East alternative. Including a portion of this enables the City's citizens as it enables the City to protect and to integrate this historic town into the community framework of North Plains for the next 20 years.

The Eastern Direction of Growth therefore facilitates cooperation with Washington County for the planning for and protection of the McKay Creek natural resources in advance of t UGB amendments and City annexations.

Growing to the east is consistent with the state's environmental goal of protecting the best quality agricultural land. The land to the east of the City and across from the City's industrial area includes the least productive agricultural land and the lowest soils classifications for agricultural use as compared to any of the agricultural land in any of the four cardinal directions under study for potential UGB expansion.

Expansion to the North will create the fewest new impacts on agricultural uses. Because the North side of the City already has in interface between residential and agricultural uses, expansion in that direction will simply move the location of the interface. Agriculture uses to the North are also out-of-direction from increased North Plains traffic, whose major destinations will be downtown or to the east industrial area or to the freeway located to the south..

We note that that the urbanization plans for the south freeway exception area presented to the City include urbanization of land zoned for EFU and that has no exception to Goal 3. This land in the south is of an agricultural soils capability class that is greater than the lands proposed for urbanization in the east. The East expansion area contains the only Class IV soils in any of the potential expansion areas.

We also find that, for reasons detailed elsewhere in these findings, the South Exception area would result in increased Vehicle Miles Travelled (VMT). This would cause environmental degradation in the form of decreased air quality, and more impervious surface to be created for additional transportation facilities.

The environmental consequences of including the land to the east and north are positive and favor the inclusion of this area in the City's UGB.

b. Social Consequences

Social consequences vary across the proposed expansion areas.

Expansion to the North and East would have the most favorable social consequences. The North and East best meet the City's livability objectives, and will help create a compact, walkable community, with a vital downtown core, and mixed-use employment and housing district to the East. Expanding to the West would avoid the negative consequences of expansion across the Freeway, but would create situation where the housing stock would be separated from the downtown area by the existing industrial uses on the west side of the City.

The South Freeway Exception area has unique and profound adverse social consequences that are significantly more adverse than in the other cardinal directions of growth.

- The South Area has developed as an entity separate from the remainder of the community of North Plains. The South Area includes Air Acres, a developed subdivision built around an airstrip, as well as a number of "rural residential" lots east of the subdivision. Air Acres, in particular, is an existing community that was created as separate and apart from the remainder of North Plains as a safe location for an airstrip. The area has by design and by virtue of Highway 26, few direct or convenient, and auto only, access to the City of North Plains. There is limited community interaction due to the barrier created by Highway 26.

- The area in the south is an exception due in part to the airstrip and the homes already developed around it. There are also rural industrial and highway commercial uses in the area. Glencoe Road to the south is the major western access for heavy urban traffic from Hillsboro, Cornelius and Forest Grove. This traffic is a source of congestion to the South and contributor to highway commercial uses. New residences in the South Area would necessarily be located near the airstrip. Detrimental impacts upon such future residences include aircraft noise and other hazards of airport operation. Encroaching development would generate complaints that eventually could result in limits on the use of or closure of the airstrip. Residents in the Air Acres Subdivision have purchased homes with access to the airstrip and full appreciation and knowledge of potential hazards. Many of the existing residents have hangers with aircraft that utilize the airstrip. Future residents in higher density housing would not have access to the airstrip or aircraft that could be hangered nearby. Theirs would be an existence not by design integrated into airstrip living, but rather forced into coexistence with it. While existing residents are a part of an airstrip community, new residents in high density urban living would have no relation to the airstrip, appreciation of its dangers and risks, and would be placed in harms way not because of the airstrip, but in spite of it. The risks of injury by placing high density housing in a low density, designated airstrip community are great.
- The South Area is separated from the community of North Plains by Highway 26, which provides a barrier that is insurmountable for daily, multi-purpose and multi-modal uses, especially by children and youth. Contact between "North Plains" and "South North Plains" is proposed by the prospective developer of "South Plains" to be improved by a pedestrian over-crossing of Highway 26, an expensive proposition for a small community with only theoretical benefits. The livability objectives of North Plains are not promoted by creating a town with a major barrier through its heart. Forcing residents of "North Plains" and "South Plains" to cross the freeway in a pedestrian cage or over the existing overpasses by foot, bicycle and motor vehicles does not eliminate the functional separation and disconnection the freeway imposes. The City notes that other communities with major highways that separate them now must take remedial actions to repair the breach that North Plains can avoid.

Social consequences of urbanization in the South freeway area that nearly doubles the City would isolate this area from the rest of the North Plains community, not only causing transportation problems as ODOT explains, but also other serious social disconnects. Residents would be required to travel North across the highway to visit friends, send children to school and access social and commercial services and to participate in other community activities. With regard to schools, if a school was not located South of the freeway, school children residing in the South would be required to be bussed to schools located North of the freeway. Conversely, if a new school was situated to the South freeway exception area, any utilization by children in the rest of City of North Plains to the North, would be required to be bussed to any such new South school. This is because school policy does not favor authorizing or forcing children to walk across a freeway overpass to a school. The freeway would disconnect the citizens in these and other less tangible ways. It is plain that the South freeway exception area is not conducive to a positive social environment for the City's citizens, present or future. This problem does not exist in the North, East or West alternative areas.

- The expansion areas to the North, West and East involve expansion onto agricultural land, with a few home sites. The City also notes that the developer's plans for expansion in the south also involves development of land zoned EFU (agricultural land), which contains prime agricultural soils. The west, east and north expansion proposals do not have existing rural communities that would be adversely impacted in the same or similar ways. On the

other hand, the proposal for expansion to the South would adversely impact the existing Air Acres community.

- The chief social consequence for expansion to the North, West and East is freedom from the formidable barrier of State Highway #26. These areas, and particularly the North and East, can be easily integrated into the City's existing communities and street system and become new neighborhoods within the larger City. These areas can accommodate both mixed housing types and mixed uses at a scale necessary for developing complete and livable communities.

c. Economic Consequences

Economic consequences vary across the proposed expansion areas.

- To the extent that a livable, walkable community has positive economic consequences, and we find that it does, the North and East option best serve this objective. The North expansion area will create positive economic consequences for downtown, by creating sufficient density to support downtown businesses.

- The City would provide commercial and industrial opportunities in any direction. However, expansion to the North, East and/or West would allow better integration with existing industrial and commercial uses.

- We have found elsewhere in these findings, and find here that costs to connect the South Area to public facilities would be greater than for any other expansion area. See Findings on Goal 14 Factor 3-7. Sanitary sewer is primarily provided by gravity flow for the existing community and would require a pump system for the South Area. Water would require additional looping to maintain appropriate flows. Transportation connections would be hampered by the barrier of the state highway. A pedestrian over-crossing has been proposed, without analysis of the potential benefit given the likely cost (i.e. would people be likely to use the new over-crossing).

- Residents south of Highway 26 have made an investment in Air Acres Subdivision and its airstrip that is potentially threatened by an increase in the density of housing proposed to surround the airstrip. No other North Plains alternative expansion area faces a similar potential loss of economic value for owners of existing properties.

- Buildable land in the South Area is fragmented by existing residential, industrial and airstrip uses, making is impossible to achieve the number, mix and density of needed residential dwellings and to create a complete, mixed-use livable community. The dwellings that can be built in the south would be severed from the city proper and they would neither augment an existing North Plain community nor create a new, livable community.

- An expansion to the North and East supports the City's commitment to serve the industrial land on the north side of West Union Road with water and sewer. Residential development in the expansion areas would also facilitate a looped water system. Each of these circumstances allows for more economic provision of public facilities and services.

- The South Area includes a filbert orchard, which is a higher value crop than the field crops in the alternative expansion areas. This production would be lost to development of the South Area. The south expansion area also includes a viable seed processing facility that is very important to local grass seed growers. Forcing this facility out of the area with urban development would be costly to the owner/operators and damaging to the agricultural enterprise. And the task of achieving compatibility between this heavy industrial activity and a residential community (noise, dust, truck traffic, etc.) would be difficult and failure to do so would likely affect residential values and commercial investments. See Johnson/Gardner Report.

d. Energy Consequences

The South Area likely would have greater energy consequences than any other possible expansion area for two reasons:

- The South Area is not conveniently located to the remainder of the community. Even with the proposed pedestrian over-crossing of Highway 26, it is more likely that interaction with the commercial and community aspects of North Plains would require a vehicle trip due to the barrier created by the elevated state highway.
- Energy consequences are more adverse in the South simply because it is served by only two accesses to the city proper, which means that many local trips (to schools, downtown, jobs, parks, etc) will be indirect and therefore of greater distance. These distances, together with the lower safety conditions, reduce alternative travel modes like walking and bicycling. And the inadequate access to downtown would act as a deterrent to downtown revitalization. Auto-dependency is a significant issue given the City's and State's planning programs that respect the building of pedestrian scale, walkable and compact communities. The South freeway exception area does not further these objectives and is decidedly contrary to them. The energy consequences of each of the alternative directions of expansion are roughly equivalent, although the West expansion creates a less efficient long and narrow urban form. It also favors orientation to the highway rather than the community, which is an encouragement to more travel.

- The North, East and West would have generally similar energy consequences. Each area could have the same relative mix of uses, and each is located near existing portions of the City. However, we find that the North/East option would have the most salutary effect on energy consumption. The North/East option would result in the best mix of housing near the commercial downtown core, and East Industrial Area. We find that this would result in fewer overall automobile trips, and thus less energy consumption than any other option.

e. Air Acres Subdivision and Airstrip: A Case of Unique ESEE Consequences that result in adverse impacts that are "significantly more adverse than would typically result from the same proposal being located" in other areas

The City acknowledges adverse environmental, social, economic and energy effects that would likely occur if urban levels of residential growth are placed in close proximity to the existing airport. First, noise and vibration conflicts caused by the aircraft will adversely impact residents of the area. Second, the chance of aircraft mishap has an increased intensity of injury and property damage if the area immediately surrounding the airport is urbanized. Third, the

runway is inconsistent with children playing in their yards, crossing the runway and/or using the runway as a play area.

The way the runway is laid out, it is an imposing physical barrier to connecting the neighborhoods that would develop in the South. This increases the chances of pedestrians, including children cutting across the runway to reach others in their South freeway community. The presence of the airport would require the City to shoulder an increased burden to plan around the airport and protect citizens as best as it can. This would require the City to incur costs that could otherwise be directed to solving more global City issues than constantly having to address the compatibility of the runway.

State and local laws regulating aircraft and airports are generally preempted to the extent they are inconsistent with federal law. *City of Burbank v. Lockheed Air Terminal, Inc.*, 411 U.S. 624, 93 S. Ct. 1854 (1973). *City and County of San Francisco v. FAA*, 942 F.2d 1391 (9th Cir. 1991), *cert. denied* 503 U.S. 983, 112 S. Ct. 1665 (1992).

Oregon statutes require local governments to protect and encourage existing airports and existing and potential future airport uses. *See* ORS 836.600, *et seq.* For example, local governments are required to identify private airport uses in their comprehensive plans. ORS 836.608(2). State policy is "to encourage and support the continued operation and vitality of Oregon's airports," including all of the different types of aircraft uses listed in ORS 836.618(2).[110] Local governments are prohibited from:

(1) Imposing limitations on the continued operation of existing private airports;

(2) Preventing the growth of uses described in ORS 836.816(2) at an existing private airport; or

(3) Imposing limitations on the operation of an existing private airport contrary to those uses approved by a local government prior to Jan 1, 1997.

See ORS 836.608(3)(a); ORS 836.608(4); *see also* ORS 836.608(5).

The most prudent way to protect the airport as well as future citizens is to minimize new residential uses close to the airport.

In addition, as pointed out in a memorandum dated June 21, 1999, ORS 836.600, *et seq.* places a number of obligations on local governments to ensure the continued viability and growth of airports. *See* Sullivan memorandum at pp. 4-5. This memorandum notes that local compliance with these laws require additional planning and resources that may be better directed to other important governmental priorities, including enforcement of the compatibility and safety rules adopted by LCDC.

Local governments are required to adopt "Airport Safety Overlay Zones" to promote aviation safety by prohibiting structures, trees and other objects of natural growth from penetrating airport "imaginary surfaces"[111] and "approach surfaces"[112] OAR 660-013-0070. For

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[110] *See* ORS 836.600; OAR 660-013-0030(2).

[111] The term "Imaginary surfaces" is defined as "surfaces established with relation to the airport and to each runway based on the category of each runway according to the type of approach available or planned for that runway. The slope and the dimensions of the approach surface applied to end of a runway shall be determined by the most precise approach exiting or planned for that runway end." *See* Exhibit 2 to OAR Ch. 660, Div. 13.

private airports, the "approach surface" has the shape of a wedge or a doorstop and has dimensions of 450' to 2500' with a rise of 1 vertical foot for every 20 horizontal feet. *See* Exhibit 2 to OAR Ch. 660, Div 13. These requirements are in addition to the requirements that local governments define "runway protection zones" for near public and privately owned public use airports. OAR 660-013-0080. In this case, application of the Airport Safety Overlay Zone removes from potential development a wide area which the proponents of South expansion include their concept plan for future urban uses.

State statutes also require the LCDC and DLCD to establish compatibility and safety standards for uses of land near public and privately owned public use airports identified in ORS 836.610(1). Although the statutes and rules do not require local governments to apply these rules to privately owned airports, both the statute and the administrative rules recognize that local governments are allowed to adopt land use compatibility and safety requirements that are more stringent than the minimum standards adopted by LCDC. ORS 836.623; OAR 660-013-0080(2).

Urbanization of the South freeway area, would likely require the City to exercise its authority under ORS 836.623 and OAR 660-013-0080(2) to adopt more stringent land use compatibility and safety requirements than the minimum standards adopted by LCDC. The City would likely apply the land use compatibility and safety requirements specified in the LCDC rules for public use airports to the South expansion area, because it believes these standards better protect both the airport and the public from incompatible uses and safety issues.

At page 3 of their submission regarding the airport, the proponents of the South expansion area state:

> "The airport boundary required to be established by ORS 836.608(2) is defined at OAR 660-013-0040 to include areas such as existing and planned runways, taxiways and aircraft storage areas. However, it specifically excludes aircraft storage accessory to residential airpark type development. The Air Acres subdivision is exactly the type of development from which aircraft storage is excluded, and hence, such storage is not a protected use."

This statement misreads the applicable statutes and administrative rules. OAR 836.608(2) states that "local planning documents shall establish a boundary showing areas in airport ownership, or subject to long-term lease, that are developed or committed to airport uses described in ORS 836.616(2)." This requirement applies to all private use airports and privately owned public use airports not listed in ORS 836.610(3) and would, therefore, include the Air Acres subdivision. This obligation is separate and distinct from the requirements in OAR 660-013-0040(1) requiring a local government to adopt a map showing the location of airport boundaries. This latter requirement applies specifically to airports identified under ORS 836.610(1) and is a separate and distinct requirement from the standards in ORS 836.608(2). DLCD's administrative rules make clear that private use airports are subject to

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[112] The term "approach surface" is defined as "a surface longitudinally centered on the extended runway center line and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of the runway. The inner edge of the approach surface is the same width as the primary surface and expands uniformly to the width of 450 feet for that end of a private use airport with only visual approaches. The approach surface extends for a horizontal distance of 2,500 feet at a slope of twenty to one. " The definition of "approach surface" relies, in turn, on the definition of the term "primary surface," which is defined as "a surface longitudinally centered on a runway. The primary surface ends at each end of the runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway center line. The width of the primary surface is 200 feet for private use airport runways." *See* Exhibit 2 to OAR Ch. 660, Div. 13.

the planning and zoning requirements described in ORS 836.608(2) through (6) and (8). *See* OAR 660-013-0155(1).

In addition, the proponents of the South expansion area mistakenly assume that because a use such as aircraft storage is excluded from the definition of aircraft boundary in OAR 660-013-0040 that it is "not a protected use." *See* letter, p.3 (quoted above). The aircraft boundary, as defined in OAR 660-013-0040(1) is relevant when considering the types of land use regulations for non-towered airports identified in ORS 836.610(1) and determinations of whether commercial industrial manufacturing and other uses can be authorized within an airport boundary. *See* OAR 660-013-0100 and 0110. The term "airport boundary" applies to small airports when considering the types of uses which are appropriate within its "boundaries." *See* OAR 660-013-0155. However, the definition of "airport boundary" does not affect the requirements of ORS 836.608(2) through (6) and (8), and does not determine whether a use is "protected".

On page 4, the proponents of the South expansion area state that the "imposition of such standards [in ORS 836.608(4)] indicates that the state policy towards airports is not preemptive of local regulations but the growth of even existing uses must be consistent with adjacent ongoing uses." *See* letter, dated October 11, 2000, at p.4. However, the statute does not require that growth of existing airport uses must be consistent with "adjacent ongoing uses." The statute requires a local government to consider present "uses on surrounding lands" when determining whether to issue a building permit for a growth of an existing use. Nonetheless, for purposes of an ESEE analysis under the administrative rule, the City must determines the unique adverse consequences of urbanizing to the south as opposed to the other cardinal directions. In selecting the direction of growth that is the most appropriate, the City must consider the potential that the existing airport may expand in the future. These considerations lead the City to conclude that the ESEE consequences of urbanizing the south freeway exception area are significantly more adverse than urbanizing in the other cardinal directions which lack the unique ESEE consequences posed by the south.

Finally, the proponents of the South expansion area state that the Air Field Safety Zone depicted on the figure entitled "Exception Area Capacity Study" in the North Plains 2020 Productivity Analysis dated October, 2000 is incorrect because it does not conform with Exhibit 2 to OAR Ch. 660, Div. 13. The proponents of the South expansion area are correct that the FAA regulations do not apply to this private air strip. However, it is also noted that this is not the equivalent of the City refusing to apply its planning jurisdiction over the South expansion area based on FAA recommended safety zones. The City simply notes that urbanization to the south would require the City to determine the scope of the application of FAA recommended safety zones or more. This reinforces that the City would be forced to address the significant social (which includes safety) and economic consequences associated with urbanizing with an airport at the core of the urban area and to address the significant adverse consequences associated therewith.

On balance, it is determined that it is preferable at the outset to avoid the serious conflicts between the airport and the intense urban development which the city contemplates over its 20 year planning horizon. The conflicts being avoided are harms to the health, safety and welfare of a large urban population in close proximity to an existing airport, protected by CCR's.

f. The Main Implication Arising from the City's Decision on Expansion Areas

The City's decision based on the facts analyzed above is to expand the UGB to the North (about 75 acres) and to the East (about 72 acres). These expansions allow the City to grow from

its existing core outward, to reinforce its down town core and to complement development of its eastside industrial area with mixed-use residential communities. The lands included in these expansion areas do not include McKay Creek and its riparian corridor. This reduces the amount of environmental conflicts in the near-term, but it allows for long-term, cooperative efforts with the county and local property owners to enhance and protect these natural resources. Expanding into these areas also allows the city's planning program that has been underway since 1995 to achieve a milestone and to permit development to move forward expeditiously in a compact manner. It will facilitate aggressive infill and redevelopment within the existing City because the existing City will remain vital and not spread out across the distant freeway. Urban growth in North Plains is directed away from the County's primary area of irrigated agriculture that is critical to the overall agricultural enterprise. The City is spared now and even longer term having to deal with the debilitating consequences of a major highway facility passing through the heart of the City. It also spared the consequence of having its down town core and eastern industrial area languish if City infrastructure and other public and private investments were forced to focus on the distant south freeway exception area rather than on the existing City.

E. Factor 6: Retention of Agricultural Land as Defined, with Class I Being the Highest Priority for Retention and Class VI the Lowest Priority

Goal 14, Factor 6 reads as follows:

> "Retention of agricultural land as defined, with Class I being the highest priority for retention and Class VI the lowest priority."

The Goal 14 factors are to be balanced, and used to determine which potential locations are best suited to meet the land need. No single factor is dispositive. Goal 14, Factor 6, hence requires the City, in its balancing of the five "locational" factors to consider soil capability classifications for the four potential expansion areas. While much of the potential South exception area is in agricultural use, including peach and filbert orchards, the South Expansion area is not "agricultural land" as defined. OAR 660-033-0020(1)(c). Given that Goal 14, Factor 6 looks at Agricultural land not exception land, the South Freeway exception area is not particularly relevant to this factor.

The City reviewed the Washington County Soils Map from the Washington County Soil Conservation Service as well as a map produced by Alpha Engineering Inc. which identifies the various soils in the four cardinal directions, into Soil Capability Classes I through IV. Each of the four potential expansion areas was reviewed for soil capability class. A map showing the various soils types is provided in the TGM Study.

Based on the soil maps, the City makes the following determinations with respect to Goal 14, Factor 6.

- All "agricultural soils" in the four potential expansion areas contain some soils classified as Classes I through III.[113]

- The East expansion area contains the least amount of Class I and II soils and the only Class IV soils within any of the four potential expansion areas. Therefore, the Eastern portion of the potential East expansion area is the most suitable of the

[113] The exception land in the South freeway area is not agricultural land "as defined."

remaining three areas for early inclusion in the UGB from the standpoint of Goal 14, Factor 6.

- The agricultural soils in the North West and South expansion areas contain predominantly Type I and Type II soils, with Type III soils located in some of the low-lying areas.

In sum, of the four expansion areas, the South freeway exception area, while containing important agricultural activities is not "agricultural" land by definition under Goal 14, Factor 6. The land in the South that is zoned EFU is agricultural land that is equivalent soils to those in the West and North. The East expansion area contains the lowest capability soils in the four cardinal directions, while the agricultural and in the South (sprinkled within the exception area), North and West areas each contain similar amounts of Type I, II and III soils. The area of "agricultural land" containing the East productive agricultural soils based solely on an evaluation of Factor 6 is the East. We find no significant different in the agricultural lands in the South, North and West are very similar under the analysis of Goal 14, Factor 6.

However, beyond just soil type is the focus of Goal 14, Factor 6, Goal 14 requires the City to focus on *retention* of agricultural land. Without considering other factors, or whether the South freeway exception area can reasonably satisfy the City's particular identified urbanization needs, this language in Goal 14, Factor 6 would favor the South freeway 'exception" lands. On the other hand, there are important agricultural activities occurring in the South exception lands. These are discussed in more detail under Goal 14, Factor 7, below. The City also notes its concern that a South freeway expansion creates substantial pressure to expand onto nearby agricultural lands, which include important, productive orchards and row crops. Because the South expansion area has the highest cost for public facilities per dwelling unit (*see* Productivity Analysis), there will be pressure to continue to expand beyond the limits of the South freeway exception area in order to amortize the high per unit cost of public facilities. This pressure to expand the size of the South area is contrary to Goal 14, Factor 6 because while it may allow the urbanization of lands not defined under state law as "agricultural lands" it also puts significant financial pressure on the productive agricultural lands to the South to be the site of additional expansions.

F. Factor 7: The Compatibility of the Proposed Urban Uses with Nearby Agricultural Activities

Goal 14, Factor 7 requires an analysis of the "[c]ompatibility of the proposed urban uses with nearby agricultural activities." Statewide Goal 2 requires similar analysis. Goal 2, Part II(c)(4) and ORS 197.732(1)(c)(D). Essentially, this requires the City to analyze agricultural activities potentially impacted by potential UGB expansion areas and compare the compatibility of proposed urban uses with such agricultural activities.

The City reviewed the "Farming Practices Impact Analysis for the City of North Plains Alternative Expansion Areas" (hereinafter referred to as "Impact Analysis"). The Impact Analysis was based on a parcel-by-parcel evaluation of agricultural activities both within the particular cardinal expansion areas and also within a one-mile radius of each of the potential expansion areas as well as extensive interviews with farm experts as to the practices associated with each agricultural activity. These are explained in detail in the Impact Analysis. The City hereby adopts the determinations contained in the Impact Analysis.

The Impact Analysis evaluated each of the four potential expansion areas for impacts to agricultural activities. The South exception area, as briefly explained above, contains significant "agricultural activities" that must be analyzed under Goal 14, Factor 7, even though the land is not "Agricultural land" for purposed of Factor 6.. In this regard, we note that the Impact Study evaluated agricultural activities both inside each expansion area, as well as those in the one-mile analysis area.

Each of the potential expansion areas results in urban growth that potentially impacts agricultural activities in the analysis area. Agricultural activities in the analysis areas of the West, North and East areas are primarily grass crops farmed by dry land farming. Dry land farming occurs with the hay, clover and grass seed production activities. The identified dry land farming operations around North Plains are of relatively low intensity. For example, spraying occurs infrequently and is accomplished with low drift ground spraying methodologies. Also, minimal transportation trips to the field are required as described in the Farm Impact Analysis report (amounting to about 10 trips per year). Each of the areas studied had substantially similar levels of activity connected to the dryland farming. The nature of the activity on the dry land farming areas will not cause unacceptable conflicts with urban development.

With regarding to rhubarb, strawberries, boysenberries, pumpkins, these crops are not currently located inside the East or North expansion area. These activities are however located within one mile of the North and East expansion area as shown on the map attached to the Agricultural Impact Analysis. These crops include the farming practices described in the report. However, as also noted in the report, there are little or no offsite impacts associated with these activities to which mitigation must be employed to such an extent that feasibility is adversely compromised. Thus, whereas blueberries to the South require noise strategies to discourage birds, boysenberries and the other crops do not typically employ this strategy. Similarly, there are no overhead spraying activities that are associated with these crops. Spraying is ground-based application with little to no offsite drift. Accordingly, the farming activities to the East, North and West do not include creating impacts that will create conflicts with urban uses. We note that in the West area there is a peach orchard on Vadias Rd. which employs blower spraying (orchard speed spraying) similar to the spraying activities in the South which do create off site drift and can lead to serious conflicts with urban uses. Accordingly, as noted in the Agricultural Analysis Report, there are fewest conflicts with agricultural activities to the North and East.

There are important nursery activities in the analysis area of the East expansion area. However, these nursery activities do not create impacts beyond the parcel boundaries and there is no proposal to urbanize the nursery. These nursery activities are also separated from the East exception area by distance and topography, as well as Jackson School Road. There are no impacts to the nursery foreseen from urbanization of the East expansion area. Conversely there are no impacts to prevent or interfere with urbanization from the nursery.

The South freeway exception area contains and is nearby to filbert and peach orchards and a significant seed processing factory is located in the South freeway exception area as well. These are significant farming activities with the potential for significant conflicts with urban development. For example, orchards spray pesticides at a higher elevation than the boom sprayers used to spray wheat grass or clover. Orchard spraying, which uses fans to spray into the treetops, is more likely to result in conflicts with urban development due to drifting.

In addition, there is a blueberry farm just across Beach road from the South freeway exception area. To drive birds from their crops, blueberry farmers use a variety of noisemaking methods early in the morning and in the evening, when the birds are feeding. Because the purpose of the devices is to make enough noise to scare birds, mitigation measures are not likely to eliminate the conflict with intensive urban residential uses across the street. The City finds that these noisemaking methods, which are a normal farming practice, will create conflicts with potential residential uses of the South freeway area.

Accordingly, the City finds, based on the Impact Study, that under Goal 14 Factor 7 and Goal 2 Part II(c)(4), Urban Growth Boundary expansion to the North, East or West can occur without unacceptable conflicts between uses. The City finds that any UGB expansion to the South exception area, and to a lesser extent the West, would create a higher likelihood of conflict between agricultural activities and urban uses than expansion to the East or North.. This makes it less feasible for the South freeway exception area to fare well under a balance that includes this factor.

Related to Goal 14, Factor 7 is the concern about putting significant urbanization pressure on important agricultural activities under a UGB amendment. Urbanizing the South freeway exception area puts significant pressure on that area to urbanize. As noted above, within that South freeway exception area is a significant seed processing facility and significant orchard activities. Also, we note that under Goal 14, Factor 5 an evaluation of the economic impacts of any UGB expansion to the agricultural economy in each of the four areas is also warranted.

The City has reviewed a memorandum from Gerald Johnson at Johnson Gardner detailing agricultural production values and redevelopment potential for land surrounding the City of North Plains ("Johnson Agricultural Activities Report"), and adopts the findings contained therein. The Johnson Agricultural Activities Report evaluates the agricultural activities in the analysis area from an economic perspective to determine compatibility of urbanization with agricultural activities in the area.

Because various crops have various values, expansion of the Urban Growth Boundary in different areas will have different economic effects on the farm economy. The Johnson Agricultural Activities Report evaluated crop values per acre both inside each of the potential expansion areas and in the immediate vicinity of the potential expansion areas. The Johnson Agricultural Activities Report concludes that "the average crop value per acre farmed is highest in the South area, at an estimated $1,900 per acre." The East area had the lowest crop value within the potential expansion area at $200 per acre, the West average crop value was $800 per acre and the average crop value to the North was $1,200 per acre. On a per acre basis the peach orchard within the South exception area is the single most valuable crop per acre.

The City finds that a loss of more valuable farmland, particularly orchards, will have a greater negative impact on Washington County's farm economy than the loss of dry land crops like wheat, clover or grass seed. As noted in the Johnson Agricultural Activities Report, the capital investment is higher, and time to obtain a return from orchards is longer. The City finds that this will make it less likely that orchards will be replaced, once they are gone. The loss of orchards will contribute to a loss of the suppliers, buyers, warehouses and other local infrastructure necessary to maintain other farms growing the same crops.

In addition, the South side expansion area contains the Jewett-Cameron Seed Company. The Johnson Agricultural Activities Report concludes that "the facility is a processor and granary for seed crops, and is an important asset to the local agricultural community." The seed facility is the only one of its kind of grass seed processing in the area, and was recently purchased for 1.5 million dollars. Expansion to the South Freeway exception area either expressly contemplates destroying this seed processing factory or putting so much urbanization pressure on it as to force it to be demolished in favor of urban uses. We note that the proponents of the South freeway expansion area submitted a plan slating the area of the seed factory a site for major commercial/retail development. Demolishing the seed processing facility in favor of urban stores eliminates an important agricultural activity for local farmers, increasing shipping costs, vehicle miles traveled, and reduce the profitability of grain and seed crops in the area.

There are no similar activities in either the West, North or East expansion areas. While there are agricultural activities, they are not as important to the agricultural economy as those agricultural activities in the South freeway exception area.

Based on the Johnson Agricultural Activities Report, the City finds that of the four potential expansion areas, expansion to the South freeway exception area has the greatest negative impact on the local farm economy.

G. Conclusion

Regarding the balancing of the Goal 14 Factors, we conclude that the balance favors the 2021 City growing in the directions of the North/East alternative to the extent of each direction accommodating roughly one half of the City's identified land needs over the 20 year horizon.

VIII. CONCLUSION

In summary, the City's land need is twofold. The City has a numeric need to amend the UGB to accommodate a 20 year land supply. The City has a need to ensure that this growth happens consistent with the vision developed by the City Council and the important long-term planning policy developed in the TGM study. North Plains can meet this livability need and become a model of how to create a vibrant, sustainable town. The TGM Study and the Periodic Review process conducted by the City in partnership with the State is a testament to the ability of the existing regulatory framework to assure compliance with the Statewide Planning Goals in a manner that incorporates the community vision of the City.

Hillsboro School District 1J
OFFICE OF THE SUPERINTENDENT

HILLSBORO SCHOOL DISTRICT 1J

3083 N.E. 49TH PLACE, #200
HILLSBORO, OR 97124-5008
TEL: 503.844.1500
FAX: 503.844.1781
WEB: www.hsd.k12.or.us

April 17, 2006

W&H Pacific
Attn: Hal Keever, Office Manager
97755 SW Barnes Road, Suite 300
Portland, OR 97225

Dear Mr. Keever:

Hillsboro School District 1J is interested in negotiating the purchase of approximately ten acres of buildable land in your parcel of property located on the east side of North Plains.

Mr. Ed Hayden of Hayden Group, LLC, represents Hillsboro School District in real estate matters. Please forward all correspondence regarding this matter directly to Mr. Hayden at:

Hayden Group LLC
505 SE Washington Street
Hillsboro, Oregon 97123-4142
(503) 648-6445

Sincerely,

Jeremy Lyon, Ph.D.
Superintendent

JL:cb

c: Ed Hayden
Carlos Pérez, Deputy Superintendent

EXHIBIT C

Revised Land Need Calculations – Per Remand Item No. 3

With a projected population of 4,000 and a persons per household size of 2.5, the required number of dwelling units is 1,600.

Needed Units: 1,600

Units accommodated in existing UGB:

Existing = 637 units
Units provided in Infill / Redevelopment Study = 379 units
Units provided in Mixed Use (C-1 zone) and Upzone = 48 units
Addition of 26 units in Commercial and Industrial zones = 26

Sub-Total = 1,090 units

Units displaced by park need = 28 units

Total net units inside UGB = 1,062

Needed units in expansion area: 1,600 units needed
- 1,062 inside UGB
538 units in expansion area

Area needed for residential in expansion areas:

538 units / 8.4 units per acre = 64 acres

64 acres x 25% gross-to-net = 85.3 acres

Expansion Area Land Need Table:

Use	Net	Gross
Residential	64	85.3*
Commercial	6.25	7.8**
Industrial	0.0	.00
Institutional	10.0	12.5**
School	10.0	11.1***
Neigh. Park	2.6	2.9***
Comm. Park	2.4	2.7***
Muni. Park	20.0	22.2***
Greenway	4.5	4.5****
Total	119.75	149

* Applied a 25% gross-to-net factor
** Applied a 20% gross-to-net factor
*** Applied a 10% gross-to-net factor
**** Applied a 0% gross-to-net factor

Previous Units in : UGB – 976 Expansion Area – 524

Revised Units in : UGB – 1,062 Expansion Area – 538

The previous total was based on 1,500 dwelling units serving a population of 3,750. The revised total is based on1,600 dwelling units with a population of 4,000. The absorption of the additional 100 dwelling units has 86 of the units going into the existing UGB and 14 units into the expansion area.

Acreage Differential:

Use	Task 3 Gross	Remand Gross	+/-
Residential	94.0	85.3	- 8.7
Commercial	7.75	7.8	+ .05
Industrial	.20	.00	- .20
Institutional	12.5	12.5	N/C
School	12.5	11.1	- 1.4
Neigh. Park	3.25	2.9	- .35
Comm. Park	3.0	2.7	- .30
Muni. Park	25.0	22.2	- 2.8
Greenway	5.6	4.5	- 1.1
Total	164.0	149.0	- 15.0

FINANCIAL IMPACT OF PROPOSED ANNEXATION TO NORTH PLAINS

REVISED REPORT
27 June, 2006

Deleted: May 1, 2006

East Property

Submitted to:

City of North Plains
Don Otterman, City Manager

Applicant:

Polygon Northwest
Fred Gast

Prepared by:

Shiels Obletz Johnsen, Inc.
Rick Gustafson

TABLE OF CONTENTS

Attachments

Exhibits

General Information

Owner	Jackson-Union LLC 1440 S.W. Taylor Street Portland, OR 97205
Applicant/Purchaser	Polygon Northwest 109 East 13th Street Vancouver, WA 98660 Tel.: 360-695-7700 Fax: 360-693-4442 Contact: Fred Gast
Applicant's Representative	W&H Pacific 9755 S.W. Barnes Road, Suite 300 Portland, OR 97225 Tel.: 503-372-3600 Fax: 503-526-0775 Contact: Hal Keever
Property Identification	Tax Lot 100 Tax Map 1N2-07
Site Area	24.33 Acres
Requested Approval	Approval to Schedule Annexation Election

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Introduction

This report is a financial impact analysis of the proposed annexation prepared for Polygon Northwest by Shiels Obletz Johnsen, Inc. The applicant, Polygon Northwest, requests annexation application approval resulting in the scheduling of a public vote of the City's electors. The request is to annex the East property totaling 24.33 acres. The applicant's representative is Polygon Northwest.

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The purpose of this annexation request is to incorporate 24.33 acres of the expansion areas recently brought into the City's Urban Growth Boundary (UGB) during the City's Periodic Review process. Three concurrent annexation proposals have been submitted for a total of 72.65 acres. The properties include the Paine tract (23.93 acres), Cropp property (24.39 acres) and East property (24.33 acres). The proposed annexation will provide the City with the opportunity to become self sufficient and achieve the vision as stated in the Comprehensive Plan of being a "complete community that provides a place for its citizens to live, work, shop, have convenient access to schools, and maximizes access to fire, life and safety services."

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Approach

The financial impact analysis is conducted with a conservative approach of identifying a "worst case" growth scenario assumed by an absorption rate of 70 units each year.

This annexation application includes one of three areas proposed for annexation. Should all three be approved, each would develop a proportional share of a total of 70 units per year. For the East Property, this is 27 units per year from 2007 through 2011 and 14 units in 2012 for a total of 149 units. However, should only one or two of the annexation requests be approved, it is assumed that the development schedule of the approved tracts would be accelerated and produce a total of 70 units each year until they reach their total number of planned units.

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Summary

The City of North Plains has effectively planned its future. The financial analysis of the impacts of the proposed growth indicates that the effective planning has prepared the community for this annexation. The services, utilities and transportation access have been planned and developed so that the City of North Plains is able to benefit from the growth revenues provided with the proposed development. There are sufficient revenues to support desired level of services and utilities.

The following financial benefits are projected from the proposed annexation of the area described on Exhibit A:

1. **Police Service:** Police service in North Plains is a critical service that is currently short of funds. The budget for 2005-2006 included a reduction from 3 officers to 2 due to the loss of the serial levy. The proposed annexation will generate additional revenue expanded to support police service. Funding increases were included in the projected budget adding a 3rd officer in 2008-2009, 4th officer in 2009-2010 and a 5th officer in 2011-2012, enabling 24-hour response in

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the community at that time. No additional serial levies were included. This public safety improvement can be accomplished without use of the proposed special levy.

2. **Parks Maintenance:** The parks maintenance budget projection is increased by $12,000 in 2008-2009 in anticipation of development of the new park proposed in the annexation area. This additional cost can be absorbed in the general fund budget.

3. **General Fund:** The General Fund revenues will grow above the inflation rate enabling the community to enhance other services such as library service, redevelopment and police services. The increase in public services and parks maintenance can be absorbed by the proposed growth.

4. **Water Fund:** The SDC revenue projected from the new development will assure sufficient debt coverage for the new water main so that projected rate increases can be delayed and potentially reduced.

The Summary of Financial Analysis is attached (Attachment #1). The table includes the projected General Fund Revenue and Expense for base service. Included in the base service is expansion of the police service to five officers by 2012. The new revenue generated from the property taxes paid by the new properties is sufficient to assure the General Fund has a positive balance.

An estimated 20 acres of new parks will be created in the areas proposed for annexation. North Plains budgeted $59,956 in 2004-2005 for parks maintenance. An increase in maintenance costs ($12,000 per year) is included in 2008-2009 to reflect the new park.

The water revenues from SDC's and water sales are included in the summary report. The bond cost for the new pipeline is estimated to be $225,000 per year. The estimated SDC revenues from the development is just over $215,000 per year and should be sufficient to assure payment of the bond cost for the new pipeline. The water sales are projected to grow at the population growth rate for North Plains. There should be sufficient revenues to enable a delay in projected rate increases. The original rate projections required funds from existing water sales to be used to support debt service. The proposed growth should eliminate that requirement.

Fire service is provided by Fire District 2. Revenues to the Fire District will be increased by $225,000 per year by 2017. North Plains is currently served by a combination of paid and volunteer fire fighters. The additional property tax revenue generated by construction of new homes each year would support North Plains returning to 24-hour staffed fire service. The Hillsboro School District has indicated that they have plans to develop a new school on the East property to keep pace with the growth in the community. The sewer service is adequate for the additional growth.

North Plains' transportation access is sufficient to accommodate the proposed annexation. Kittelson & Associates has prepared a separate report on transportation access. The financial impacts are that City revenues from SDC's and related revenues to support maintenance will increase sufficiently to cover costs.

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Financial Assumptions

Attached is a table of the assumptions included in the analysis (Attachment #2). The approach was to estimate the direct financial impact on North Plains resulting from the development. To that extent, no other development in the period of 2006 to 2018 was included in the analysis.

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1. **Population:** 2005 population of 1,650 citizens.

2. **Projected Development:** For the purpose of this analysis, the applicant projects to add a total of 149 homes at a rate of 27 units per year with the first new homes built in 2007 and continuing to 2012. However, should only one or two of the annexation requests be approved, it is assumed that the development schedule of the approved tracts would be accelerated and produce a total of 70 units each year until they reach their total number of planned units.

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3. **Added Population:** Average household is assumed to average 2.5 persons per house. It is assumed that 100 people are added in 2005-2006 to the population that are not part of the proposed development.

4. **Inflation:** Annual inflation of 3%.

5. **Assessed Value:** Average home value is $294,000 plus inflation adding $11 million in assessed each year plus inflation.

6. **City Revenues:** City revenues are divided into those that would increase with the population growth and those increased from assessed value growth.

7. **Police Service:** Police service was reduced to two officers in 2005-2006 due to the loss of the serial levy. Revenues are projected to increase to support adding new officers in 2008-2009, 2009-2010, and 2011-2012. The North Plains budget will increase to a point that the 24 hour police service can be achieved by 2012.

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8. **System Development Charges:** Current SDC's are assumed for the purpose of this analysis. While past history has shown 6% average increase in these fees, no increase is included to assure a conservative analysis of revenues to North Plains. The Storm Drainage SDC is proposed by the City and estimated for the project but the rate has not been established at this time. The park SDC of $4,941 per unit is being used in the analysis.

General Fund

Attached is a table for the General Fund projections for North Plains (Attachment #3). The revenues and expenditures were derived from the proposed budget of North Plains for 2006-2007 fiscal years. Revenues are then expanded with inflation along with the expenditure categories. Property taxes due to development are projected separately and are based upon the assumed growth of the proposed annexation area. Included in the development growth are franchise fees and state shared revenues which are projected to grow at the population growth rate.

The 2005-2006 budget included a reduction of one police officer. Projections of the budget include adding a new police officer in the 2008-2009 fiscal year, another in 2009-2010, and another officer in 2011-2012. The added cost to the budget is $80,000 for each new officer. This would bring the police service to five full-time officers which would support 24-hour response capability for the community.

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The new revenues from the development of the proposed annexation area will be received starting in 2007-2008. Growth of the General Fund budget via annexation is adequate to assure that no additional serial levies would be necessary for police service once the proposed levy has expired.

Support Services, Municipal Court, Planning Department and Library have been projected to grow with inflation. These programs are supported by the General Fund and other revenues and may well vary as the growth rate changes in the community. For the purposes of the isolated analysis, they were assumed to meet general inflation growth.

The Parks Department maintenance costs are expected to grow with $12,000 added to the budget in 2008-2009 when the new park is anticipated to be built within the annexed areas and given to the City of North Plains. The General Fund budget projection includes an inflationary increase over the current adopted budget in addition to the increase of $12,000.

The increased general fund revenues will enable projected revenues to exceed projected expenditures. The Revenue Less Expense line on the projections shows that there will be increasing positive cash balances available to North Plains to respond to other financial impacts from the projected growth of the community.

The available cash balance to start the analysis was estimated through consultation with the City Manager regarding historical practices of North Plains in managing the General Fund budget. It is assumed that North Plains will achieve operating savings through the year that will assure additional cash balance of $125,000 each year. The amount of the available cash balance to start the year exceeds the unallocated cash from the previous year. The difference of $125,000 per year is assumed to accrue through operating savings.

Other Fund Revenues

Attached are Other Fund Revenues and SDC's (Attachment #4). Projections were made based upon the residential growth assumptions only and compared with the 2006-2007 proposed budget. In general, fees in all areas will grow considerably with the additional growth from the proposed annexation area.

1. **Street Tax:** Revenues from proposed SDC's, storm drainage, state highway tax, utility fees will increase 10-15% per year and support the transportation needs for North Plains. The table identifies current projected levels for the budget and expected increases due to population increases over the period of the proposed growth.

2. **Water System:** North Plains has anticipated its planned growth by installing the water main in this fiscal year. Less than $3 million was expected in 2004-2005 for the installation. Final cost will be determined upon completion of the construction. The water system funds will be

substantially improved by the additional users proposed in the annexation. North Plains current water users have been required to pledge a portion of their monthly costs to assure payment of the bonds for the water main extension. The revenues from the SDC's for the proposed annexation are sufficient to cover the debt service for the water main. Water users can expect a leveling of their water rates as the full potential of the new line is realized with new customers.

3. **Water Fund:** Increased water sales will result from the additional customers on the water system. The water rate projections included sufficient contingency to assure payment of the debt service on the new water line. Adding customers along with the SDC revenues will substantially diminish the need for raising water rates over the next 7 years. The water rates were projected without the additional growth as a conservative approach. Water users in North Plains will have a more stable rate for water service as a result of the proposed annexation.

4. **Parks:** The parks SDC revenues are adequate to assure development of the parks in the expansion area. It is anticipated that the development will provide the parks in the annexed areas through the SDC credit program. A substantial portion of the SDC's will be used to assure the quality parks proposed.

5. **Traffic Impact Fees:** The annual revenue from Traffic Impact Fees would increase from $100,000 per year to $269,000 per year. The developer anticipates providing the transportation improvements in the annexed property sufficient to support the traffic. Some of the transportation impact fee may be used as credits for eligible work provided by the developer.

6. **Storm Drainage:** Storm drainage SDC revenues are estimated to be $40,000 per year as an extrapolation of the $10,000 revenue projection for the current budget. North Plains is considering the imposition of the SDC but has not yet adopted or established a rate.

Property Tax Evaluation

Current Property Taxes

The proposed annexation includes 24.33 acres of a total 199 acres on owned by Jackson Union LLC. The property is designated for either Exclusive Farm Use or AF-20 by Washington County. The value of the property is designated as having a "Land Special Use Value" which reflects the fact that the properties currently meet the standards established as an active farming use. The current taxes reflect these values:

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	Acres	Current Taxes	Special Use Value
Jackson Union LLC	199.20	$1,241	$105,500

Deferred Taxes

Given the taxation rate based upon the "Land Special Use Value", the full market value taxes have been deferred. Annexation does not affect this status if the property remains in a farming use. However, when the property is rezoned for a use other than farm use, or if the property no longer meets the definition of "farm use" these deferred taxes must be addressed in one of the following ways:

1) If a government agency initiates the rezoning of the property, all deferred taxes would be forgiven.

2) If the annexation and rezoning occur in separate tax years, five years of the deferred taxes must be repaid. This amount is estimated to be $26,000.

3) If the annexation and rezoning occur within the same tax year, ten years of the deferred taxes must be repaid. This amount is estimated to be $50,050.

Additional Taxes With Annexation

For taxation purposes, once the property is annexed, the value of the land has the potential of being assessed for two different values, depending upon whether it remains in farming use or is rezoned for residential development.

Farming use: If the use of the property continues to meet the current standards for farming use, it will retain its "Land Special Use Value" of approximately $658 per acre and would be taxed at a rate of $14.591 for every $1000 of value. Once the property is annexed, the property owner may apply for a farm deferral for the property, even though it has been designated as a non-farm zone within the City.

Residential use: Once the property is rezoned for residential use, its value is estimated be approximately $150,000 per acre and would be taxed at the rate of $14.591 of every $1000 of value.

The valuation of any wetland property within the annexed area would be treated differently depending upon whether the land falls within the developable residential area or the farming use area.

Tax Revenues by Category

Taxes for the 73 acres under the "Land Use Special Value" and rezoned for residential use is:

	Rate	Current/Farming Use Taxes Per Year	Residential Zone Taxes Per Year
Land Value		$658/acre	$150,000/acre
Total Tax	$14.591	$701	$159,771
City	$2.170	$104	$23,761
Fire District #2	$1.1219	$54	$12,285
Other	$11.299	$543	$123,725

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North Plains Annexation
Summary of Financial Analysis
Attachment #1

	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	17-18
General Fund												
General Fund Revenue	$1,373,205	$1,433,594	$1,531,718	$1,692,170	$1,826,912	$1,945,317	$2,017,311	$2,083,534	$2,143,828	$2,198,033	$2,245,982	$2,287,504
General Fund Expense	$1,373,205	$1,409,443	$1,445,726	$1,573,020	$1,694,211	$1,819,037	$1,867,608	$1,917,636	$1,969,165	$1,972,240	$2,026,908	$2,083,215
Unallocated GF	$0	$24,151	$85,992	$119,150	$132,702	$126,280	$149,703	$165,898	$174,663	$225,793	$219,075	$204,290
Water												
SDC Revenue	$102,920	$180,110	$180,110	$180,110	$180,110	$180,110	$100,347	$0	$0	$0	$0	$0
Water Sales	$427,900	$470,690	$513,480	$556,270	$599,060	$641,850	$665,690	$685,661	$665,690	$665,690	$665,690	$665,690

North Plains Annexation
Revenue Assumptions --
Attachment #2

General Assumptions		05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
Population	1,650													
Population Addition	2.5	0	175	175	175	175	175	98	0	0	0	0	0	0
Cumulative Pop		1,750	1,925	2,100	2,275	2,450	2,625	2,723	2,723	2,723	2,723	2,723	2,723	2,723
Percent Growth			10.00%	9.09%	8.33%	7.69%	7.14%	3.71%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Inflation Rate	3.00%													

Proposed Development		05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
Annexed Real Mark Val		$0	$10,897,500	$10,642,288	$10,387,075	$10,131,863	$9,876,650	$9,621,438	$9,366,225	$9,111,013	$8,855,800	$8,600,588	$8,345,375	$8,090,163
East			*$3,649,500*	*$3,564,031*	*$3,478,562*	*$3,393,093*	*$3,307,624*	*$3,222,155*	*$3,136,686*	*$3,051,217*	*$2,965,748*	*$2,880,279*	*$2,794,810*	*$2,709,341*
Paine Tract			*$3,589,500*	*$3,440,962*	*$3,358,464*	*$3,275,946*	*$3,193,428*	*$3,110,909*	*$3,028,391*	*$2,945,873*	*$2,863,355*	*$2,780,837*	*$2,698,319*	*$2,615,801*
Cropp Property			*$3,658,500*	*$3,572,820*	*$3,487,141*	*$3,401,461*	*$3,315,781*	*$3,230,101*	*$3,144,422*	*$3,058,742*	*$2,973,062*	*$2,887,382*	*$2,801,703*	*$2,716,023*
City Tax Revenue		$0	$23,721	$23,165	$22,610	$22,054	$21,499	$20,943	$20,387	$19,832	$19,276	$18,721	$18,165	$17,610
East			*$7,944*	*$7,758*	*$7,572*	*$7,386*	*$7,200*	*$7,014*	*$6,828*	*$6,642*	*$6,456*	*$6,270*	*$6,083*	*$5,897*
Paine Tract			*$7,813*	*$7,490*	*$7,310*	*$7,131*	*$6,951*	*$6,772*	*$6,592*	*$6,412*	*$6,233*	*$6,053*	*$5,873*	*$5,694*
Cropp Property			*$7,963*	*$7,777*	*$7,590*	*$7,404*	*$7,217*	*$7,031*	*$6,844*	*$6,658*	*$6,471*	*$6,285*	*$6,098*	*$5,912*
Proposed New Units	389	0	70	70	70	70	70	39	0	0	0	0	0	0
East	149		*27*	*27*	*27*	*27*	*27*	*14*	*0*	*0*	*0*	*0*	*0*	*0*
Paine Tract	100		*18*	*18*	*18*	*18*	*18*	*10*	*0*	*0*	*0*	*0*	*0*	*0*
Cropp Property	140		*25*	*25*	*25*	*25*	*25*	*15*	*0*	*0*	*0*	*0*	*0*	*0*
Average Value/Unit		$0	$294,000	$302,820	$311,905	$321,262	$330,900	$340,827	$351,051	$361,583	$372,430	$383,603	$395,111	$406,965
Added Assessed Value			$20,580,000	$42,394,800	$65,499,966	$89,953,287	$115,814,857	$132,581,539	$136,558,985	$140,655,754	$144,875,427	$149,221,690	$153,698,341	$158,309,291
East			*$7,938,000*	*$16,352,280*	*$25,018,988*	*$33,945,698*	*$43,140,209*	*$46,673,895*	*$50,134,112*	*$51,638,135*	*$53,187,280*	*$54,782,898*	*$56,426,385*	*$58,119,176*
Paine Tract			*$5,292,000*	*$10,901,520*	*$16,679,326*	*$22,630,465*	*$28,760,139*	*$32,651,144*	*$33,630,678*	*$34,639,598*	*$35,678,786*	*$36,749,150*	*$37,851,624*	*$38,987,173*
Cropp Property			*$7,350,000*	*$15,141,000*	*$23,185,730*	*$31,431,202*	*$39,944,638*	*$45,685,277*	*$47,055,835*	*$48,467,510*	*$49,921,536*	*$51,419,182*	*$52,961,757*	*$54,550,610*
Property Tax Rate	2.1767													
New Property Tax Rev		$0	$44,796	$92,281	$142,574	$195,801	$252,094	$288,590	$297,248	$306,165	$315,350	$324,811	$334,555	$344,592
East			*$17,279*	*$35,594*	*$54,459*	*$73,890*	*$93,903*	*$105,948*	*$109,127*	*$112,401*	*$115,773*	*$119,246*	*$122,823*	*$126,508*
Paine Tract			*$11,519*	*$23,729*	*$36,306*	*$49,260*	*$62,602*	*$71,072*	*$73,204*	*$75,400*	*$77,662*	*$79,992*	*$82,392*	*$84,863*
Cropp Property			*$15,999*	*$32,957*	*$50,425*	*$68,416*	*$86,947*	*$99,443*	*$102,426*	*$105,499*	*$108,664*	*$111,924*	*$115,282*	*$118,740*
Total New Property Tax		$0	$68,517	$115,446	$165,183	$217,855	$273,593	$309,533	$317,635	$325,997	$334,627	$343,532	$352,721	$362,202

System Development Charge	Amount
Permit Fees	$150
Streets	$400
Storm Drainage	
Parks	**$4,941**
Water Meter	$150
Water SDC	$2,573
ROW Permit	$150
Sewer Permit	$0
Traffic Impact Fee	$2,850

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North Plains Annexation
General Fund Budget Projection
Attachment #3

General Fund Revenues	Growth Assump	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
Total		$1,373,205	$1,344,664	$1,376,745	$1,469,413	$1,534,325	$1,580,581	$1,607,846	$1,665,966	$1,717,899	$1,763,474	$1,802,518	$1,834,851	$1,860,290
Available Cash		$424,546	$347,000	$349,151	$410,992	$444,150	$457,702	$451,280	$474,703	$490,898	$499,663	$500,793	$494,075	$479,290
Taxes	Inflation	$253,180	$254,933	$262,581	$270,458	$278,572	$286,929	$295,537	$304,403	$313,535	$322,941	$332,630	$342,609	$352,887
2-year Levy		$0	$0	$0	$0	$0								
Franchise Fees	Inflation	$138,585	$169,130	$174,204	$179,430	$184,813	$190,357	$196,068	$201,950	$208,009	$214,249	$220,676	$227,297	$234,115
State Tax Sharing	Inflation	$35,704	$35,000	$36,050	$37,132	$38,245	$39,393	$40,575	$41,792	$43,046	$44,337	$45,667	$47,037	$48,448
Development Fee	**Inflation**	**$150,000**	**$150,000**	**$154,500**	**$159,135**	**$163,909**	**$168,826**	**$173,891**	**$179,108**	**$184,481**	**$190,016**	**$195,716**	**$201,587**	**$207,635**
Other	Inflation	$371,190	**$388,601**	$400,259	$412,267	$424,635	$437,374	$450,495	$464,010	$477,930	$492,268	$507,036	$522,247	$537,915
Revenues Due to Dev														
Property Taxes	Growth	$0	$68,517	$115,446	$165,183	$217,855	$273,593	$309,533	$317,635	$325,997	$334,627	$343,532	$352,721	$362,202
Franchise Fees	Growth		$16,913	$32,750	$47,702	$61,919	$75,516	$82,798	$82,798	$82,798	$82,798	$82,798	$82,798	$82,798
State Tax Sharing	Growth		$3,500	$6,777	$9,872	$12,814	$15,627	$17,134	$17,134	$17,134	$17,134	$17,134	$17,134	$17,134
Total Added Revenue		$0	$88,930	$154,973	$222,757	$292,587	$364,736	$409,466	$417,568	$425,930	$434,559	$443,464	$452,653	$462,134
Total Revenue		$1,373,205	$1,433,594	$1,531,718	$1,692,170	$1,826,912	$1,945,317	$2,017,311	$2,083,534	$2,143,828	$2,198,033	$2,245,982	$2,287,504	$2,322,424
Expenditures														
Finance &Administration	Inflation	$272,224	$215,154	$221,609	$228,257	$235,105	$242,158	$249,422	$256,905	$264,612	$272,551	$280,727	$289,149	$297,823
Municipal Court	Inflation	$186,928	$189,392	$195,074	$200,926	$206,954	$213,162	$219,557	$226,144	$232,928	$239,916	$247,114	$254,527	$262,163
Planning Department	Inflation	$248,452	$232,342	$239,312	$246,492	$253,886	$261,503	$269,348	$277,428	$285,751	$294,324	$303,154	$312,248	$321,616
Police	Infl +	$327,469	$408,563	$420,820	**$513,444**	**$608,848**	**$707,113**	$728,327	$750,176	$772,682	$795,862	$819,738	$844,330	$869,660
Sewer & LID	Inflation	$29,784	$29,020	$29,891	$30,787	$31,711	$32,662	$33,642	$34,651	$35,691	$36,762	$37,865	$39,000	$40,170
Parks Department	Inflation	$63,526	$67,250	$69,268	**$81,268**	$83,706	$86,217	$88,803	$91,467	$94,211	$97,038	$99,949	$102,947	$106,036
Library	Inflation	$44,822	$67,722	$69,754	$71,846	$74,002	$76,222	$78,508	$80,864	$83,290	$85,788	$88,362	$91,013	$93,743
		$1,173,205	$1,209,443	$1,245,726	$1,373,020	$1,494,211	$1,619,037	$1,667,608	$1,717,636	$1,769,165	$1,822,240	$1,876,908	$1,933,215	$1,991,211
Unappropriated Bal		$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$200,000	$150,000	$150,000	$150,000	$150,000
		$1,373,205	$1,409,443	$1,445,726	$1,573,020	$1,694,211	$1,819,037	$1,867,608	$1,917,636	$1,969,165	$1,972,240	$2,026,908	$2,083,215	$2,141,211
Revenue Less Expense		$0	$24,151	$85,992	$119,150	$132,702	$126,280	$149,703	$165,898	$174,663	$225,793	$219,075	$204,290	$181,213
Unexpended Balance		$325,000	$349,151	$410,992	$444,150	$457,702	$451,280	$474,703	$490,898	$499,663	$500,793	$494,075	$479,290	$456,213

General Fund: General fund projections based upon proposed 2006-2007 budget.
Revenues Due to Dev: Revenues to the General Fund are derived from increased property tax value and population growth.
Expenditures: Current expenditures inflated by 3% except Police and Parks with targeted expansions.
Police Service: Add $80,000 to base for new officer in 2008-2009, 2009-2010, and 2011-2012.
Parks Service: Add $12,000 to base maintenance in 2008-2009 to reflect new park from proposed development.
Revenue Less Expense Cash balance to the General Fund estimated to grow each year based upon increased revenues from annexation.

North Plains Annexation
Other Fund Revenues and SDC's
Attachment #4

		05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
Street Tax														
SDC's		$0	$28,000	$28,000	$28,000	$28,000	$28,000	$15,600	$0	$0	$0	$0	$0	$0
Storm Drainage		$44,000	$44,000	$44,000	$44,000	$44,000	$44,000	$44,000	$44,000	$44,000	$44,000	$44,000	$44,000	$44,000
State Hwy Tax		$87,650	$96,415	$105,180	$113,945	$122,710	$131,475	$136,358	$136,358	$136,358	$136,358	$136,358	$136,358	$136,358
Trans Utility Fee		$22,000	$24,200	$26,400	$28,600	$30,800	$33,000	$34,226	$34,226	$34,226	$34,226	$34,226	$34,226	$34,226
Total Street Tax		$153,650	$192,615	$203,580	$214,545	$225,510	$236,475	$230,184	$214,584	$214,584	$214,584	$214,584	$214,584	$214,584
Water System														
Other Revenue														
SDC		$102,920	$180,110	$180,110	$180,110	$180,110	$180,110	$100,347	$0	$0	$0	$0	$0	$0
Expense														
Water Sales		$427,900	$470,690	$513,480	$556,270	$599,060	$641,850	$665,690	$665,690	$665,690	$665,690	$665,690	$665,690	$665,690
Other Revenue		$455,737	$469,409	$483,491	$497,996	$512,936	$528,324	$544,174	$560,499	$577,314	$594,633	$612,472	$630,847	$649,772
Expense		$883,637	$910,146	$937,450	$955,574	$994,541	$1,024,377	$1,055,109	$1,086,762	$1,119,365	$1,152,946	$1,187,534	$1,223,160	$1,259,855
Parks	ASSUMES NEW FEE OF $4,988 per unit.													
SDC		$0	$349,160	$349,160	$349,160	$349,160	$349,160	$194,532	$0	$0	$0	$0	$0	$0
SDC Credit for New Dev.	70.00%	$0	($244,412)	($244,412)	($244,412)	($244,412)	($244,412)	($136,172)	$0	$0	$0	$0	$0	$0
Available for Other Parks		$0	$104,748	$104,748	$104,748	$104,748	$104,748	$58,360	$0	$0	$0	$0	$0	$0
Cumulative from New Dev.		$0	$104,748	$209,496	$314,244	$418,992	$523,740	$582,100	$582,100	$582,100	$582,100	$582,100	$582,100	$582,100
Traffic Impact Fees														
Cash														
Residential		$0	$188,300	$188,300	$188,300	$188,300	$188,300	$104,910	$0	$0	$0	$0	$0	$0
Developer Credit		$0	$94,150	$94,150	$94,150	$94,150	$94,150	$52,455	$0	$0	$0	$0	$0	$0

W&H PACIFIC
AN ASCG COMPANY

9755 SW Barnes Road, Suite 300
Portland, Oregon 97225
503.626.0455
Fax 503.526.0775

APRIL 24, 2006

LEGAL DESCRIPTION FOR
PROPOSED ANNEXATION AREA "1"
TO THE CITY OF NORTH PLAINS

PROJECT NO. 32992

EXHIBIT "A"

A TRACT OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 6, TOWNSHIP 1 NORTH, RANGE 2 WEST OF THE WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON, AND BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE SOUTHWEST CORNER OF THE ANDERSON SMITH D.L.C. NO. 64 AND RUNNING ON THE SOUTH LINE OF SAID D.L.C. SOUTH 89°58'53" EAST, 3855.92 FEET; THENCE SOUTH 00°01'07" WEST, 30.00 FEET TO THE SOUTH RIGHT-OF-WAY LINE OF N.W. WEST UNION ROAD (C.R. NO. 2496) AND ALSO BEING THE POINT OF BEGINNING; THENCE CONTINUING ON SAID SOUTH RIGHT-OF-WAY LINE (THE FOLLOWING TWO COURSES) SOUTH 89°58'53" EAST, 785.23 FEET; THENCE SOUTH 56°02'29" EAST, 746.21 FEET TO A POINT ON THE WESTERLY RIGHT-OF-WAY LINE OF N.W. JACKSON SCHOOL ROAD; THENCE ON SAID WESTERLY RIGHT-OF-WAY LINE SOUTH 00°10'16" WEST, 410.28 FEET; THENCE LEAVING SAID RIGHT-OF-WAY LINE NORTH 89°58'53" WEST, 1070.41 FEET; THENCE NORTH 00°10'16" EAST, 100.00 FEET; THENCE NORTH 89°58'53" WEST, 510.00 FEET; THENCE NORTH 00°10'16" EAST, 305.00 FEET; THENCE SOUTH 89°58'53" EAST, 145.00 FEET; THENCE NORTH 00°10'16" EAST, 230.00 FEET; THENCE SOUTH 89°58'53" EAST, 30.00 FEET; THENCE NORTH 00°10'16" EAST, 191.91 FEET TO THE SOUTH RIGHT-OF-WAY LINE OF N.W. WEST UNION ROAD AND THE POINT OF BEGINNING.

CONTAINING APPROXIMATELY 1,059,721 SQUARE FEET OR 24.33 ACRES.

THE BASIS OF BEARINGS FOR THIS DESCRIPTION IS THE SOUTH LINE OF THE ANDERSON SMITH D.L.C. AND IS SHOWN AS SOUTH 89°58'53" EAST.

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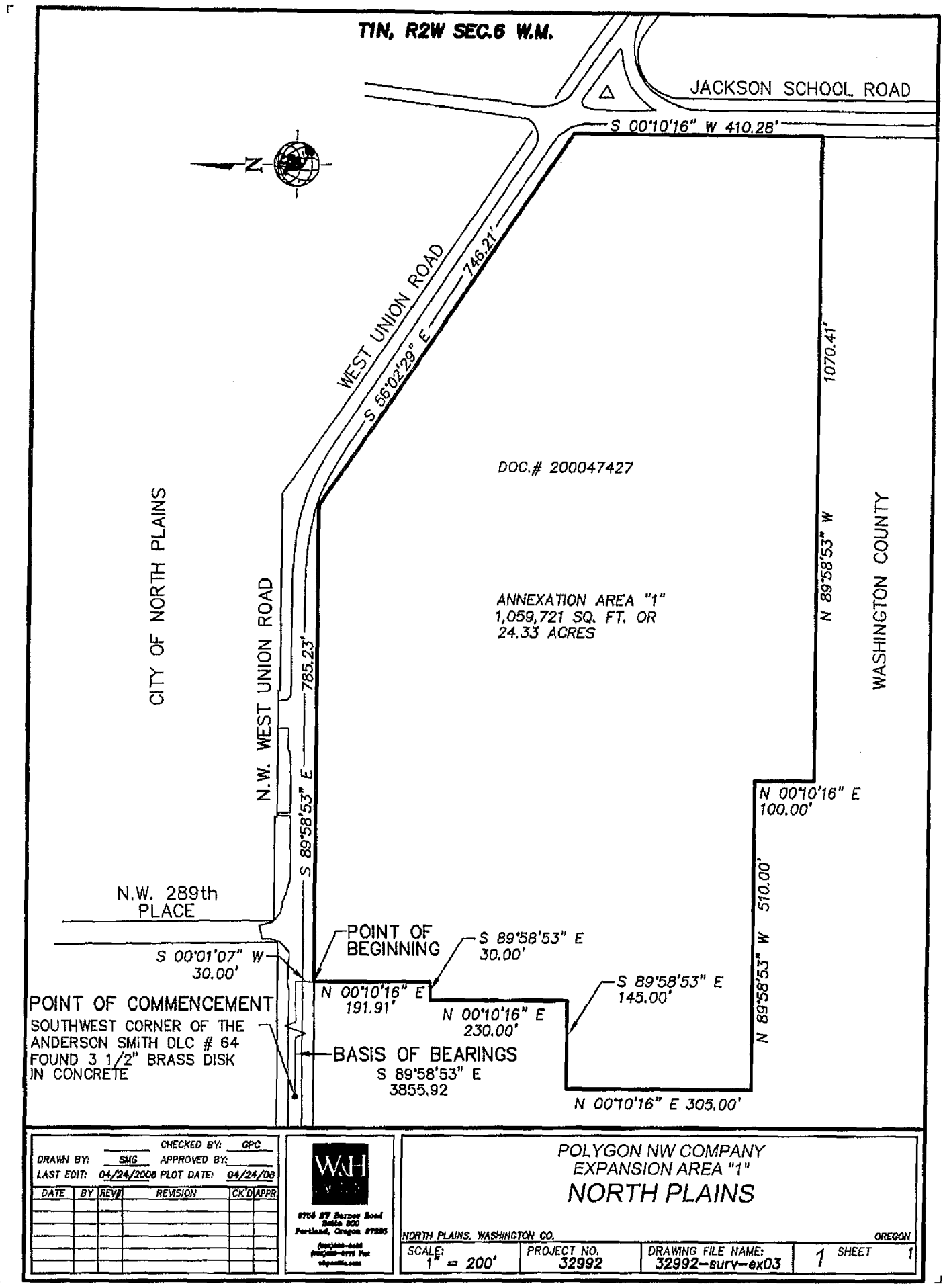

DRAWN BY: SMG CHECKED BY: GPC
LAST EDIT: 04/24/2008 PLOT DATE: 04/24/08 APPROVED BY:

DATE	BY	REV#	REVISION	CK'D	APPR

W&H

9755 SW Barnes Road
Suite 300
Portland, Oregon 97225

POLYGON NW COMPANY
EXPANSION AREA "1"

NORTH PLAINS

NORTH PLAINS, WASHINGTON CO. OREGON

SCALE:	PROJECT NO.	DRAWING FILE NAME:	SHEET
1" = 200'	32992	32992-surv-ex03	1 of 1

Transportation Impact Analysis

North Plains Expansion Area

North Plains, Oregon

April 2006

Transportation Impact Analysis

North Plains Expansion Area

North Plains, Oregon

Prepared For:
Polygon Northwest, Co.
109 E 13th Street
Vancouver, Washington 98660

Prepared By:
Kittelson & Associates, Inc.
610 SW Alder, Suite 700
Portland, OR 97205
(503) 228-5230

Project Principal: Mark Vandehey, P.E.
Project Manager: Julia Kuhn, P.E.
Transportation Analyst: Joe Bessman

Project No. 6953.00

April 2006

Table of Contents

List of Figures

List of Tables

Section 1

Executive Summary

Executive Summary

Polygon Northwest is proposing conceptual development on two expansion areas within the City of North Plains, Oregon. The 74-acre north expansion area is located to the northwest of the Glencoe Road/North Avenue intersection and may include a mixture of residential and retail development. The 70-acre east expansion area is located to the southwest of the West Union Road/Jackson School Road intersection and may include a mixture of residential and retail development as well as a new school. For the purposes of this analysis, it was assumed that both sites would likely be developed in phases and could be fully built out in the next seven to ten years. The current mix of residential and commercial uses assumed in this report is based on conceptual estimates of developable land and will be further refined as additional information becomes available.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The analysis described in this report resulted in the findings and recommendations outlined below.

- All of the study area intersections currently operate acceptably during the weekday a.m. and p.m. peak hours, with the exception of the US 26/Glencoe Road eastbound and westbound ramps.
- Funding for improvements to the Glencoe Road interchange are included in the Oregon Department of Transportation's (ODOT) Statewide Transportation Improvement Program (STIP). As part of this improvement project, ODOT will be developing an Interchange Area Management Plan (IAMP) to address all private and public accesses within one-quarter mile of the interchange. The IAMP will commence in Spring 2005.
- The improvement of both the Glencoe Road and Jackson School Road (which is currently under construction) interchanges will significantly improve accessibility into North Plains.
- The NW West Union Road/NW Glencoe Road intersection is anticipated to operate over capacity in 2015 with development of the expansion areas although is not anticipated to warrant a traffic signal. Widening of the northbound approach to include separate turn lanes will restore intersection operations to acceptable levels. Alternatively, the installation of a single-lane roundabout at this location would enable the intersection to function at a level-of-service "A" through the year 2015. The City and County should monitor the intersection to determine if and when a traffic signal should be installed at this location. Polygon will work with the City and County to determine the appropriate mitigation at this location.
- Any improvements (turn lanes and/or signals) to the NW West Union/NW Glencoe Road intersection will also trigger the need to install active control devices, such as flashing lights and gates at the Portland & Western rail crossing to the north of the intersection.
- The westbound left-turn movement at the NW Highland Court/NW Glencoe Road intersection is expected to operate over capacity. Due to the close proximity to the Glencoe Road interchange, ODOT may evaluate alternative access configurations at this location. All other movements at this intersection are forecast to operate acceptably.
- A traffic signal is not anticipated to be warranted at the NW Pacific Street/NW Glencoe Road intersection. The City and County should monitor this intersection to identify if and when a

traffic signal should be installed. Polygon will work with the City and County to determine the appropriate need for mitigation at this location.

- Polygon is working with Washington County and City of North Plains staff to identify the appropriate improvements needed to both NW North Avenue and NW West Union Road. Both roadways are rural in nature today and need appropriate facilities for all modes of travel (e.g., curbs, gutter, sidewalks, striped bike lanes, center turn lanes, etc.).

Section 2

Introduction

Introduction

PROJECT DESCRIPTION

Polygon Northwest is proposing conceptual development in the north and east expansion areas within North Plains. The location of the two expansion areas is shown in Figure 1. The City of North Plains is considering the annexation of both properties. Development of the two areas is expected to occur in phases, with the full buildout expected by year 2015.

SCOPE OF THE REPORT

This analysis identifies the transportation-related impacts associated with the proposed expansion areas, and was prepared in accordance with City of North Plains and Washington County requirements. The study intersections and overall study area for this project were determined based on a review of existing travel patterns and direction provided by City and County transportation staff.

Washington County's Resolution & Order (R&O) 86-95 requires analysis of any intersections identified on Washington County's 2001 Safety Priority Index System (SPIS) list in the site vicinity that are forecast to be impacted by an increase in link volumes of ten percent or greater. There are no intersections on the SPIS list within the impact area.

Additionally, R&O 86-95 requires analysis of all regionally significant intersections in the "Influence Area" to ensure adequate safety and operations of the site-access routes.

Although the City of North Plains does not have defined influence area standards, the following intersections were analyzed to understand potential impacts within the city:

- NW North Avenue/NW 313th Avenue
- NW North Avenue/NW 309th Avenue
- NW North Avenue/NW Glencoe Road/NW Shadybrook Road (herein referred to as "NW North Avenue/NW Glencoe Road")
- NW Glencoe Road/NW West Union Road/NW Commercial Street (herein referred to as "NW Glencoe Road/NW West Union Road")
- NW Glencoe Road/NW Pacific Street
- NW Glencoe Road/Highland Court
- NW Glencoe Road/US 26 Westbound Ramps
- NW Glencoe Road/US 26 Eastbound Ramps

Report Organization

The remaining sections of this report address the following transportation issues:

- Existing land use and transportation system conditions within the site vicinity;
- Planned developments and transportation improvements in the study area;

- Forecast year 2015 background traffic conditions during the weekday a.m. and p.m. peak hour;
- Trip generation and distribution estimates for the proposed development;
- Forecast year 2015 total traffic conditions with build-out of the site during the weekday a.m. and p.m. peak hour; and,
- Conclusions and recommendations.

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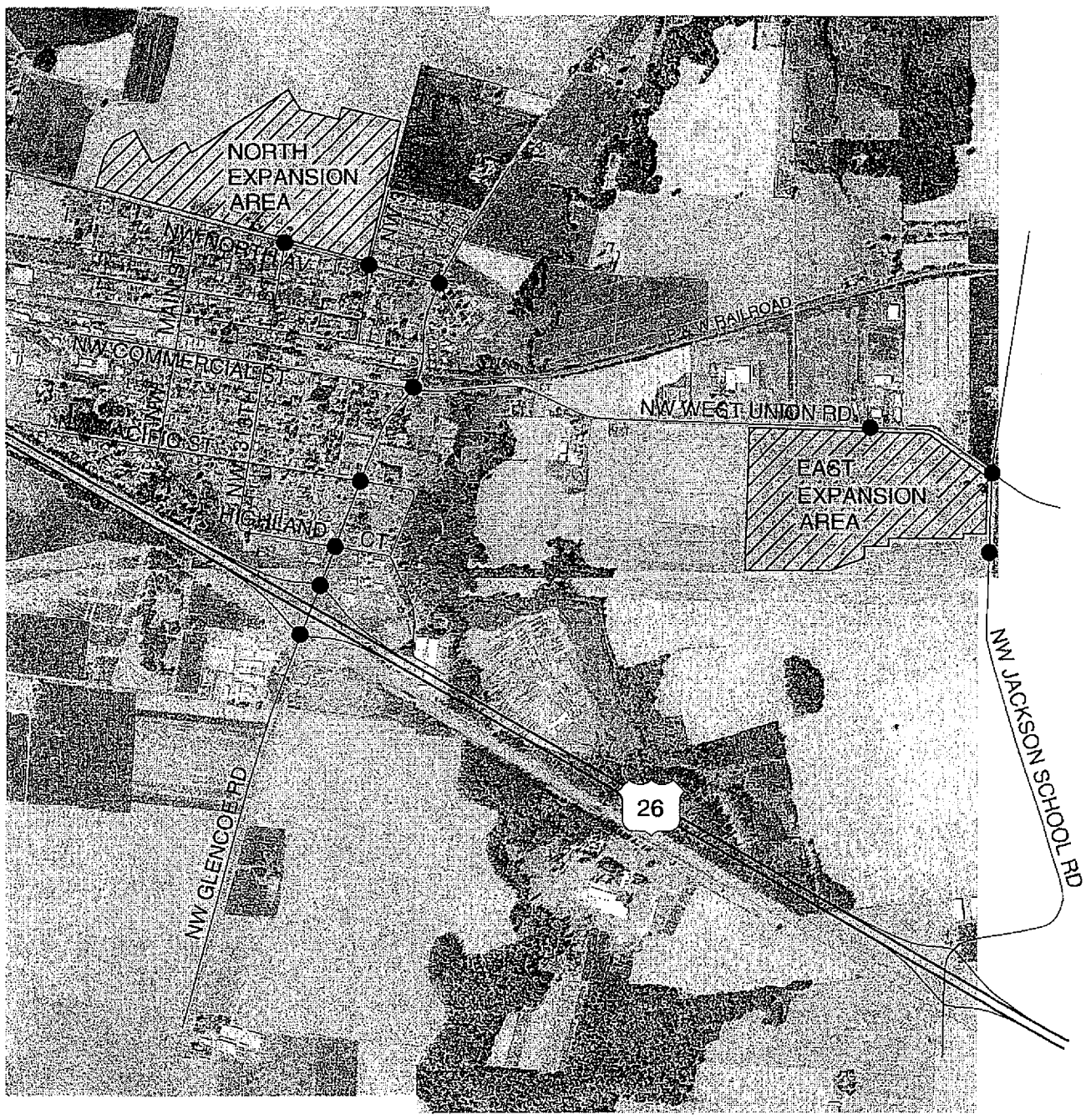

LEGEND

● PROPOSED STUDY INTERSECTIONS

SITE VICINTY MAP
NORTH PLAINS, OREGON

FIGURE 1

H:\proj\file16953\dwgs\figs\16953FIGS.dwg Apr 20, 2006 - 8:37am - kgutzler Layout Tab: Site Vicinity

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Section 3

Existing Conditions

Existing Conditions

The existing conditions analysis identifies site conditions and the current operational and geometric characteristics of roadways within the study area. The purpose of this section is to set the stage for a basis of comparison to future conditions.

The sites of the proposed expansion areas were visited and inventoried in fall 2004. At that time, information was collected regarding site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area.

SITE CONDITIONS AND ADJACENT LAND USES

The north expansion area is located north of North Avenue and west of Shadybrook Road. There are existing single family residences to the east and south of the north expansion area. The east expansion area is located to the south of West Union Road and west of Jackson School Road. The land uses surrounding the east expansion area are predominantly rural in nature.

TRANSPORTATION FACILITIES

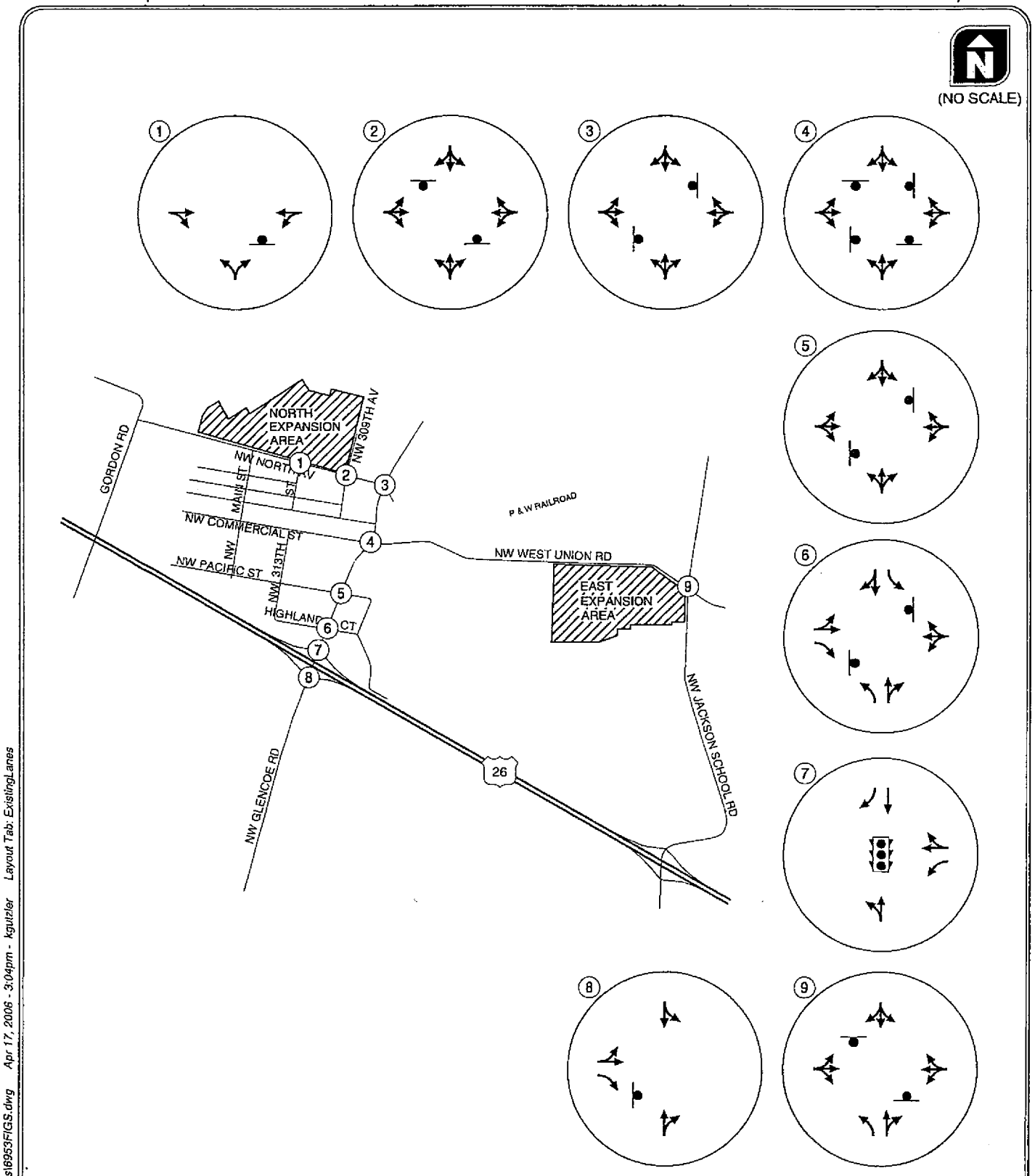
Roadway Facilities

The regionally significant roadways located in the site vicinity are summarized in Table 1. Figure 2 illustrates the location of the study intersections as well as the existing lane configurations and traffic control devices associated with them.

Table 1
Existing Transportation Facilities and Roadway Designations

Roadway	Functional Classification[1]	Cross Section	Speed Limit (mph)	Sidewalks?	Bicycle Lanes?	On-Street Parking?
NW North Avenue	Collector	2 lanes	40 mph	Partial pathway on south side	No	No
NW Glencoe Road	Arterial	2 lanes	35 mph	West side	No	No
NW West Union Road	Arterial	2 lanes	NP	No	No	No

NP: Not Posted
[1]As documented in the City of North Plains Transportation System Plan



LEGEND

- STOP SIGN
- TRAFFIC SIGNAL

YEAR 2005 EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES NORTH PLAINS, OREGON

FIGURE 2

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Pedestrian and Bicycle Facilities

As shown in Table 1, there are limited pedestrian facilities and no marked bicycle lanes in the vicinity of either expansion area today. As part of site development, sidewalks and striped bicycle lanes should be constructed along both North Avenue and West Union Road.

Washington County commenced a study in August 2004 to address pedestrian safety concerns on North Avenue (Reference 1). The primary recommendations of that study include:

- Reduce the speed on North Avenue to 35 miles per hour.
- Maintain the existing two-way stop-control configuration at the NW 309th/NW North Avenue intersection.
- Install a flashing yellow beacon on NW North Avenue and a flashing red beacon on NW 309th to improve driver awareness of the intersection. Also install improved signing, pavement markings and street lighting.
- Improve and extend the existing sidewalk/pathway on the south side of NW North Avenue. Install a sidewalk on the east side of NW 309th from NW Lenox to NW North.
- Provide marked crosswalks at the NW 309th/NW North Avenue intersection.
- Improve sight distance at the NW 309th/NW North Avenue intersection. This intersection currently meets sight distance requirements but improvements can be made to extend the amount of sight distance provided.
- Realign NW 309th Street to remove the offset north and south of NW North Avenue.
- Widen NW North Avenue to provide appropriate travel lane widths, shoulders, and clear zones to existing mailboxes.
- Educate children about safe transportation options.
- Educate users of Pumpkin Ridge Golf Course regarding traffic safety along NW North Avenue.

At this point, none of these improvements are funded. Polygon is working with the City of North Plains and Washington County to determine the appropriate scope of improvements along both NW North Avenue and NW West Union Road to improve safety for all users.

Transit Facilities

The City of North Plains is currently located outside of the TriMet service boundary. No public transit service is provided within the city limits.

TRAFFIC VOLUMES AND PEAK HOUR OPERATIONS

Manual turning movement counts were obtained for the study intersections on mid-week days in October 2004. These counts were conducted during the weekday morning (7:00 to 9:00 a.m.) and evening (4:00 p.m. to 6:00 p.m.) peak hours. The weekday a.m. peak hour was found to occur between 7:15 and 8:15 a.m., and the weekday p.m. peak hour was found to occur between 4:30 and 5:30 p.m. The turning movement counts from the weekday a.m. and p.m. peak hour were summarized and rounded to the nearest five vehicles per hour, as shown in Figures 3 and 4. *Appendix "A" contains the traffic count sheets used in this study.*

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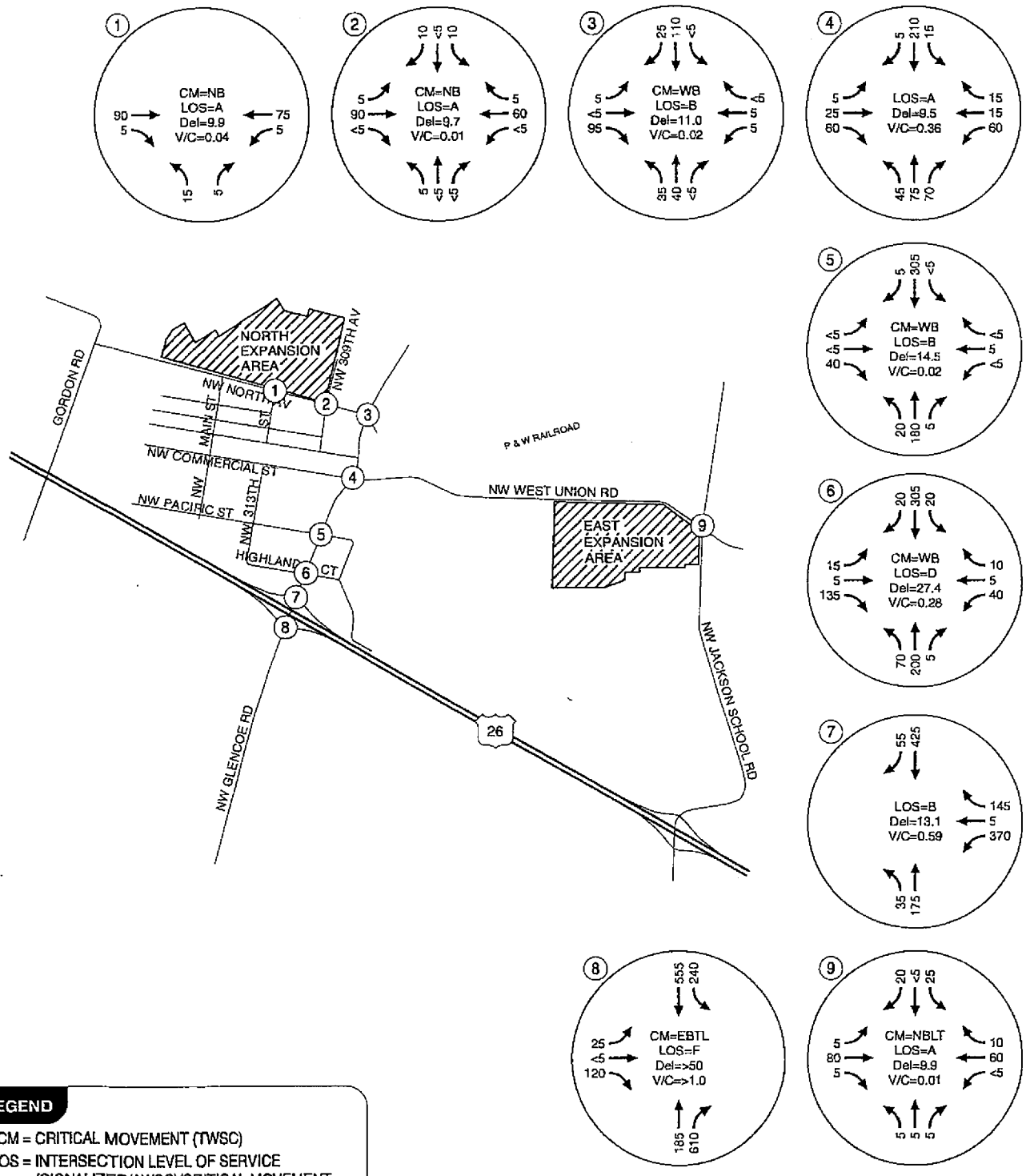

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LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED/AWSC)/CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
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TWSC = TWO-WAY STOP CONTROL
AWSC = ALL-WAY STOP CONTROL

YEAR 2005 EXISTING TRAFFIC CONDITIONS
WEEKDAY AM PEAK HOUR
NORTH PLAINS, OREGON

FIGURE 3

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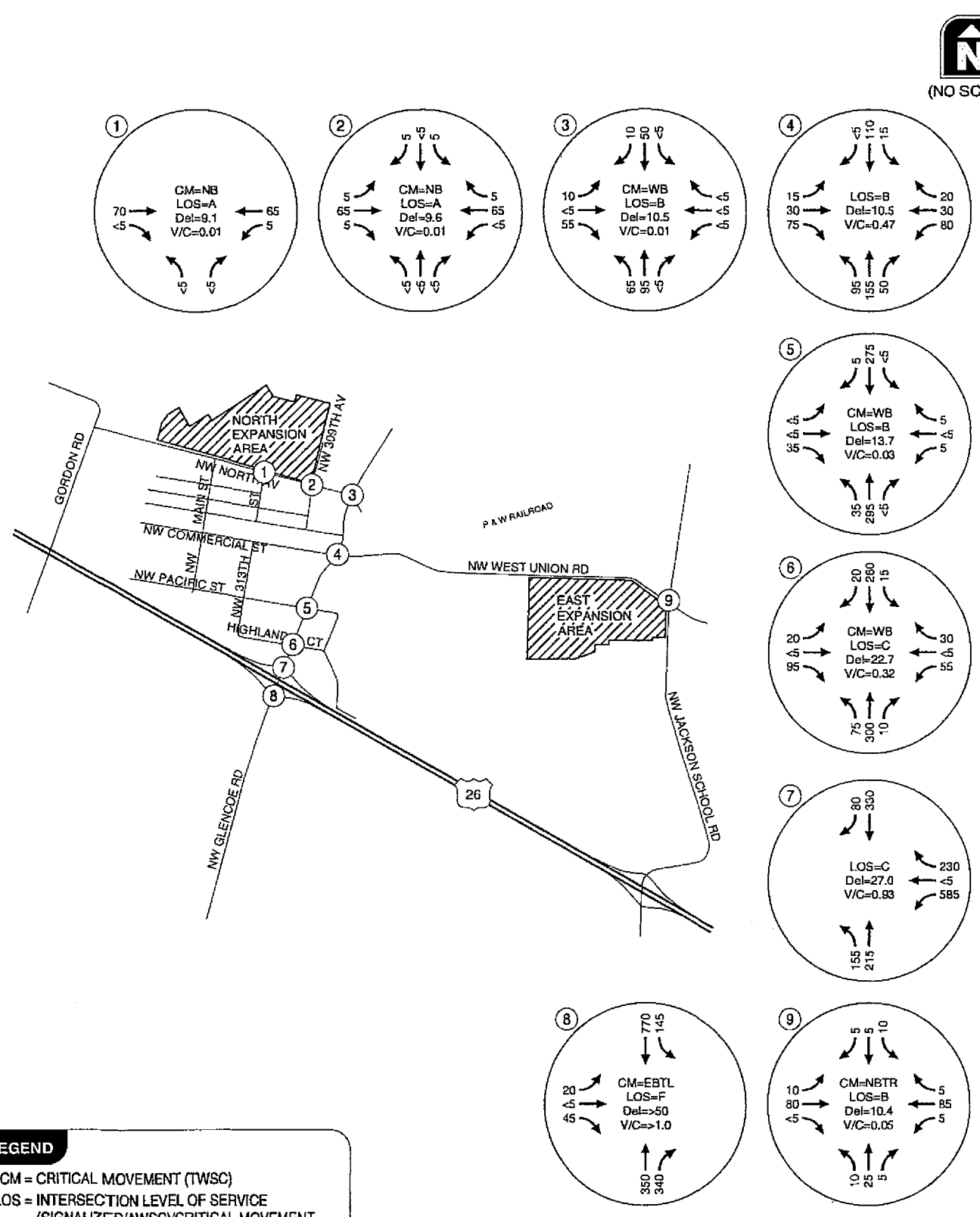

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YEAR 2005 EXISTING TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
NORTH PLAINS, OREGON

FIGURE 4

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Current Levels of Service

All level-of-service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (Reference 3). A description of level of service and the criteria by which they are determined is presented in Appendix "B." Appendix "B" also indicates how level of service is measured and what is generally considered the acceptable range of level of service. An important point to note is that the level of service analyses for signalized intersections in this report are based on the average control delay per vehicle entering the intersection whereas for unsignalized intersections the level of service is based on the intersection's capacity to accommodate the worst or critical movement.

The acceptable standards as per Washington County requirements are as follows:

- Level of service D or better and a volume-to-capacity (v/c) ratio less than 0.95 is required for signalized intersection operations.
- Level of service E or better and a volume-to-capacity (v/c) ratio less than 0.95 is required for unsignalized intersection operations.

These same standards were applied for the City of North Plains.

The standards above are based on a reasonable worst-case scenario, which involves using the peak 15-minute flow rate during the weekday a.m. and p.m. peak hours in the evaluation of all intersection levels of service. For this reason, the analyses reflect conditions that are only likely to occur for 15 minutes out of each average peak hour. Traffic conditions during all other weekday hours will likely operate under better conditions than those described in this report.

Level-of-service Analyses

Based on the existing weekday a.m. and p.m. peak hour traffic volumes, volume-to-capacity ratios and levels of service were calculated for the study intersections as shown in Figures 3 and 4, respectively. As indicated in the figures, all of the intersections currently operate acceptably with the exception of the Glencoe Road/US 26 ramps. As will be discussed in the next Section of this report, the Oregon Department of Transportation has funding to improve this interchange. With these improvements in-place, acceptable operations can be restored at both intersections.

Appendix "C" includes the existing conditions level-of-service worksheets.

Traffic Safety

Washington County uses a ranking system of evaluating the crash rates at intersections along County roads; this system is known as the Safety and Priority Index System (SPIS). If a development is estimated to contribute more than ten percent of the daily traffic to any leg of an intersection on the SPIS List, mitigations may be necessary. None of the study area intersections are included on the most recent Washington County SPIS List (1999-2001).

As discussed above, Washington County recently commenced a study of NW North Avenue in response to a pedestrian fatality that occurred at NW 309th. A number of recommendations were included in the report and detailed above. If development occurs in the expansion areas, Polygon will work with city and county staff to determine the appropriate improvements that can be made along NW North Avenue and NW West Union Road to improve safety for all modes.

Section 4

Transportation Impact Analysis

Transportation Impact Analysis

The transportation impact analysis identifies how the study area's transportation system will operate in the year that the proposed expansion areas could be fully built-out and occupied. If annexed, the properties could be developed over the next seven to ten years. The potential traffic impacts associated with the expansion areas were examined using the methodology outlined below.

- Planned developments and transportation improvements in the site vicinity were identified and reviewed.
- Background weekday a.m. and p.m. peak hour traffic conditions for year 2015 were analyzed.
- Future daily, weekday a.m., and weekday p.m. peak hour site-generated trips were estimated for build-out of the two expansion areas.
- A trip distribution pattern was derived through a review of previous studies, similar existing facilities, roadway volumes, and development patterns in the site vicinity.
- Predicted site-generated traffic from the expansion areas was added to the background traffic volumes to evaluate total traffic operations at the study area intersections during the weekday a.m. and p.m. peak hour during the year 2015.

PLANNED DEVELOPMENTS

As part of this analysis, planned developments and transportation improvements within the site vicinity were identified and reviewed. Based on information supplied by the City of North Plains and Washington County, a one percent annual growth rate was assumed to account for regional traffic growth in the site vicinity.

PLANNED TRANSPORTATION IMPROVEMENTS

The improvement of the Glencoe Road/US 26 Interchange and the Jackson School Road/US 26 Interchange are currently funded in the 2004 – 2007 Statewide Transportation Improvement Program (STIP). Both projects will improve accessibility to the City of North Plains and the expansion areas. The Jackson School Road Interchange is currently under construction. Construction on the Glencoe Road Interchange is scheduled to begin in 2005 with the signalization of the eastbound ramp terminal and the creation of a "free" northbound right-turn as well as access management improvements. Additional improvements at the interchange are scheduled to begin in 2007.

As part of the Glencoe Road interchange improvements, an Interchange Area Management Plan (IAMP) will be developed that addresses all access points and local road intersections within one-quarter mile of the interchange. This IAMP will likely recommend modifications to the existing configurations of the Highland Court and potentially the NW Pacific Street intersections. ODOT is planning to commence the IAMP in Spring 2005.

In addition to the Jackson School Road and Glencoe Road interchange improvements, the City of North Plains' Transportation System Plan (TSP) identified future signalization of the NW Highland Court/NW Glencoe Road, NW Pacific/NW Glencoe Road, and NW West Union/NW Glencoe Road intersections.

The signalization of these three intersections is not currently funded and the appropriate year of signalization still needs to be determined. For this reason, the analysis of year 2015 conditions did not assume that signals would be in-place at the NW Highland Court, NW Pacific or NW West Union/NW Commercial Street intersections along NW Glencoe Road.

YEAR 2015 BACKGROUND TRAFFIC CONDITIONS

The background traffic analysis identifies how the study area's transportation system could operate without the development of the expansion areas. This analysis includes traffic growth due to development within the study area and from general growth in the region, but does not include traffic from the proposed expansion areas.

Traffic Volumes

Year 2015 background traffic volumes were developed to account for the identified in-process traffic as well as anticipated regional growth in the study area. An annual growth rate of one percent was applied to the existing traffic volumes to account for near-term regional growth in the area. This growth rate was obtained from Washington County staff. The Jackson School Road and NW Glencoe Road interchange improvements included in the STIP were assumed to be constructed and operational by the year 2015. Figures 5 and 6 illustrate the resulting forecast year 2015 weekday a.m. and p.m. peak hour background traffic volumes, respectively.

Level of Service Analysis

Using the weekday a.m. and p.m. peak hour turning movement volumes shown in Figures 5 and 6, an operational analysis was conducted at each of the study intersections to determine the year 2015 background traffic levels of service. As indicated in the respective figures, with the Glencoe Road interchange improvements in-place, all of the study area intersections will function acceptably. *Appendix D includes the year 2015 background level of service worksheets.*

POTENTIAL DEVELOPMENT PLAN

Polygon Northwest is investigating the development of the north and east expansion areas. For the purposes of this report, general assumptions regarding potential buildout have been made through conversations with Polygon and Alpha Engineering.

The north expansion area is approximately 74 acres and may include approximately homes at a density of approximately 6 units per acre as well as 3.5 acres of commercial development. The east expansion area is approximately 70 acres and may include homes at a density of approximately five units per acre, an elementary school, and 3.5 acres of commercial development Both areas will include open spaces/parks. For the purposes of this report, it was assumed that 80 percent of the homes will be single family and 20 percent would be condominiums/town homes. A master plan will be developed in the future for both expansion areas that will refine the anticipated development scenarios.

Construction of the development will likely occur in phases, with each phase providing the necessary transportation infrastructure. An internal roadway network of local streets will be constructed in each expansion area. The appropriate layout of those streets will be determined at the time the Master Plan is developed.

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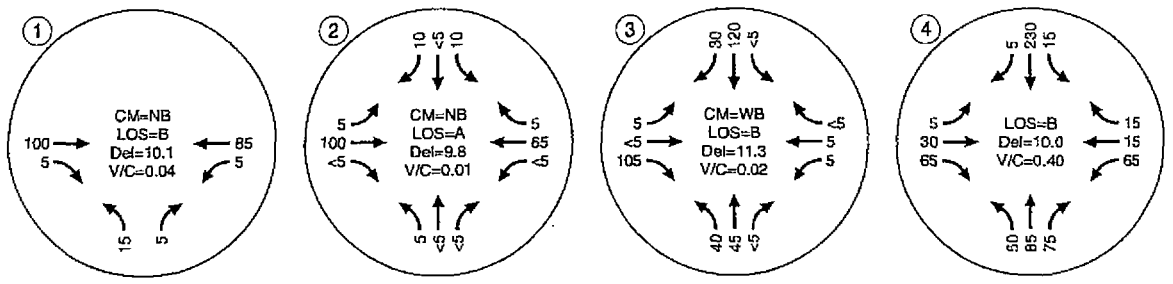

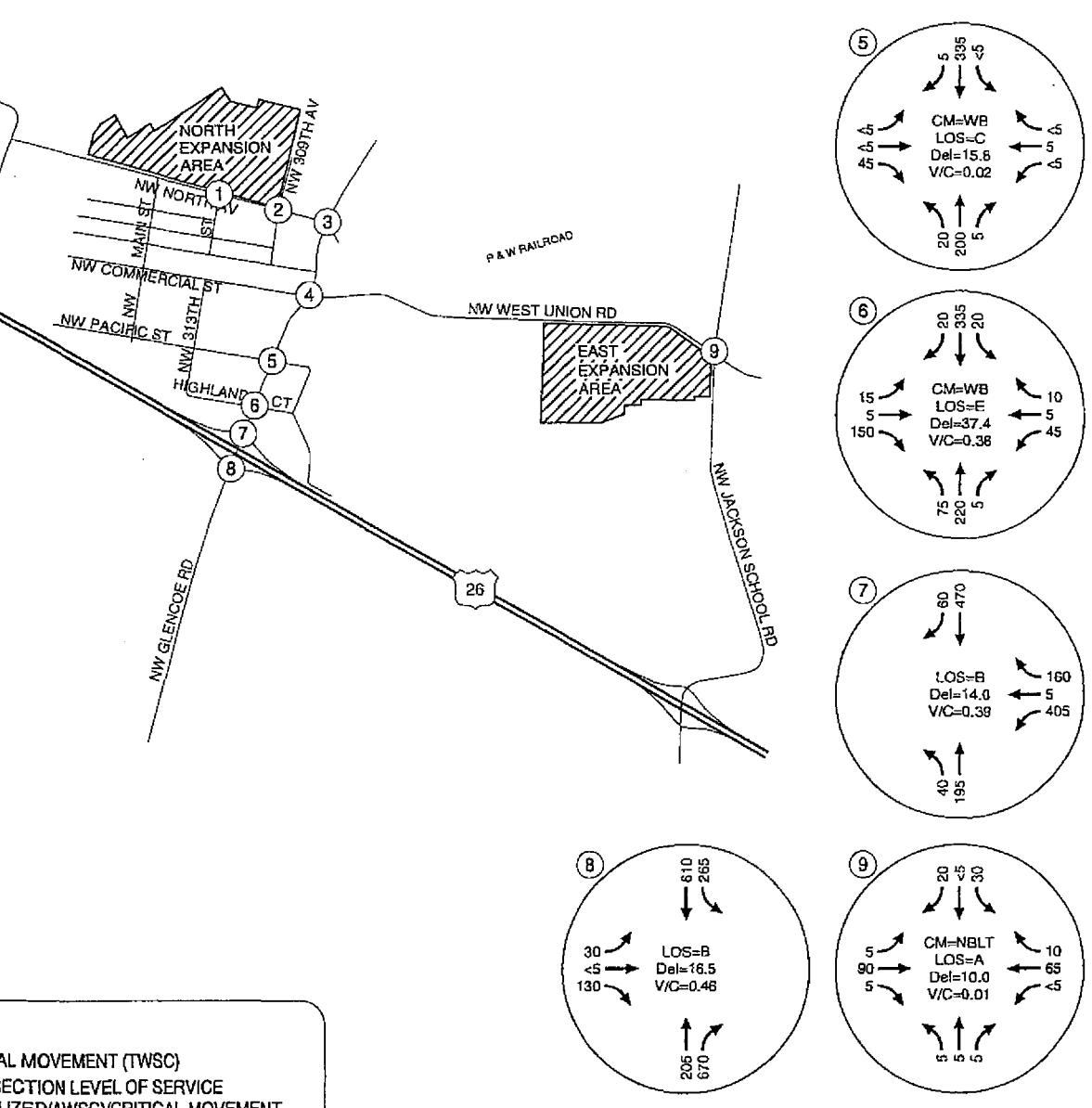

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AWSC = ALL-WAY STOP CONTROL

YEAR 2015 BACKGROUND TRAFFIC CONDITIONS
WEEKDAY AM PEAK HOUR
NORTH PLAINS, OREGON

FIGURE 5

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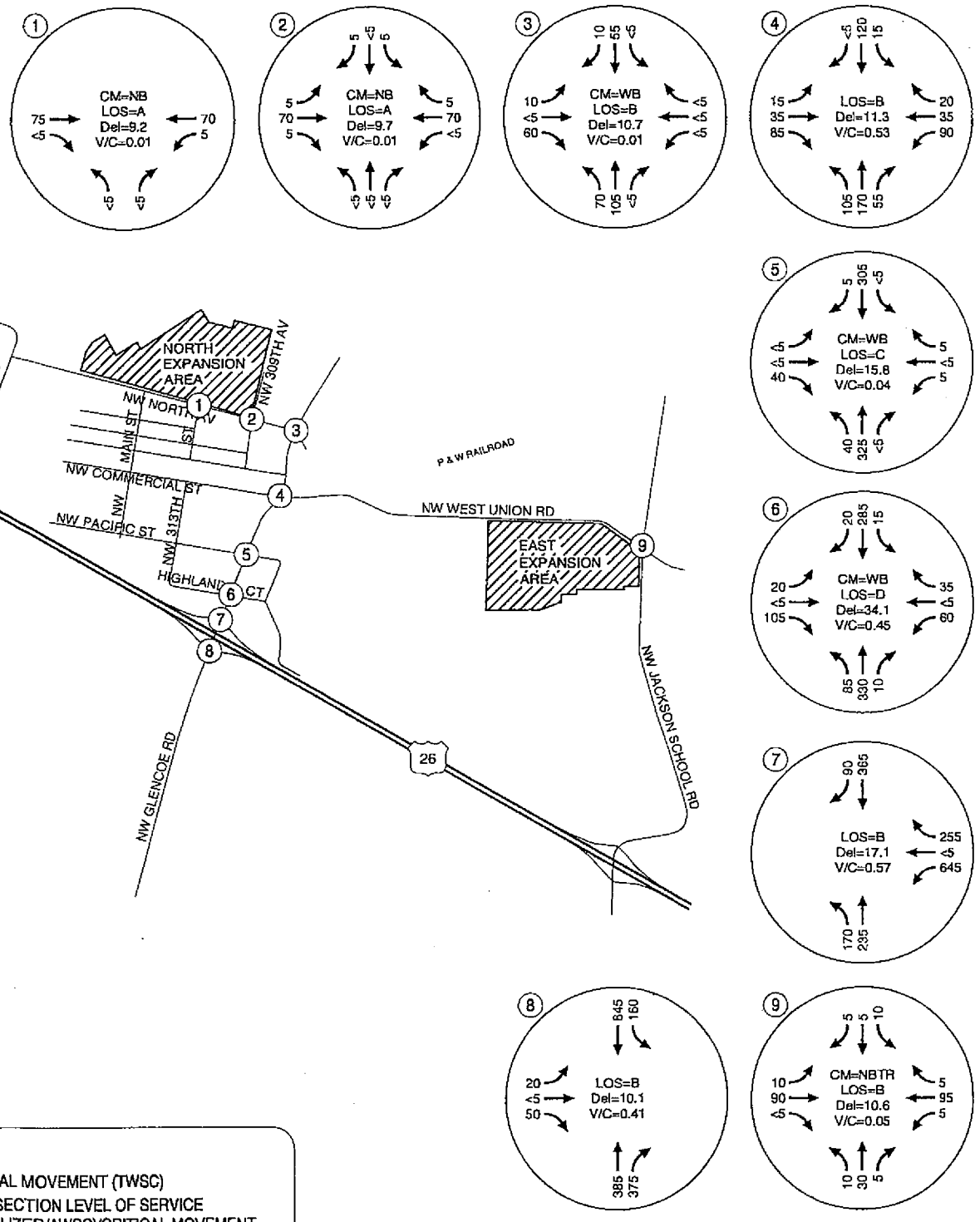
KITTELSON & ASSOCIATES, INC.
TRANSPORTATION PLANNING / TRAFFIC ENGINEERING

(NO SCALE)



LEGEND

CM = CRITICAL MOVEMENT (TWSC)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED/AWSC)/CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED/AWSC) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL
AWSC = ALL-WAY STOP CONTROL

YEAR 2015 BACKGROUND TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
NORTH PLAINS, OREGON

FIGURE 6

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TRIP GENERATION

Estimates of daily, weekday a.m., and weekday p.m. peak hour vehicle trip ends for the proposed expansion areas were developed based on empirical observations at similar land uses. These observations are summarized in the standard reference *Trip Generation, 7th Edition,* published by the Institute of Transportation Engineers (Reference 4). Tables 2 and 3 summarize the potential trip generation for the two expansion areas during a typical weekday as well as during the weekday a.m. and p.m. peak hours. All trip generation estimates shown in the tables below are rounded to the nearest five trips.

Although pass-by trip reductions are typically applied for retail developments, the existing traffic volume on both NW North Avenue and NW West Union are too low to support a measurable amount of pass-by traffic. In addition, due to the potential size and mix of land uses proposed in the two expansion areas, the potential trip reduction associated with internal trips is also low. For these reasons, no reductions were made for either pass-by or internal trips.

Table 2
Potential Trip Generation – North Expansion Area

Use	Assumed Size	Land Use Code	Daily Trips	AM Peak Hour			PM Peak Hour		
				Total	In	Out	Total	In	Out
Single Family	320 homes	210	3,060	240	60	180	325	205	120
Condos	80 units	230	470	35	5	30	40	25	15
Retail	38,000 sq ft	820	1,630	40	25	15	145	70	75
Total Trips			***5,160***	***315***	***90***	***225***	***510***	***300***	***210***

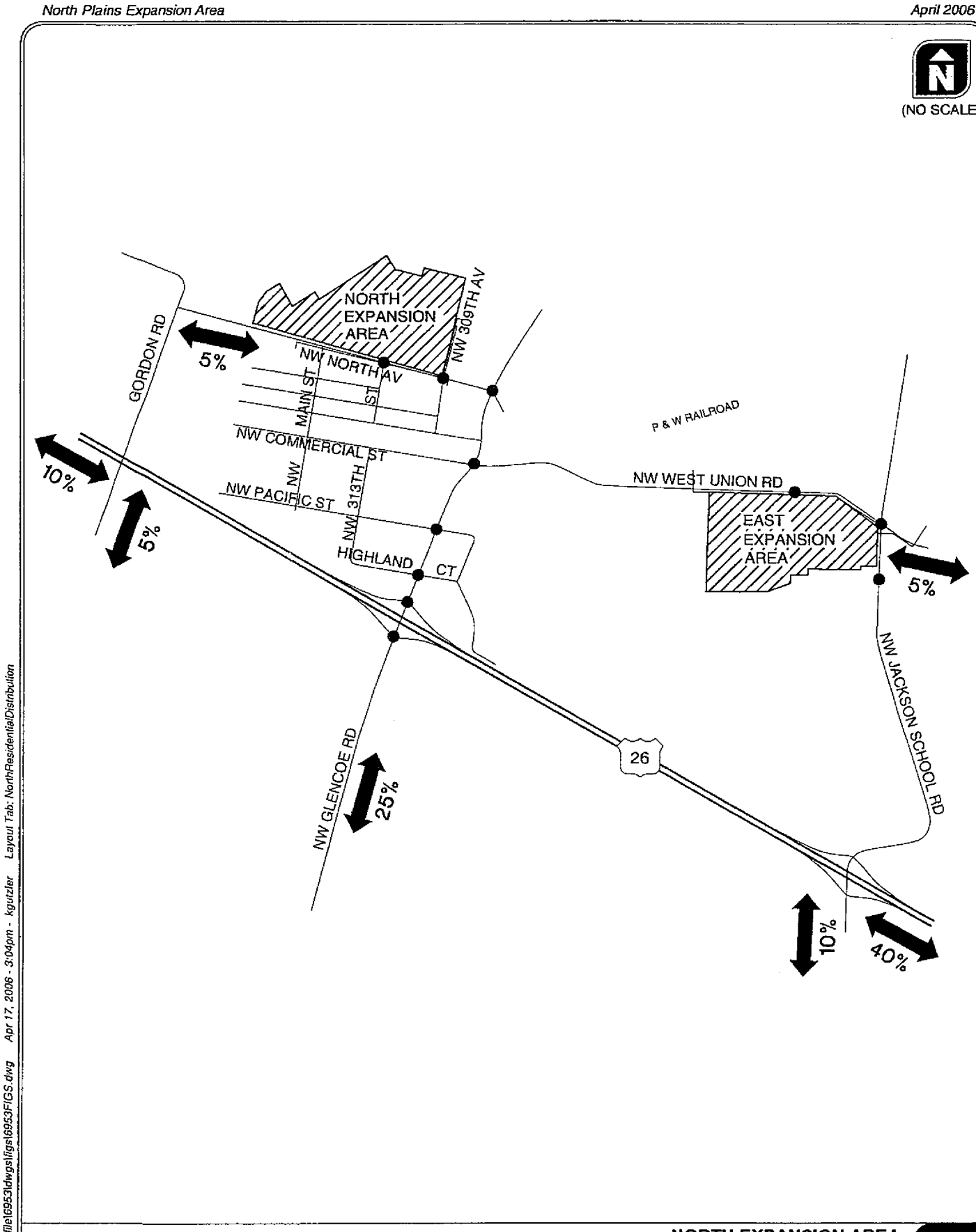
Table 3 Potential Trip Generation – East Expansion Area

Use	Assumed Size	Land Use Code	Daily Trips	AM Peak Hour			PM Peak Hour		
				Total	In	Out	Total	In	Out
Single Family	240 homes	210	2,300	180	45	135	240	150	90
Condos	60 units	230	350	25	5	20	30	20	10
Retail	38,000 sq ft	820	1,630	40	25	15	145	70	75
Elementary School	600 students	530	780	250	140	110	20*	5	15
Total Trips			***5,060***	***495***	***215***	***280***	***435***	***245***	***190***

*The ITE manual does not include data for the p.m. peak hour because the trips are typically negligible given that elementary schools do not typically have after school activities and most staff leave between 3:00 and 4:00 p.m. A small volume of trips has been assumed to account for staff activities in the above table.

TRIP DISTRIBUTION

The distribution of site-generated trips was based on existing traffic patterns, as well as the location of regional destinations. Separate trip distribution patterns were developed for the residential, retail and school uses. These distribution patterns are shown in Figures 7 – 10.



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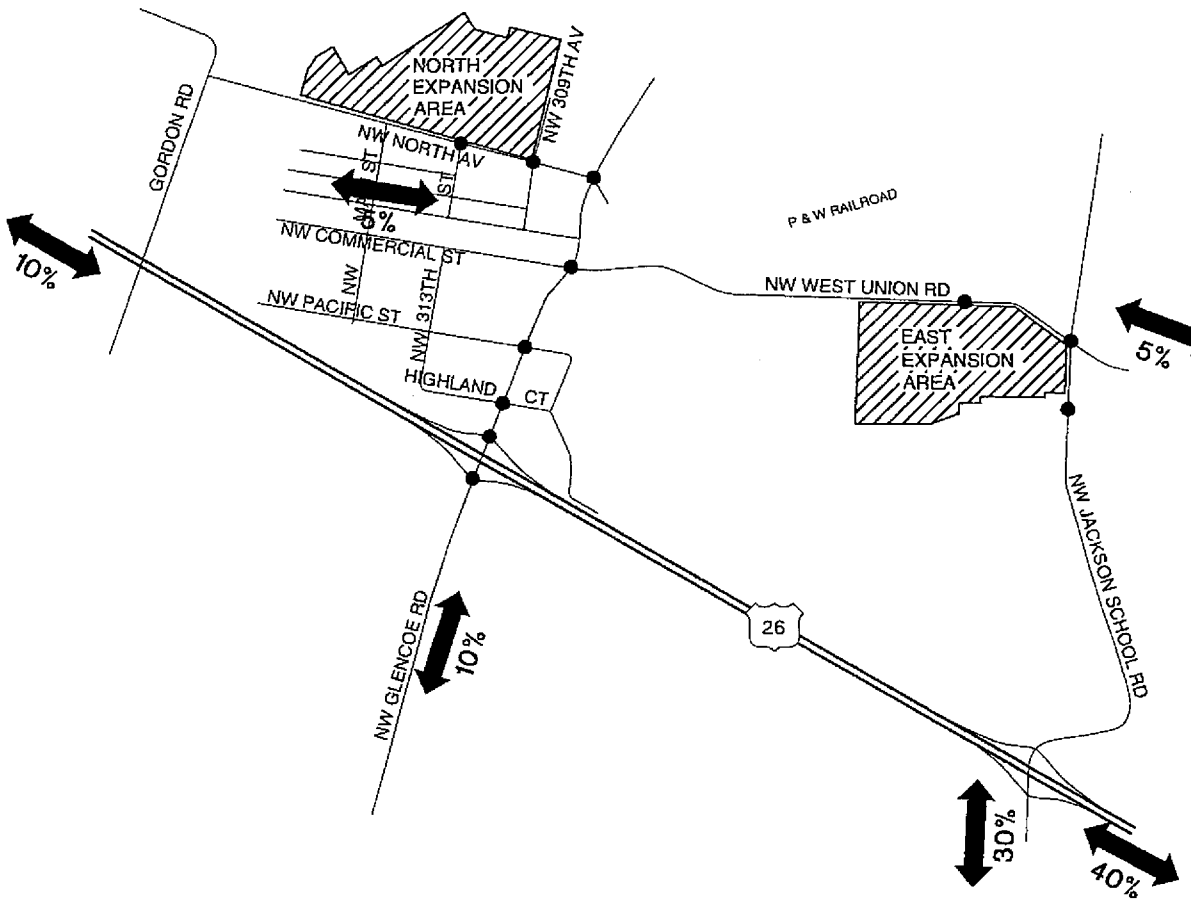
NORTH EXPANSION AREA
ESTIMATED RESIDENTIAL TRIP DISTRIBUTION PATTERN
NORTH PLAINS, OREGON

FIGURE 7

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION PLANNING / TRAFFIC ENGINEERING

(NO SCALE)



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EAST EXPANSION AREA
ESTIMATED RESIDENTIAL TRIP DISTRIBUTION PATTERN
NORTH PLAINS, OREGON

FIGURE **8**

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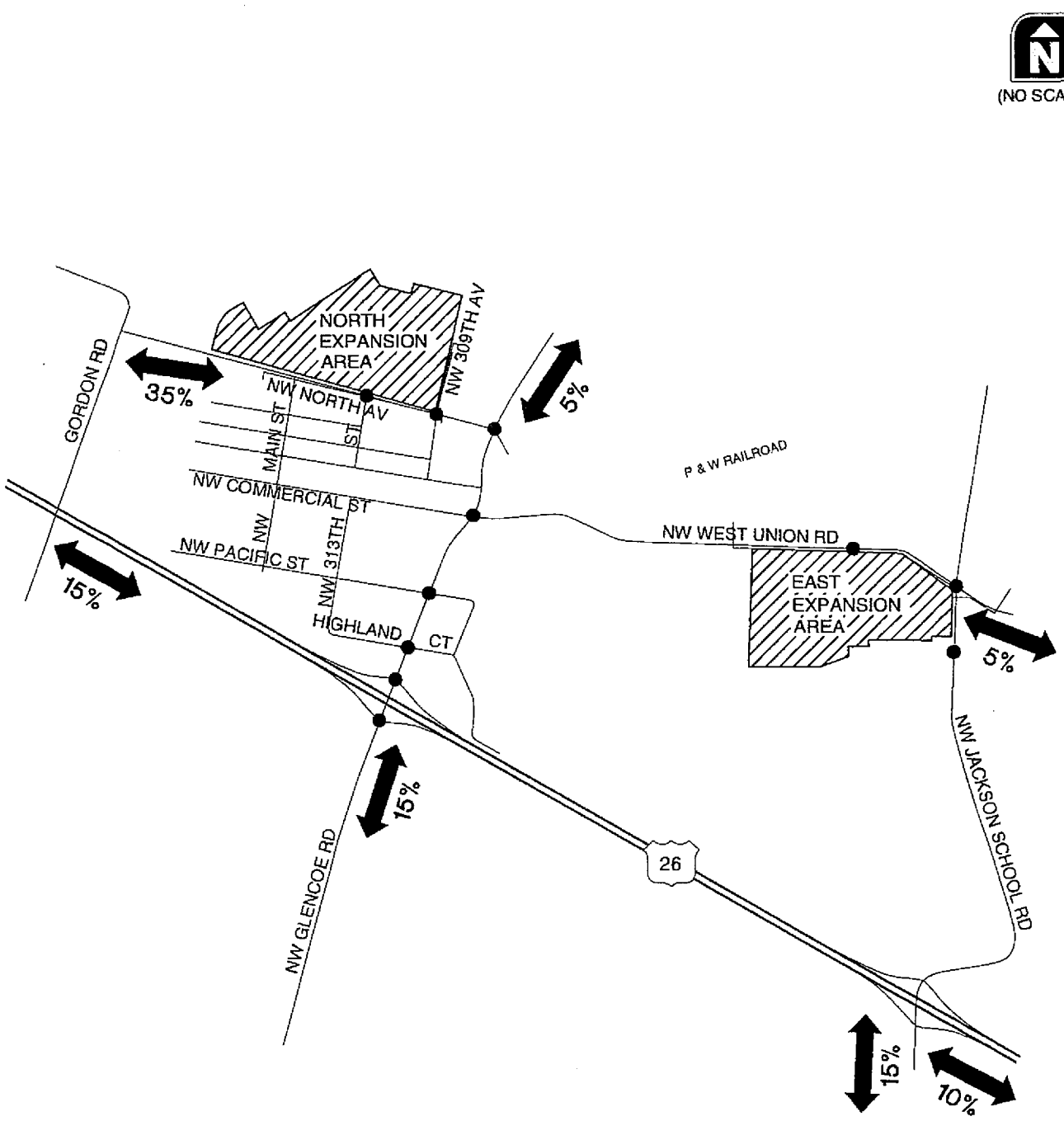
TRANSPORTATION PLANNING / TRAFFIC ENGINEERING



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ESTIMATED RETAIL TRIP DISTRIBUTION PATTERN
NORTH PLAINS, OREGON

FIGURE 9

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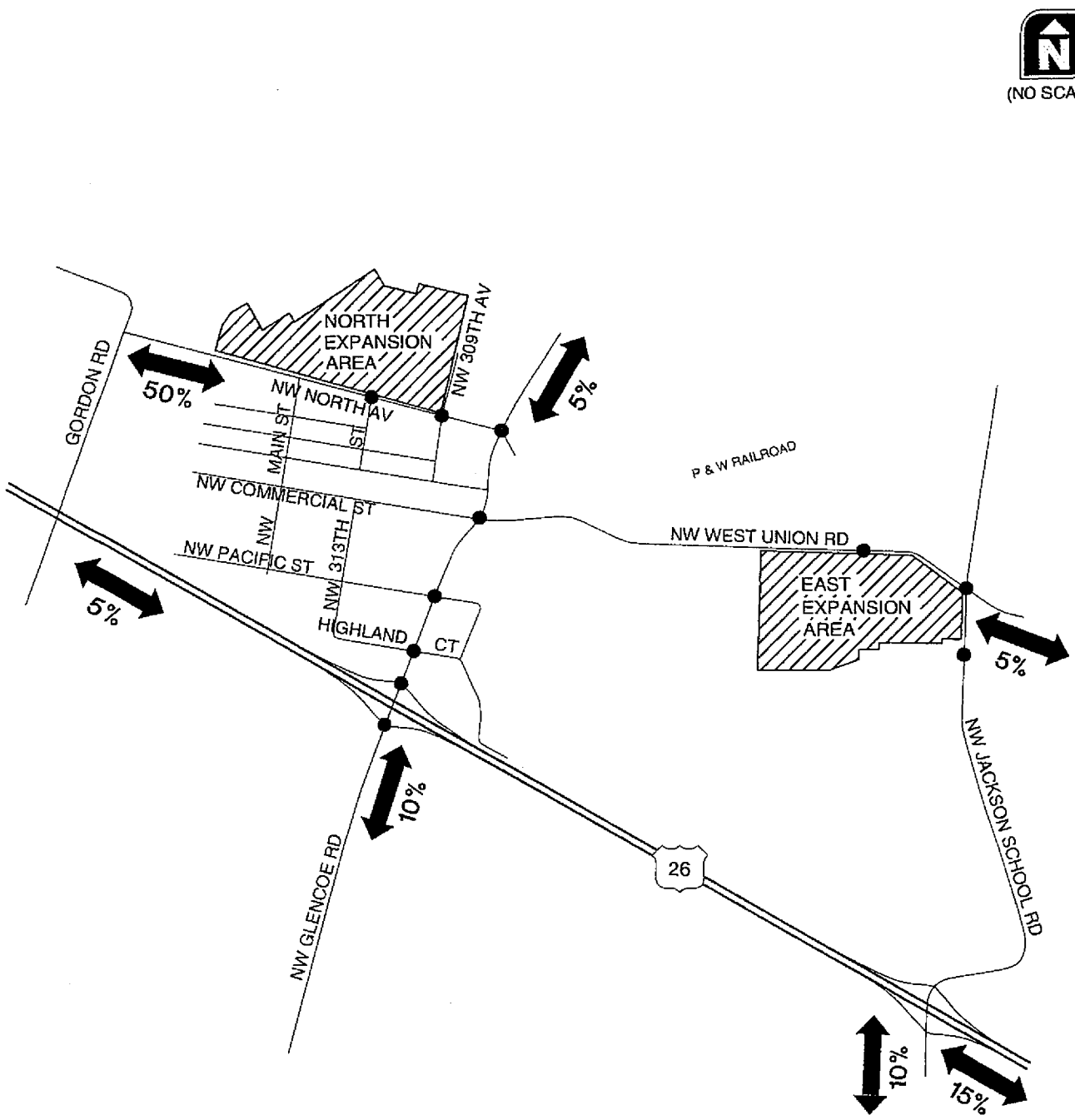
TRANSPORTATION PLANNING / TRAFFIC ENGINEERING



ESTIMATED ELEMENTARY SCHOOL TRIP DISTRIBUTION PATTERN
NORTH PLAINS, OREGON

FIGURE 10

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TRANSPORTATION PLANNING / TRAFFIC ENGINEERING

H:\projfile\69533\dwgs\figs\69533FIGS.dwg Apr 17, 2006 - 3:03pm - kgutzler Layout Tab: Elementary Distribution

Trip Assignment

Based on the estimated trip distribution patterns, the estimated weekday a.m. and p.m. peak hour site-generated traffic volumes associated with full build-out of the site were assigned to the study intersections within the site vicinity for the proposed development. Figures 11 and 12 show the assignment of site-generated trips during the weekday a.m. and p.m. peak hour, respectively.

2015 TOTAL TRAFFIC CONDITIONS

The 2015 total traffic conditions analysis forecasts how the study area's transportation system may operate with the inclusion of traffic from the expansion areas.

Traffic Volumes

The 2015 background traffic volumes for the weekday a.m. and p.m. peak hour shown in Figures 5 and 6 were added to the weekday a.m. and p.m. peak hour site-generated traffic shown in Figures 11 and 12 to arrive at the total traffic volumes also shown in Figures 11 and 12.

Level of Service Analysis

Figures 11 and 12 provide a summary of the forecast year 2015 total traffic levels of service and volume-to-capacity ratios associated with full build-out of the expansion areas. As indicated in the figures, the following intersections are forecast to operate over capacity in the next ten years: NW West Union/NW Glencoe Road and NW Highland Court/NW Glencoe Road. A discussion of potential mitigation measures is summarized below.

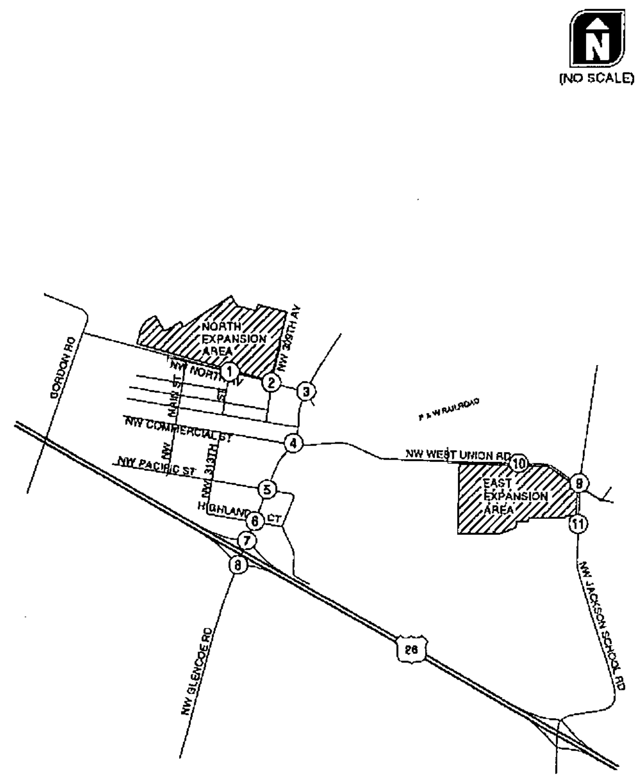
NW West Union Road/NW Glencoe Road

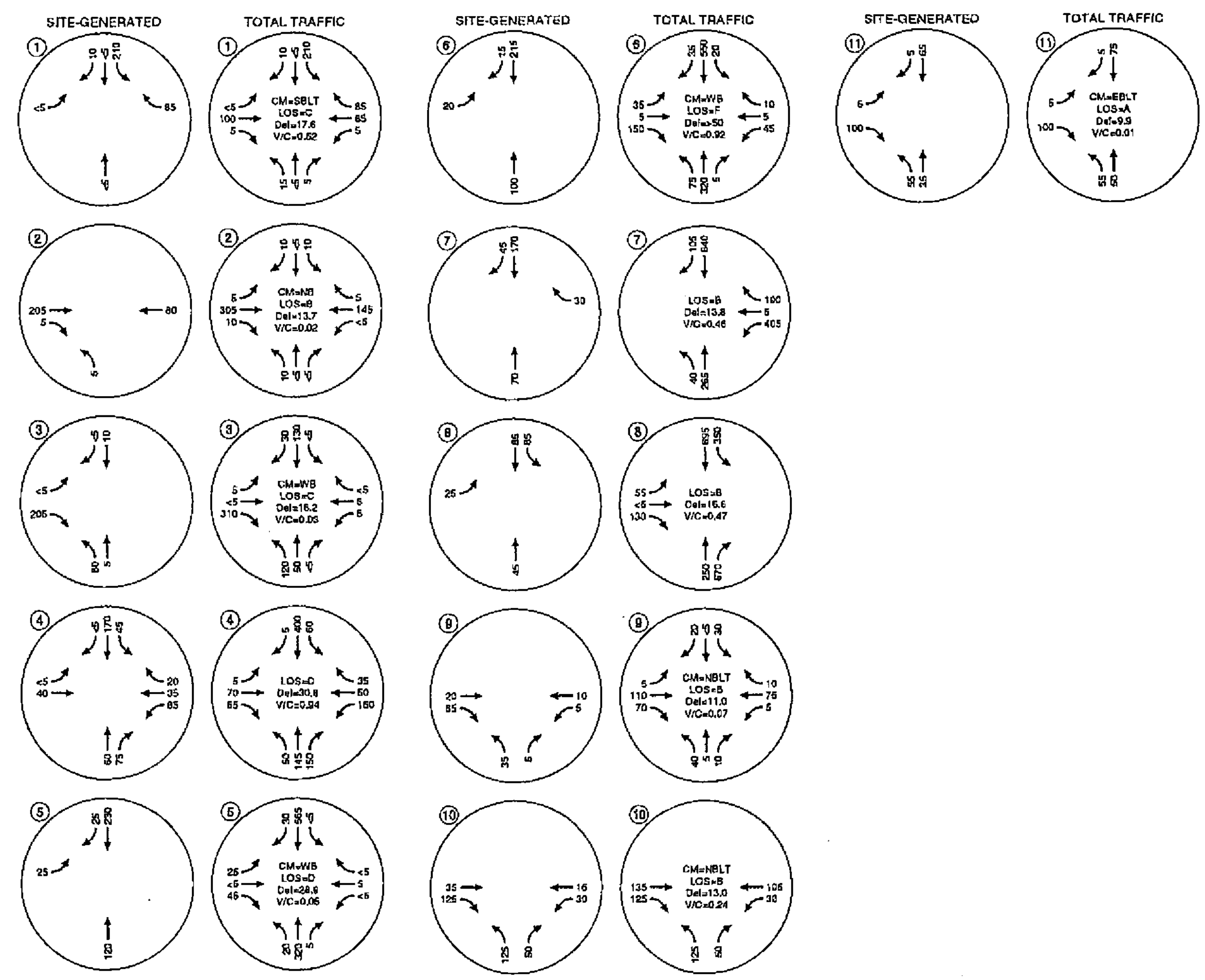
This intersection is anticipated to operate over capacity during the weekday p.m. peak hour. A sensitivity analysis was conducted in an effort to determine the threshold of development that would trigger the need for improvements at this intersection. Results of the analysis showed that the intersection would exceed a volume-to-capacity ratio of 0.95 with either: a) full build-out and occupancy of 95% of the estimated residential component on both expansion sites; or b) full build-out and occupancy of the retail, elementary school, and 50% of the residential component on both expansion sites. It should be noted that the timing associated with improvements at this intersection would depend on the mix of land uses and phasing that is incorporated at each of the expansion sites.

Traffic signal warrants were evaluated at this intersection in accordance with the procedures outlined in the Manual on Uniform Traffic Control Devices (MUTCD). According to this analysis, a traffic signal will not be warranted under year 2015 conditions. However, the widening of the northbound approach to include separate left, through and right-turn lanes will restore intersection operations to acceptable levels under the existing all-way stop-controlled configuration.

Alternatively, a single-lane roundabout could be constructed at this location in a manner that minimizes queuing across the railroad tracks. The installation of a roundabout would result in LOS "A" conditions at this location.

The City's TSP identifies the installation of a traffic signal at this intersection over the next twenty years. The City and County should monitor this intersection to identify the appropriate need for and timing of improvements at this location.





LEGEND

CM = CRITICAL MOVEMENT (TWSC)
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Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED/AWSC) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
TWSC = TWO-WAY STOP CONTROL
AWSC = ALL-WAY STOP CONTROL

NOTE: SITE ACCESS DRIVEWAY LOCATIONS WERE ESTIMATED FOR PLANNING PURPOSES. SPECIFIC ACCESS LOCATIONS WILL BE REFINED IN LATER PROJECT STAGES.

**SITE-GENERATED AND YEAR 2015 TOTAL TRAFFIC CONDITIONS
WEEKDAY AM PEAK HOUR
NORTH PLAINS, OREGON**

FIGURE 11

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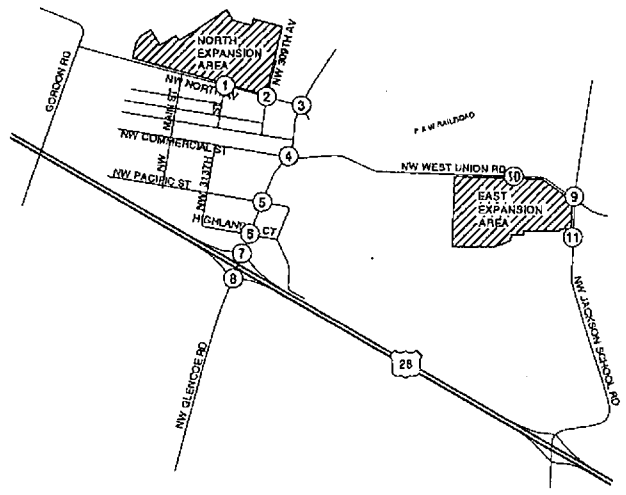
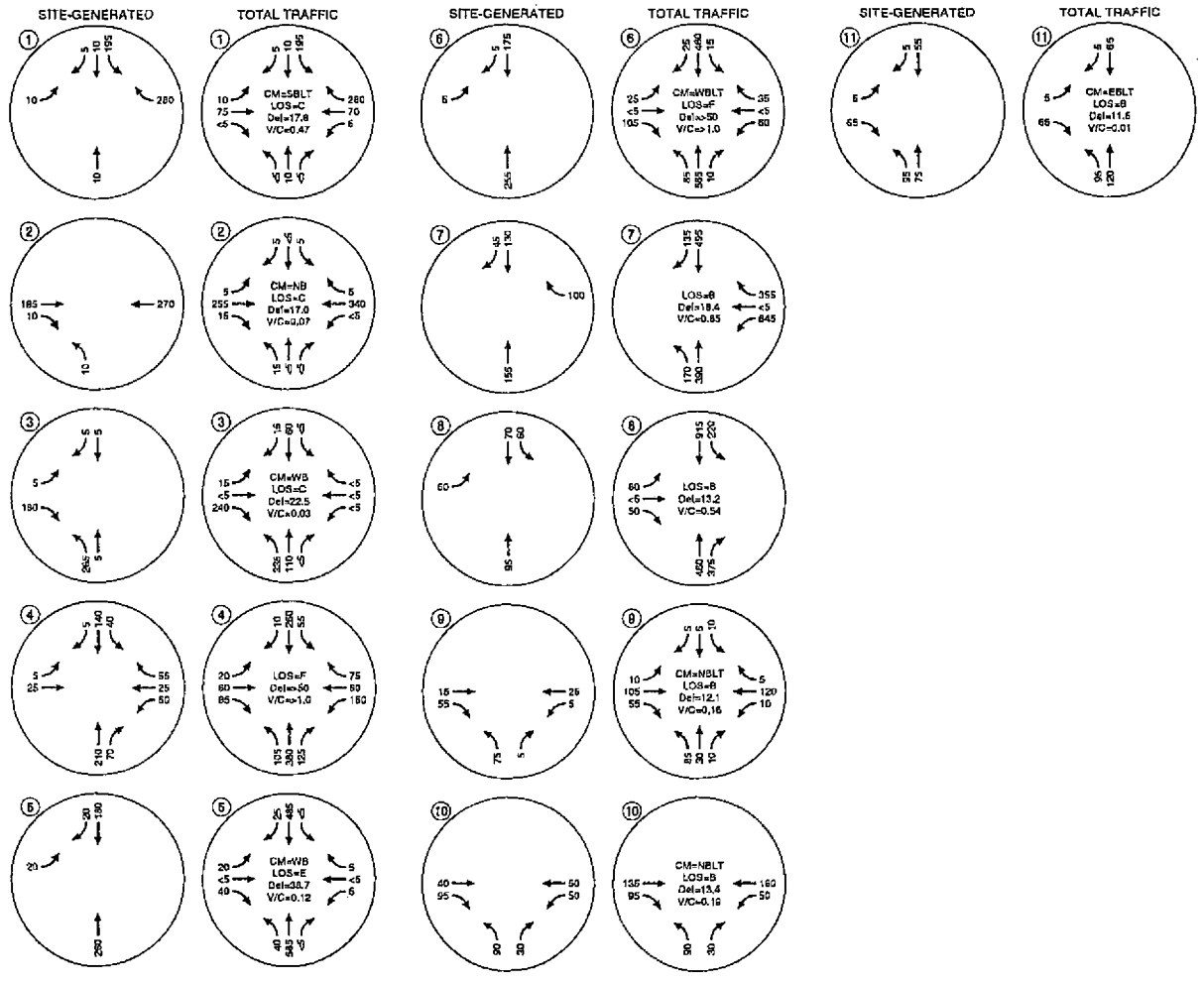
TRANSPORTATION PLANNING / TRAFFIC ENGINEERING

H:\projfile\6952\dwgs\figs\6952FIGS.dwg Apr 17, 2006 - 3:04pm - kgutzler Layout Tab: TotalAM



(NO SCALE)



LEGEND

- CM = CRITICAL MOVEMENT (TWSC)
- LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED/AWSC)/CRITICAL MOVEMENT LEVEL OF SERVICE (TWSC)
- Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED/AWSC) / CRITICAL MOVEMENT CONTROL DELAY (TWSC)
- V/C = CRITICAL VOLUME-TO-CAPACITY RATIO
- TWSC = TWO-WAY STOP CONTROL
- AWSC = ALL-WAY STOP CONTROL

NOTE: SITE ACCESS DRIVEWAY LOCATIONS WERE ESTIMATED FOR PLANNING PURPOSES. SPECIFIC ACCESS LOCATIONS WILL BE REFINED IN LATER PROJECT STAGES.

SITE-GENERATED AND YEAR 2015 TOTAL TRAFFIC CONDITIONS
WEEKDAY PM PEAK HOUR
NORTH PLAINS, OREGON

FIGURE 12

H:\proj\file\8362\dwg\fig\8362FIG3.dwg Apr 17, 2006 - 3:04pm - kgulder Layout Tab: TotalPM

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Any improvements (turn lanes and/or signals) will require coordination with ODOT's Rail Division. There is an existing Portland & Western rail line just to the north of the intersection. Any modifications to the intersection will trigger the need to install active control devices, such as flashing lights and gates.

NW Highland Court/NW Glencoe Road

The westbound left-turn at this intersection is anticipated to operate over capacity in the future. All other movements are anticipated to operate acceptably.

As discussed previously, due to the close proximity to the Glencoe Road interchange, ODOT may require alternative access configurations at this location. For this reason, the City should work with ODOT to identify the appropriate intersection mitigation at this location.

NW Glencoe Road/NW Pacific Street

The delay for the critical westbound approach at the NW Pacific Street/NW Glencoe Road intersection is anticipated to be more than 50 seconds per vehicle. However, there is sufficient capacity for this movement; therefore, no mitigation measures are recommended at this location. The City and County should monitor this intersection to determine the appropriate need for and timing of a traffic signal.

Appendix E contains the year 2015 total traffic level of service worksheets.

SITE ACCESS SPACING, SIGHT DISTANCE AND SAFETY

At the time a master plan is developed for the expansion areas, the appropriate location and number of local roadway connections to both NW North Avenue and NW West Union Road will be determined. These roadways will be spaced to ensure adequate sight distance and appropriate access management along both roadways.

IMPROVEMENT OF NW NORTH AVENUE AND NW GLENCOE ROAD

As discussed in Section 3 of this report, both NW North Avenue and NW Glencoe Road need to be improved to provide safe travel for motorists, cyclists, and pedestrians. Polygon Northwest is working with City and County staff to identify the appropriate types of improvements (e.g., curb, gutter, sidewalks, bike lanes, center turn lanes, etc) that should be constructed along both roadways.

Section 5

Conclusions and Recommendations

Conclusions and Recommendations

As discussed in this report, the expansion areas can be developed while maintaining acceptable transportation system operations with the identified mitigation measures in-place. The primary findings and recommendations are summarized below.

- All of the study area intersections currently operate acceptably during the weekday a.m. and p.m. peak hours, with the exception of the US 26/Glencoe Road eastbound and westbound ramps.
- Funding for improvements to the Glencoe Road interchange are included in the Oregon Department of Transportation's (ODOT) Statewide Transportation Improvement Program (STIP). As part of this improvement project, ODOT will be developing an Interchange Area Management Plan (IAMP) to address all private and public accesses within one-quarter mile of the interchange. The IAMP will commence in Spring 2005.
- The improvement of both the Glencoe Road and Jackson School Road (which is currently under construction) interchanges will significantly improve accessibility into North Plains.
- The NW West Union Road/NW Glencoe Road intersection is anticipated to operate over capacity in 2015 with development of the expansion areas although is not anticipated to warrant a traffic signal. Widening of the northbound approach to include separate turn lanes will restore intersection operations to acceptable levels. Alternatively, the installation of a single-lane roundabout at this location would enable the intersection to function at a level-of-service "A" through the year 2015. The City and County should monitor the intersection to determine if and when a traffic signal should be installed at this location. Polygon will work with the City and County to determine the appropriate mitigation at this location.
- Any improvements (turn lanes and/or signals) to the NW West Union/NW Glencoe Road intersection will also trigger the need to install active control devices, such as flashing lights and gates at the Portland & Western rail crossing to the north of the intersection.
- The westbound left-turn movement at the NW Highland Court/NW Glencoe Road intersection is expected to operate over capacity. Due to the close proximity to the Glencoe Road interchange, ODOT may evaluate alternative access configurations at this location. All other movements at this intersection are forecast to operate acceptably.
- A traffic signal is not anticipated to be warranted at the NW Pacific Street/NW Glencoe Road intersection. The City and County should monitor this intersection to identify if and when a traffic signal should be installed. Polygon will work with the City and County to determine the appropriate need for mitigation at this location.
- Polygon is working with Washington County and City of North Plains staff to identify the appropriate improvements needed to both NW North Avenue and NW West Union Road. Both roadways are rural in nature today and need appropriate facilities for all modes of travel (e.g., curbs, gutter, sidewalks, striped bike lanes, center turn lanes, etc.).

Section 6

References

References

1. TAK Associates Engineering Consultants. *Safety Improvements at the Intersection of NW North Avenue and NW 309th Street, North Plains, Oregon.* August 2004.

2. Tri-Met. http://www.trimet.org. February 2005.

3. Transportation Research Board. *Highway Capacity Manual.* 2000.

4. Institute of Transportation Engineers. *ITE Trip Generation Manual, Seventh Edition.* 2003.

Appendix A

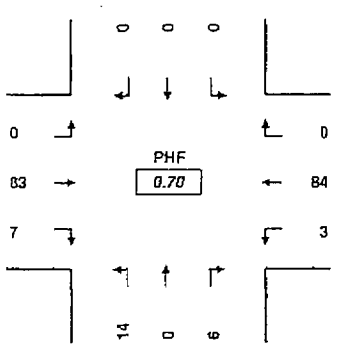
Traffic Count Data

INTERSECTION: *313th--/North Ave--*
PROJECT ID#:
QC JOB #: *10062908*

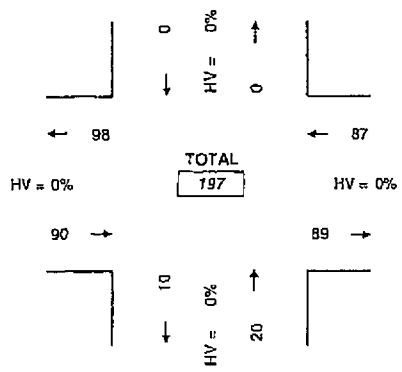
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



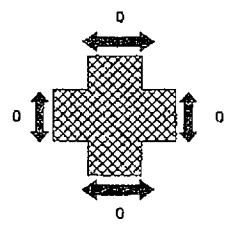
PEAK HOUR LINK VOLUMES



PEAK HOUR: 7:00 AM to 8:00 AM

PEAK 15 MINUTES: 7:30 AM to 7:45 AM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*313th--* (Southbound)			*North Ave--* (Westbound)			*313th--* (Northbound)			*North Ave--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	0	0	0	0	5	0	0	0	0	0	1	0	0	0	0	0	6	0
7:05 AM	0	0	0	0	5	0	1	0	0	1	3	0	0	0	0	0	10	0
7:10 AM	0	0	0	0	6	0	0	0	1	1	6	0	0	0	0	0	14	0
7:15 AM	0	0	0	0	5	0	0	0	1	0	6	0	0	0	0	0	12	0
7:20 AM	0	0	0	0	3	1	0	0	2	0	4	0	0	0	0	0	10	0
7:25 AM	0	0	0	0	8	0	1	0	0	1	3	0	0	0	0	0	13	0
7:30 AM	0	0	0	0	13	0	0	0	2	1	5	0	0	0	0	0	21	0
7:35 AM	0	0	0	0	11	1	0	0	3	0	10	0	0	0	0	0	25	0
7:40 AM	0	0	0	0	6	0	0	0	4	1	13	0	0	0	0	0	24	0
7:45 AM	0	0	0	0	13	0	2	0	0	1	15	0	0	0	0	0	31	0
7:50 AM	0	0	0	0	4	1	1	0	0	0	11	0	0	0	0	0	17	0
7:55 AM	0	0	0	0	5	0	1	0	1	1	6	0	0	0	0	0	14	0
8:00 AM	0	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0	6	0
8:05 AM	0	0	0	0	2	0	1	0	1	0	5	0	0	0	0	0	9	0
8:10 AM	0	0	0	0	3	1	1	0	0	0	5	0	0	0	0	0	10	0
8:15 AM	0	0	0	0	4	0	0	0	0	1	3	0	0	0	0	0	8	0
8:20 AM	0	0	0	0	1	0	0	0	1	0	5	0	0	0	0	0	7	0
8:25 AM	0	0	0	0	6	2	0	0	0	0	1	0	0	0	0	0	9	0
8:30 AM	0	0	0	0	5	2	1	0	2	0	6	0	0	0	0	0	16	0
8:35 AM	0	0	0	0	1	0	1	0	1	0	3	0	0	0	0	0	6	0
8:40 AM	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	0	4	0
8:45 AM	0	0	0	0	2	0	0	0	0	0	3	0	0	0	0	0	5	0
8:50 AM	0	0	0	0	5	0	0	0	0	1	1	0	0	0	0	0	7	0
8:55 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	0	0	0	0	84	3	6	0	14	7	83	0	0	0	0	0	197	0
7:15 AM	0	0	0	0	75	4	7	0	14	5	87	0	0	0	0	0	192	0
7:30 AM	0	0	0	0	70	5	6	0	12	5	83	0	0	0	0	0	181	0
7:45 AM	0	0	0	0	48	7	8	0	6	3	65	0	0	0	0	0	137	0
8:00 AM	0	0	0	0	33	6	4	0	5	2	39	0	0	0	0	0	89	0

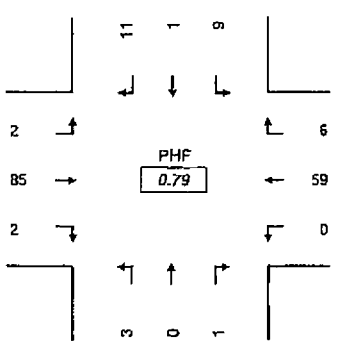
Version 3.1

INTERSECTION: *309th--/North--*
PROJECT ID#:
QC JOB #: *10062907*

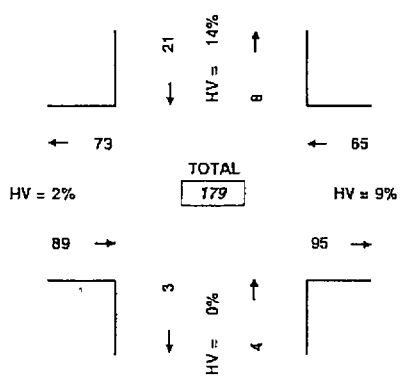
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

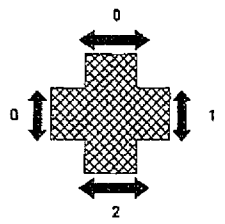
PEAK HOUR TURNING MOVEMENTS



PEAK HOUR LINK VOLUMES



PEAK HOUR PED CROSSING VOLUMES



PEAK HOUR: 7:00 AM TO 8:00 AM

PEAK 15 MINUTES: 7:45 AM TO 8:00 AM

5-MINUTE COUNT PERIOD BEGINNING AT	*309th--* (Southbound)			*North--* (Westbound)			*309th--* (Northbound)			*North--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	2	0	2	0	5	0	0	0	0	1	0	0	0	0	2	0	10	2
7:05 AM	0	0	0	0	2	0	0	0	0	0	5	0	0	0	0	0	7	0
7:10 AM	1	0	1	1	4	0	0	0	0	0	7	0	0	0	0	0	14	0
7:15 AM	1	0	1	1	6	0	0	0	0	0	4	0	0	1	0	0	13	1
7:20 AM	0	0	1	1	1	0	0	0	0	0	5	0	0	0	0	0	8	0
7:25 AM	1	0	1	0	7	0	0	0	1	0	6	0	0	0	0	0	16	0
7:30 AM	3	0	0	0	9	0	0	0	0	0	4	0	0	0	0	0	16	0
7:35 AM	0	0	0	1	5	0	0	0	0	0	14	0	0	0	0	0	20	0
7:40 AM	1	0	1	0	6	0	0	0	0	0	9	1	0	0	0	0	18	0
7:45 AM	0	0	1	0	4	0	0	0	2	0	16	0	0	0	0	0	23	0
7:50 AM	2	0	0	2	5	0	0	0	0	1	11	1	0	0	0	0	22	0
7:55 AM	0	1	1	0	5	0	1	0	0	0	4	0	0	0	0	0	12	0
8:00 AM	0	0	2	0	3	0	0	0	0	0	8	0	0	0	0	0	13	0
8:05 AM	0	0	0	0	2	0	0	0	0	0	6	1	0	0	0	0	9	0
8:10 AM	0	0	0	0	4	0	0	0	0	1	3	0	0	1	0	0	8	1
8:15 AM	0	0	0	0	2	0	0	0	0	0	4	0	0	0	0	0	6	0
8:20 AM	0	0	1	0	4	0	0	0	0	0	5	0	0	1	0	0	10	1
8:25 AM	0	0	0	0	4	0	0	0	0	0	2	0	0	0	0	0	6	0
8:30 AM	2	0	0	0	7	0	0	0	0	0	6	2	0	0	0	0	17	0
8:35 AM	1	0	0	0	2	0	0	0	0	0	5	1	0	0	0	0	9	0
8:40 AM	0	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	3	1
8:45 AM	1	0	1	0	3	0	0	0	0	0	2	0	0	1	0	0	7	1
8:50 AM	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	1	3	1
8:55 AM	0	0	0	0	5	0	0	0	0	0	6	0	0	1	0	0	11	1

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	11	1	9	6	59	0	1	0	3	2	85	2	0	1	2	0	179	3
7:15 AM	8	1	8	5	57	0	1	0	3	2	90	3	0	2	0	0	178	2
7:30 AM	6	1	6	3	53	0	1	0	2	2	86	3	0	2	0	0	163	2
7:45 AM	5	1	6	2	43	0	1	0	2	2	71	5	1	2	0	0	138	3
8:00 AM	4	0	5	0	39	0	0	0	0	1	49	4	1	4	0	1	102	6

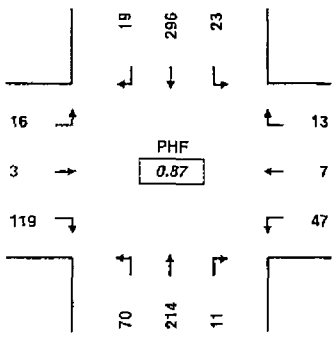
Version 3.1

INTERSECTION: *Glencoe Rd-/NW Highland--*
PROJECT ID#:
QC JOB #: *10062903*

START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

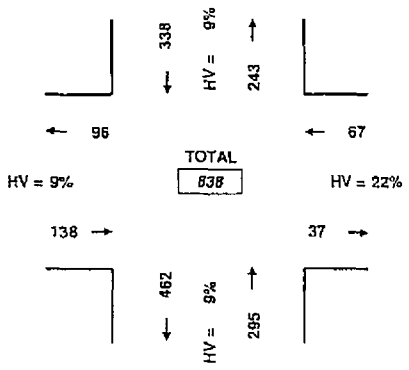
QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



PHF: *0.87*

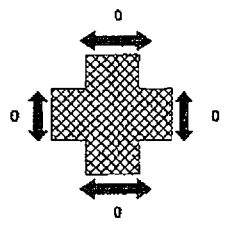
PEAK HOUR LINK VOLUMES



PEAK HOUR: 7:45 AM TO 8:45 AM

PEAK 15 MINUTES: 7:45 AM TO 8:00 AM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe Rd--* (Southbound)			*NW Highland--* (Westbound)			*Glencoe Rd--* (Northbound)			*Highland Rd--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	0	23	0	0	0	5	1	16	10	6	0	1	0	0	0	0	63	0
7:05 AM	1	24	0	3	1	4	0	13	6	6	0	1	0	0	0	0	59	0
7:10 AM	1	19	1	3	0	1	0	14	7	18	0	2	0	0	0	0	66	0
7:15 AM	1	26	0	2	0	2	0	17	4	13	0	1	0	0	0	0	66	0
7:20 AM	1	21	0	1	0	1	0	17	2	12	0	1	0	0	0	0	56	0
7:25 AM	3	21	1	1	0	0	1	19	9	6	0	0	0	0	0	0	61	0
7:30 AM	0	20	2	1	0	5	0	10	8	11	1	1	0	0	0	0	59	0
7:35 AM	0	29	0	0	1	4	1	15	9	11	0	0	0	0	0	0	70	0
7:40 AM	1	23	5	1	0	4	1	19	7	12	0	1	0	0	0	0	74	0
7:45 AM	2	33	3	0	0	6	0	20	8	11	0	1	0	0	0	0	84	0
7:50 AM	5	22	2	2	0	6	1	26	4	14	0	1	0	0	0	0	83	0
7:55 AM	2	26	3	0	0	4	0	18	6	12	0	2	0	0	0	0	73	0
8:00 AM	1	34	0	0	1	3	1	11	5	10	0	3	0	0	0	0	69	0
8:05 AM	1	24	5	0	0	2	0	14	5	13	1	0	0	0	0	0	65	0
8:10 AM	2	28	0	3	1	3	2	12	2	8	1	3	0	0	0	0	65	0
8:15 AM	0	24	2	0	2	5	1	18	1	6	0	2	0	0	0	0	61	0
8:20 AM	2	25	3	1	1	2	0	15	2	9	0	0	0	0	0	0	60	0
8:25 AM	2	28	2	4	0	3	0	14	7	4	0	3	0	0	0	0	67	0
8:30 AM	0	19	1	3	0	4	1	27	8	11	1	0	0	0	0	0	75	0
8:35 AM	1	17	1	0	0	2	2	26	8	8	0	1	0	0	0	0	66	0
8:40 AM	1	16	1	0	2	7	3	13	14	13	0	0	0	0	0	0	70	0
8:45 AM	2	21	1	2	0	5	1	21	10	11	0	3	0	0	0	0	77	0
8:50 AM	0	14	3	0	0	4	0	21	6	12	0	0	0	0	0	0	60	0
8:55 AM	1	17	1	2	0	6	0	20	6	4	1	1	0	0	0	0	59	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	17	287	17	14	2	43	5	204	80	132	1	12	0	0	0	0	814	0
7:15 AM	19	307	21	11	3	40	7	198	69	133	3	14	0	0	0	0	825	0
7:30 AM	18	316	27	12	6	47	7	192	64	121	3	17	0	0	0	0	830	0
7:45 AM	19	296	23	13	7	47	11	214	70	119	3	16	0	0	0	0	838	0
8:00 AM	13	267	20	15	7	46	11	212	74	109	4	16	0	0	0	0	794	0

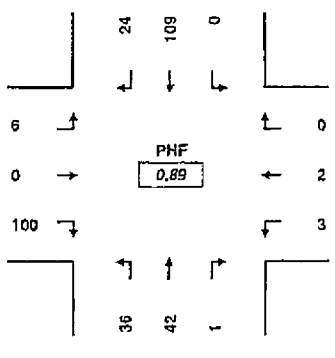
Version 3.1

INTERSECTION: *Glencoe--/North Ave--*
PROJECT ID#:
QC JOB #: *10062906*

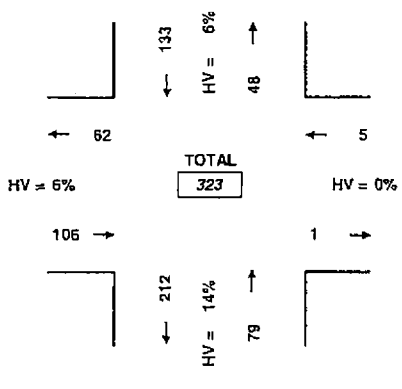
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

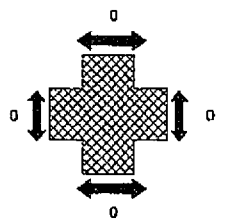
PEAK HOUR TURNING MOVEMENTS



PEAK HOUR LINK VOLUMES



PEAK HOUR PED CROSSING VOLUMES



PEAK HOUR: 7:15 AM TO 8:15 AM

PEAK 15 MINUTES: 7:45 AM TO 8:00 AM

5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe--* (Southbound)			*North Ave--* (Westbound)			*Glencoe--* (Northbound)			*North Ave--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	0	8	0	0	0	0	0	6	4	1	0	0	0	0	0	0	19	0
7:05 AM	0	12	1	0	0	1	0	2	4	4	0	0	0	0	0	0	24	0
7:10 AM	2	6	0	0	0	0	0	3	3	7	0	0	0	0	0	0	21	0
7:15 AM	1	12	0	0	0	0	0	3	4	6	0	0	0	0	0	0	26	0
7:20 AM	0	9	0	0	0	0	0	2	4	7	0	0	0	0	0	0	22	0
7:25 AM	2	11	0	0	1	1	1	4	3	5	0	0	0	0	0	0	28	0
7:30 AM	5	12	0	0	0	1	0	0	6	8	0	1	0	0	0	0	33	0
7:35 AM	2	8	0	0	0	0	0	0	3	5	0	2	0	0	0	0	20	0
7:40 AM	4	10	0	0	0	0	0	3	3	13	0	1	0	0	0	0	34	0
7:45 AM	1	7	0	0	1	0	0	8	2	15	0	0	0	0	0	0	34	0
7:50 AM	2	9	0	0	0	0	0	2	6	13	0	2	0	0	0	0	34	0
7:55 AM	3	9	0	0	0	1	0	3	1	6	0	0	0	0	0	0	23	0
8:00 AM	2	6	0	0	0	0	0	8	1	9	0	0	0	0	0	0	26	0
8:05 AM	1	12	0	0	0	0	0	5	1	8	0	0	0	0	0	0	27	0
8:10 AM	1	4	0	0	0	0	0	4	2	5	0	0	0	0	0	0	16	0
8:15 AM	0	10	0	0	0	1	0	8	3	4	0	0	0	0	0	0	26	0
8:20 AM	0	8	0	0	0	0	0	2	6	6	0	0	0	0	0	0	22	0
8:25 AM	0	6	0	0	0	0	1	5	2	3	0	0	0	0	0	0	17	0
8:30 AM	1	8	0	0	0	1	3	5	6	5	0	0	0	0	0	0	29	0
8:35 AM	0	4	0	0	0	0	0	6	1	3	0	0	0	0	0	0	14	0
8:40 AM	0	5	0	0	0	0	0	6	2	4	0	0	0	0	0	0	17	0
8:45 AM	1	7	0	0	0	0	0	5	2	4	0	0	0	0	0	0	19	0
8:50 AM	0	8	0	0	0	0	0	1	1	1	0	0	0	0	0	0	11	0
8:55 AM	0	8	0	0	0	0	0	3	4	5	0	0	0	0	0	0	20	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	22	113	1	0	2	4	1	36	43	90	0	6	0	0	0	0	318	0
7:15 AM	24	109	0	0	2	3	1	42	36	100	0	6	0	0	0	0	323	0
7:30 AM	21	101	0	0	1	3	1	48	36	95	0	6	0	0	0	0	312	0
7:45 AM	11	88	0	0	1	3	4	62	33	81	0	2	0	0	0	0	285	0
8:00 AM	6	86	0	0	0	2	4	58	31	57	0	0	0	0	0	0	244	0

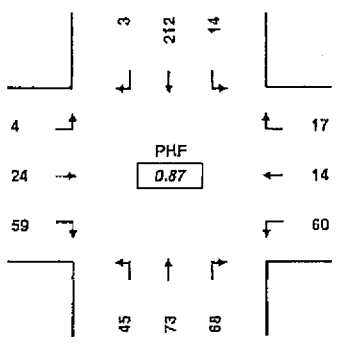
Version 3.1

INTERSECTION: *Glencoe Rd--/NW Commercial--*
PROJECT ID#:
QC JOB #: *10062905*

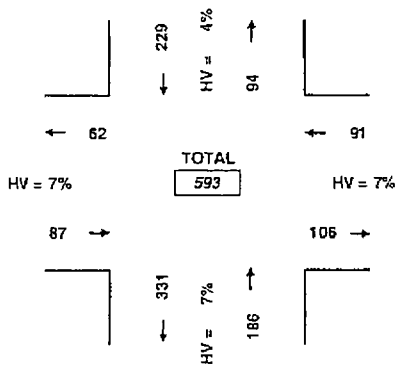
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



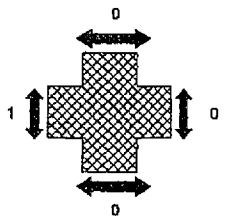
PEAK HOUR LINK VOLUMES



PEAK HOUR: 7:15 AM TO 8:15 AM

PEAK 15 MINUTES: 7:45 AM TO 8:00 AM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe Rd--* (Southbound)			*NW Commercial--* (Westbound)			*Glencoe--* (Northbound)			*NW Commercial--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	0	7	1	0	0	6	4	10	6	5	2	1	0	0	0	0	42	0
7:05 AM	3	12	1	0	1	3	4	5	2	4	2	0	0	0	0	0	37	0
7:10 AM	0	14	1	0	1	2	3	7	3	0	0	0	0	0	0	0	31	0
7:15 AM	0	17	1	1	0	4	3	8	5	7	1	1	0	0	0	0	48	0
7:20 AM	1	13	2	0	1	4	6	6	7	3	0	0	0	0	0	0	43	0
7:25 AM	0	18	0	1	0	3	7	7	7	5	5	3	0	0	0	0	56	0
7:30 AM	1	16	3	4	2	5	6	3	3	3	3	0	0	0	0	0	49	0
7:35 AM	0	12	1	0	0	2	6	5	3	5	2	0	0	0	0	0	36	0
7:40 AM	0	27	0	2	2	6	5	3	2	1	2	0	0	0	0	0	50	0
7:45 AM	0	22	1	3	1	4	8	7	2	4	4	0	0	0	0	0	56	0
7:50 AM	0	23	2	3	3	5	7	6	3	6	1	0	0	0	0	0	59	0
7:55 AM	1	14	1	0	2	8	9	7	7	3	3	0	0	0	0	0	55	0
8:00 AM	0	16	0	1	1	2	2	10	4	10	1	0	0	0	0	0	47	0
8:05 AM	0	24	2	1	0	8	4	3	1	7	0	0	0	0	0	0	50	0
8:10 AM	0	10	1	1	2	9	5	8	1	5	2	0	0	0	0	1	44	1
8:15 AM	0	16	2	1	2	3	7	7	5	8	0	1	0	0	0	0	52	0
8:20 AM	1	14	1	2	0	4	2	5	6	5	1	0	0	0	0	0	41	0
8:25 AM	1	11	1	0	0	7	2	13	3	6	0	0	0	0	0	0	44	0
8:30 AM	0	15	1	5	0	6	5	12	4	7	1	0	0	0	0	0	56	0
8:35 AM	0	6	2	4	1	3	3	10	6	0	2	0	0	0	0	0	37	0
8:40 AM	0	9	0	1	1	9	2	6	6	5	1	0	0	0	0	0	40	0
8:45 AM	0	9	2	0	2	4	2	5	4	6	0	2	0	0	0	0	36	0
8:50 AM	0	9	0	1	0	3	5	3	7	4	0	0	0	0	0	0	32	0
8:55 AM	0	14	3	0	2	2	4	12	5	4	2	0	0	0	0	0	48	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	6	195	14	14	13	52	68	74	50	46	25	5	0	0	0	0	562	0
7:15 AM	3	212	14	17	14	60	68	73	45	59	24	4	0	0	0	1	593	1
7:30 AM	4	205	15	18	15	63	63	77	40	63	19	1	0	0	0	1	583	1
7:45 AM	3	180	14	22	13	68	56	94	48	66	16	1	0	0	0	1	581	1
8:00 AM	2	153	15	17	11	60	43	94	52	67	10	3	0	0	0	1	527	1

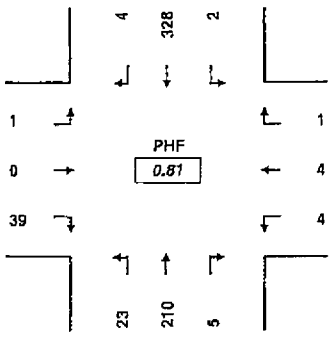
Version 3.1

INTERSECTION: *NW Glencoe Rd--From North/Car Shop--From East*
PROJECT ID#:
QC JOB #: *10062904*

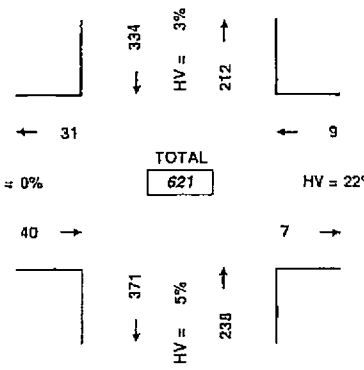
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



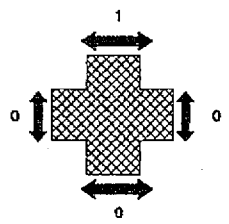
PEAK HOUR LINK VOLUMES



PEAK HOUR: 7:45 AM TO 8:45 AM

PEAK 15 MINUTES: 7:45 AM TO 8:00 AM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	NW Glencoe Rd--From North (Southbound)			Car Shop--From East (Westbound)			NW Glencoe Rd--From South (Northbound)			Pacific St--From West (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	0	25	0	1	0	0	0	18	1	2	0	1	0	0	0	0	48	0
7:05 AM	0	14	0	0	0	0	0	13	0	1	0	0	0	0	0	0	28	0
7:10 AM	0	22	0	0	0	1	0	14	1	7	0	0	0	0	0	0	45	0
7:15 AM	0	27	1	0	0	0	0	15	4	3	0	0	0	0	0	0	50	0
7:20 AM	0	21	0	0	0	0	0	21	0	4	0	0	0	0	0	0	46	0
7:25 AM	0	24	0	0	0	0	0	21	1	2	0	0	0	0	0	0	48	0
7:30 AM	0	24	0	0	0	0	2	12	1	3	0	0	0	0	0	0	42	0
7:35 AM	0	23	0	1	0	0	0	13	2	4	0	0	0	0	0	0	43	0
7:40 AM	0	27	0	0	0	0	0	11	0	2	0	1	0	0	0	0	41	0
7:45 AM	0	32	0	0	0	1	0	19	2	2	0	0	0	0	0	0	56	0
7:50 AM	1	38	0	0	2	1	2	20	4	4	0	0	0	0	0	0	72	0
7:55 AM	1	26	0	0	0	0	0	24	4	8	0	1	0	0	0	0	64	0
8:00 AM	0	28	0	0	0	0	0	16	0	4	0	0	0	0	0	0	48	0
8:05 AM	0	44	0	0	0	0	1	8	1	2	0	0	1	0	0	0	56	1
8:10 AM	0	22	1	0	1	0	0	16	2	4	0	0	0	0	0	0	46	0
8:15 AM	0	29	0	0	0	0	0	18	2	4	0	0	0	0	0	0	53	0
8:20 AM	0	22	0	1	0	1	1	12	1	1	0	0	0	0	0	0	39	0
8:25 AM	1	24	0	0	1	0	0	20	1	3	0	0	0	0	0	0	50	0
8:30 AM	0	33	1	0	0	0	0	20	2	3	0	0	0	0	0	0	59	0
8:35 AM	1	10	0	0	0	1	1	18	2	4	0	0	0	0	0	0	37	0
8:40 AM	0	20	0	0	0	0	0	19	2	0	0	0	0	0	0	0	41	0
8:45 AM	1	21	0	0	0	0	0	15	2	1	0	0	0	0	0	0	40	0
8:50 AM	0	19	0	0	0	3	0	21	2	3	0	0	0	0	0	0	48	0
8:55 AM	0	13	0	1	0	0	1	26	2	2	0	0	0	0	0	0	45	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	2	303	1	2	2	3	4	201	20	42	0	3	0	0	0	0	583	0
7:15 AM	2	336	2	1	3	2	5	196	21	42	0	2	1	0	0	0	612	1
7:30 AM	3	339	1	2	4	3	6	189	20	41	0	2	1	0	0	0	610	1
7:45 AM	4	328	2	1	4	4	5	210	23	39	0	1	1	0	0	0	621	1
8:00 AM	3	285	2	2	2	5	4	209	19	31	0	0	1	0	0	0	562	1

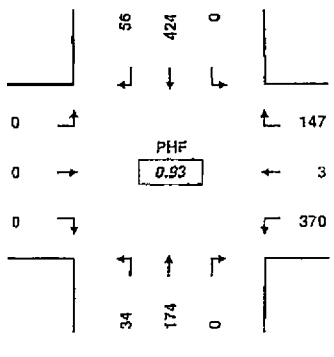
Version 3.1

INTERSECTION: *Glencoe–/Sunset Hwy WB Off Ramp–*
PROJECT ID#:
QC JOB #: *10062902*

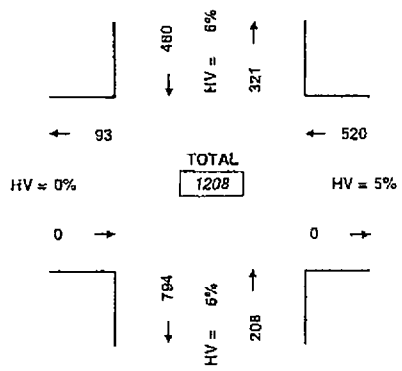
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

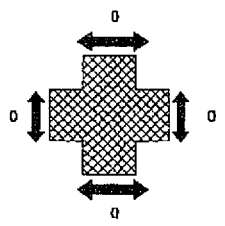
PEAK HOUR TURNING MOVEMENTS



PEAK HOUR LINK VOLUMES



PEAK HOUR PED CROSSING VOLUMES



PEAK HOUR: 7:15 AM TO 8:15 AM

PEAK 15 MINUTES: 7:45 AM TO 8:00 AM

5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe–* (Southbound)			*Sunset Hwy WB Off Ramp–* (Westbound)			*Glencoe–* (Northbound)			*Sunset Hwy WB On–* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	3	32	0	13	0	21	0	13	3	0	0	0	0	0	0	0	85	0
7:05 AM	0	34	0	14	0	21	0	8	9	0	0	0	0	0	0	0	86	0
7:10 AM	7	31	0	8	0	30	0	16	3	0	0	0	0	0	0	0	95	0
7:15 AM	5	36	0	9	0	29	0	13	3	0	0	0	0	0	0	0	95	0
7:20 AM	5	29	0	8	0	29	0	14	3	0	0	0	0	0	0	0	88	0
7:25 AM	4	23	0	19	0	39	0	17	3	0	0	0	0	0	0	0	105	0
7:30 AM	6	30	0	8	0	36	0	14	3	0	0	0	0	0	0	0	97	0
7:35 AM	2	42	0	14	0	28	0	20	2	0	0	0	0	0	0	0	108	0
7:40 AM	7	32	0	11	2	45	0	10	3	0	0	0	0	0	0	0	110	0
7:45 AM	4	46	0	12	1	11	0	25	2	0	0	0	0	0	0	0	101	0
7:50 AM	4	38	0	20	0	35	0	20	3	0	0	0	0	0	0	0	120	0
7:55 AM	4	38	0	14	0	32	0	16	1	0	0	0	0	0	0	0	105	0
8:00 AM	4	43	0	7	0	10	0	9	2	0	0	0	0	0	0	0	75	0
8:05 AM	6	33	0	10	0	48	0	11	9	0	0	0	0	0	0	0	117	0
8:10 AM	5	34	0	15	0	28	0	5	0	0	0	0	0	0	0	0	87	0
8:15 AM	4	31	0	7	0	30	0	16	3	0	0	0	0	0	0	0	91	0
8:20 AM	2	34	0	11	0	26	0	7	2	0	0	0	0	0	0	0	82	0
8:25 AM	4	31	0	10	0	29	0	9	3	0	0	0	0	0	0	0	86	0
8:30 AM	2	32	0	17	0	37	0	15	4	0	0	0	0	0	0	0	107	0
8:35 AM	2	25	0	15	0	43	0	25	4	0	0	0	0	0	0	0	114	0
8:40 AM	6	30	0	15	0	25	0	12	2	0	0	0	0	0	0	0	90	0
8:45 AM	4	33	0	19	0	27	0	16	1	0	0	0	0	0	0	0	100	0
8:50 AM	5	25	0	8	0	14	0	18	4	0	0	0	0	0	0	0	74	0
8:55 AM	5	22	0	13	0	22	0	12	2	0	0	0	0	0	0	0	76	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	51	411	0	150	3	356	0	186	38	0	0	0	0	0	0	0	1195	0
7:15 AM	56	424	0	147	3	370	0	174	34	0	0	0	0	0	0	0	1208	0
7:30 AM	52	432	0	139	3	358	0	162	33	0	0	0	0	0	0	0	1179	0
7:45 AM	47	415	0	153	1	354	0	170	35	0	0	0	0	0	0	0	1175	0
8:00 AM	49	373	0	147	0	339	0	155	36	0	0	0	0	0	0	0	1099	0

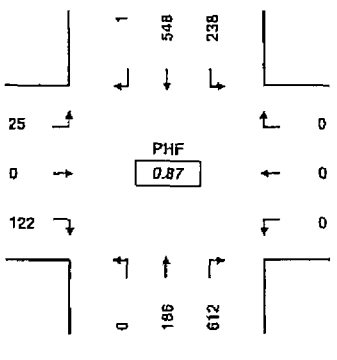
Version 3.1

INTERSECTION: *Glencoe Rd-/Sunset Hwy EB Ramp-*
PROJECT ID#:
QC JOB #: *10062901*

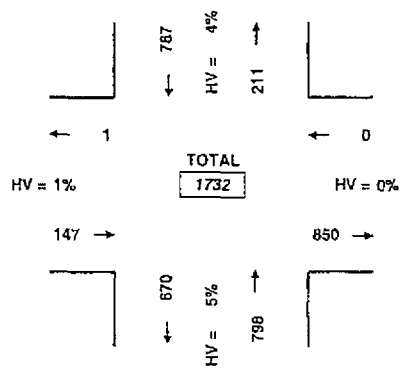
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



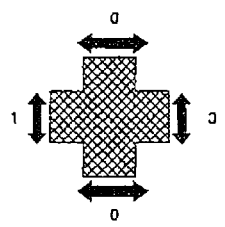
PEAK HOUR LINK VOLUMES



PEAK HOUR: 7:15 AM TO 8:15 AM

PEAK 15 MINUTES: 7:30 AM TO 7:45 AM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe Rd-* (Southbound)			*Sunset Hwy EB Ramp-* (Westbound)			*Glencoe Rd-* (Northbound)			*Sunset Hwy EB Ramp-* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	0	30	23	0	1	0	46	7	0	0	0	0	0	0	0	0	107	0
7:05 AM	0	40	14	0	0	0	60	11	0	0	0	0	0	0	0	0	125	0
7:10 AM	0	43	21	0	0	0	49	16	0	0	0	0	0	0	0	0	129	0
7:15 AM	0	39	27	0	0	0	49	7	0	8	0	1	0	0	0	0	131	0
7:20 AM	1	37	22	0	0	0	19	6	0	8	0	1	0	0	0	0	94	0
7:25 AM	0	46	17	0	0	0	54	25	0	13	0	1	0	0	0	0	156	0
7:30 AM	0	49	19	0	0	0	66	12	0	10	0	3	0	0	0	1	159	1
7:35 AM	0	56	15	0	0	0	71	22	0	12	0	3	0	0	0	0	179	0
7:40 AM	0	55	19	0	0	0	50	19	0	15	0	1	0	0	0	0	159	0
7:45 AM	0	33	23	0	0	0	49	23	0	14	0	2	0	0	0	0	144	0
7:50 AM	0	48	23	0	0	0	61	18	0	12	0	10	0	0	0	0	172	0
7:55 AM	0	53	18	0	0	0	57	16	0	5	0	0	0	0	0	0	149	0
8:00 AM	0	40	14	0	0	0	52	9	0	10	0	2	0	0	0	0	127	0
8:05 AM	0	53	22	0	0	0	59	14	0	5	0	0	0	0	0	0	153	0
8:10 AM	0	39	19	0	0	0	25	15	0	10	0	1	0	0	0	0	109	0
8:15 AM	0	46	13	0	0	0	46	7	0	8	0	2	0	0	0	0	122	0
8:20 AM	0	42	14	0	0	0	47	21	0	14	0	1	0	0	0	0	139	0
8:25 AM	0	37	18	0	0	0	23	14	0	9	0	3	0	0	0	0	104	0
8:30 AM	1	53	14	0	0	0	30	17	0	6	0	4	0	0	0	0	125	0
8:35 AM	0	46	16	0	0	0	52	20	0	5	0	5	0	0	0	0	144	0
8:40 AM	0	43	9	0	0	0	38	22	0	7	0	6	0	0	0	0	125	0
8:45 AM	0	40	19	0	0	0	30	15	0	3	0	4	0	0	0	0	111	0
8:50 AM	0	26	14	0	0	0	23	16	0	6	0	3	0	0	0	0	88	0
8:55 AM	0	28	14	0	0	0	33	19	0	6	0	4	0	0	0	0	104	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	1	529	241	0	1	0	631	182	0	97	0	22	0	0	0	1	1704	1
7:15 AM	1	548	238	0	0	0	612	186	0	122	0	25	0	0	0	1	1732	1
7:30 AM	0	551	217	0	0	0	606	190	0	124	0	28	0	0	0	1	1716	1
7:45 AM	1	533	203	0	0	0	539	196	0	105	0	36	0	0	0	0	1613	0
8:00 AM	1	493	186	0	0	0	458	189	0	89	0	35	0	0	0	0	1451	0

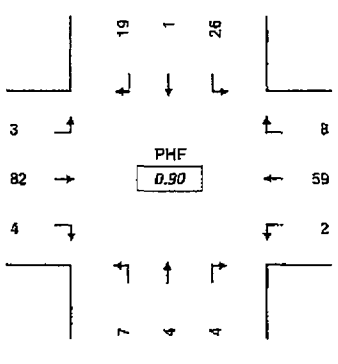
Version 3.1

INTERSECTION: *NW Jackson–/NW West Union Rd–*
PROJECT ID#:
QC JOB #: *10062909*

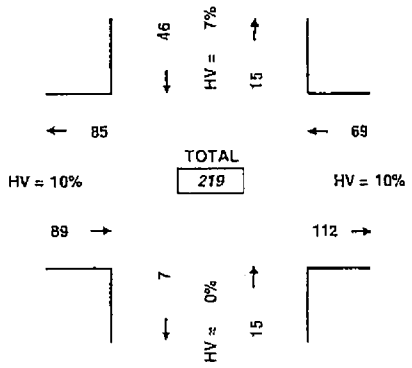
START TIME: *7:00 AM*
END TIME: *9:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



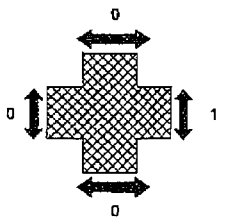
PEAK HOUR LINK VOLUMES



PEAK HOUR: 7:15 AM TO 8:15 AM

PEAK 15 MINUTES: 7:30 AM TO 7:45 AM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*NW Jackson–* (Southbound)			*NW West Union Rd–* (Westbound)			*Jackson–* (Northbound)			*West Union Rd–* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	3	0	1	0	3	0	0	0	2	0	4	2	0	0	0	0	15	0
7:05 AM	2	0	0	0	2	0	0	1	1	0	5	0	0	0	0	0	11	0
7:10 AM	0	0	1	0	3	0	0	0	0	0	2	1	0	0	0	0	7	0
7:15 AM	0	0	5	0	5	0	0	0	0	0	4	0	0	0	0	0	14	0
7:20 AM	2	0	4	0	5	0	0	0	1	0	5	0	0	0	0	0	17	0
7:25 AM	2	0	1	1	0	1	0	0	0	0	9	1	0	0	0	0	15	0
7:30 AM	4	0	2	1	5	0	1	0	1	1	9	0	0	0	0	0	24	0
7:35 AM	0	0	0	1	6	0	0	0	0	1	6	1	0	0	0	0	15	0
7:40 AM	1	0	2	1	11	0	0	0	1	0	6	0	0	0	0	0	22	0
7:45 AM	1	1	3	1	2	0	0	1	1	0	10	0	0	0	0	0	20	0
7:50 AM	1	0	0	1	4	0	1	0	2	1	5	0	0	0	0	0	15	0
7:55 AM	0	0	3	0	6	0	0	2	0	1	8	0	0	1	0	0	20	1
8:00 AM	3	0	2	1	6	0	2	0	0	0	7	0	0	0	0	0	21	0
8:05 AM	3	0	3	1	4	0	0	0	0	0	6	0	0	0	0	0	17	0
8:10 AM	2	0	1	0	5	1	0	1	1	0	7	1	0	0	0	0	19	0
8:15 AM	1	0	4	1	3	0	0	0	0	0	7	1	0	0	0	0	17	0
8:20 AM	2	0	0	0	6	0	0	0	1	1	5	0	0	0	0	0	15	0
8:25 AM	3	0	1	0	3	0	0	0	0	2	2	0	0	1	0	0	11	1
8:30 AM	1	0	2	1	8	1	0	0	0	0	3	1	0	0	0	0	17	0
8:35 AM	2	0	0	0	3	0	0	1	0	0	3	2	0	1	0	0	11	1
8:40 AM	1	1	1	0	5	0	0	1	0	0	2	2	0	0	0	0	13	0
8:45 AM	0	0	3	0	4	0	0	0	2	1	1	0	0	0	0	0	11	0
8:50 AM	0	0	0	0	3	0	0	0	0	0	5	1	0	0	0	0	9	0
8:55 AM	0	0	0	0	4	0	1	0	0	0	5	0	0	0	0	0	10	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
7:00 AM	16	1	22	6	52	1	2	4	9	4	73	5	0	1	0	0	195	1
7:15 AM	19	1	26	8	59	2	4	4	7	4	82	3	0	1	0	0	219	1
7:30 AM	21	1	21	8	61	1	4	4	7	7	78	3	0	2	0	0	216	2
7:45 AM	20	2	20	6	55	2	3	6	5	5	65	7	0	3	0	0	198	3
8:00 AM	18	1	17	4	54	2	3	3	4	4	53	8	0	2	0	0	171	2

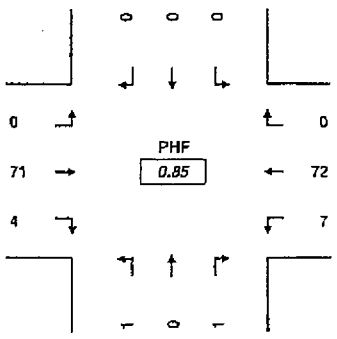
Version 3.1

INTERSECTION: *NW 313th Ave--/NW North Ave--*
PROJECT ID#:
QC JOB #: *10062917*

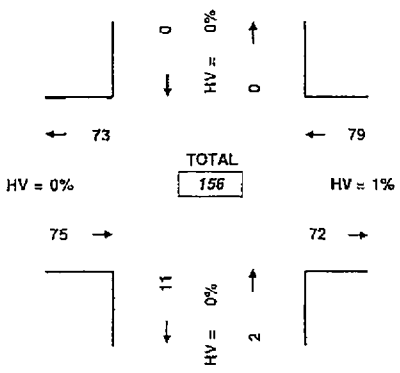
START TIME: *4:00 AM*
END TIME: *6:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



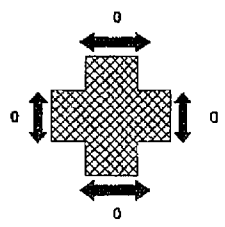
PEAK HOUR LINK VOLUMES



PEAK HOUR: 5:00 AM TO 6:00 AM

PEAK 15 MINUTES: 5:00 AM TO 5:15 AM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*NW 313th Ave--* (Southbound)			*NW North Ave--* (Westbound)			*313th--* (Northbound)			*North Ave--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 AM	0	0	0	0	11	0	0	0	0	0	13	0	0	0	0	0	24	0
4:05 AM	0	0	0	0	3	1	0	0	0	0	7	0	0	0	0	0	11	0
4:10 AM	0	0	0	0	1	1	0	0	0	0	5	0	0	0	1	0	7	1
4:15 AM	0	0	0	0	4	0	0	0	0	0	1	0	0	0	0	0	5	0
4:20 AM	0	0	0	0	5	1	0	0	0	0	5	0	0	0	0	0	11	0
4:25 AM	0	0	0	0	3	0	0	0	0	0	1	0	0	0	0	0	4	0
4:30 AM	0	0	0	0	5	0	0	0	0	1	5	0	0	0	0	0	11	0
4:35 AM	0	0	0	0	6	0	1	0	0	0	4	0	0	0	0	0	11	0
4:40 AM	0	0	0	0	6	1	0	0	0	0	9	0	0	0	0	0	16	0
4:45 AM	0	0	0	0	6	0	0	0	0	0	4	0	0	0	0	0	10	0
4:50 AM	0	0	0	0	6	1	0	0	0	0	5	0	0	0	0	0	12	0
4:55 AM	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	6	0
5:00 AM	0	0	0	0	4	1	0	0	0	0	12	0	0	0	0	0	17	0
5:05 AM	0	0	0	0	8	1	0	0	0	0	10	0	0	0	0	0	19	0
5:10 AM	0	0	0	0	6	1	0	0	0	0	3	0	0	0	0	0	10	0
5:15 AM	0	0	0	0	5	1	0	0	0	0	8	0	0	0	0	0	14	0
5:20 AM	0	0	0	0	5	0	0	0	0	0	3	0	0	0	0	0	8	0
5:25 AM	0	0	0	0	5	1	0	0	0	0	5	0	0	0	0	0	11	0
5:30 AM	0	0	0	0	5	1	0	0	0	1	10	0	0	0	0	0	17	0
5:35 AM	0	0	0	0	5	0	0	0	0	2	3	0	0	0	0	0	10	0
5:40 AM	0	0	0	0	9	1	1	0	0	0	0	0	0	0	0	0	11	0
5:45 AM	0	0	0	0	6	0	0	0	0	1	4	0	0	0	0	0	11	0
5:50 AM	0	0	0	0	6	0	0	0	0	0	8	0	0	0	0	0	14	0
5:55 AM	0	0	0	0	8	0	0	0	1	0	5	0	0	0	0	0	14	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 AM	0	0	0	0	59	5	1	0	0	1	62	0	0	0	1	0	128	1
4:15 AM	0	0	0	0	62	6	1	0	0	1	62	0	0	0	0	0	132	0
4:30 AM	0	0	0	0	65	7	1	0	0	1	71	0	0	0	0	0	145	0
4:45 AM	0	0	0	0	67	8	1	0	0	3	66	0	0	0	0	0	145	0
5:00 AM	0	0	0	0	72	7	1	0	1	4	71	0	0	0	0	0	156	0

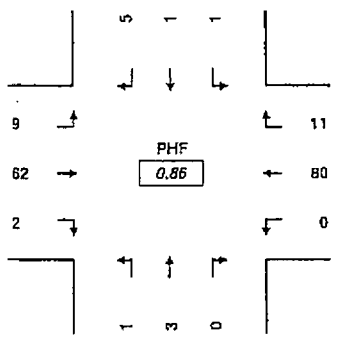
Version 3.1

INTERSECTION: *NW 309th Ave--/NW North Ave--*
PROJECT ID#:
QC JOB #: *10062916*

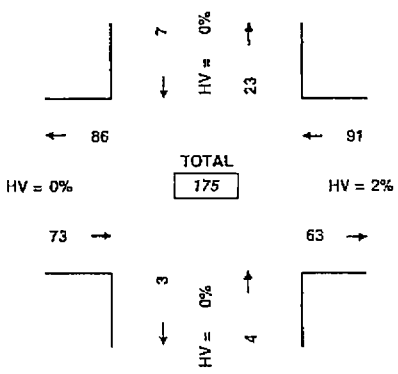
START TIME: *4:00 PM*
END TIME: *6:00 PM*
DATE: *10/26/2004*

QUALITY COUNTS
18285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



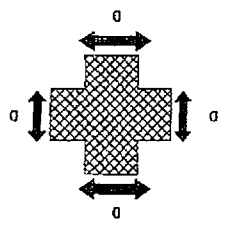
PEAK HOUR LINK VOLUMES



PEAK HOUR: 5:00 PM TO 6:00 PM

PEAK 15 MINUTES: 5:00 PM TO 5:15 PM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*NW 309th Ave--* (Southbound)			*NW North Ave--* (Westbound)			*NW 309th Ave--* (Northbound)			*NW North Ave--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	1	0	0	1	8	0	0	0	0	0	16	0	0	0	0	0	26	0
4:05 PM	0	0	0	0	6	0	0	0	0	0	5	1	0	0	0	0	12	0
4:10 PM	0	0	0	0	2	0	0	0	0	0	6	1	0	0	0	0	9	0
4:15 PM	0	0	2	0	6	0	0	0	0	0	0	0	0	0	0	0	8	0
4:20 PM	0	0	0	0	7	0	0	0	0	0	4	0	0	0	0	0	11	0
4:25 PM	0	0	0	1	3	0	0	0	0	0	3	0	0	0	0	0	7	0
4:30 PM	0	0	1	0	5	0	0	0	0	0	2	0	0	0	0	0	8	0
4:35 PM	0	0	0	0	5	0	0	0	0	0	8	2	0	0	0	0	15	0
4:40 PM	1	0	0	0	3	0	0	0	0	1	5	1	0	0	0	0	11	0
4:45 PM	1	0	0	0	8	0	0	1	0	0	7	0	0	0	0	0	17	0
4:50 PM	0	0	1	0	5	0	0	0	0	0	6	0	0	0	0	0	12	0
4:55 PM	0	0	0	0	4	0	0	0	0	0	2	0	0	0	0	0	6	0
5:00 PM	0	0	0	1	3	0	0	0	0	0	10	0	0	0	0	0	14	0
5:05 PM	2	0	0	2	9	0	0	0	0	0	9	1	0	0	0	0	23	0
5:10 PM	0	0	1	0	6	0	0	1	0	0	5	1	0	0	0	0	14	0
5:15 PM	0	0	0	1	8	0	0	0	0	1	4	1	0	0	0	0	15	0
5:20 PM	0	1	0	1	5	0	0	0	0	0	3	0	0	0	0	0	10	0
5:25 PM	0	0	0	1	6	0	0	0	0	1	5	1	0	0	0	0	14	0
5:30 PM	2	0	0	1	4	0	0	2	0	0	7	0	0	0	0	0	16	0
5:35 PM	1	0	0	1	7	0	0	0	0	0	5	2	0	0	0	0	16	0
5:40 PM	0	0	0	1	8	0	0	0	1	0	2	0	0	0	0	0	12	0
5:45 PM	0	0	0	1	8	0	0	0	0	0	3	0	0	0	0	0	12	0
5:50 PM	0	0	0	1	5	0	0	0	0	0	4	0	0	0	0	0	10	0
5:55 PM	0	0	0	0	11	0	0	0	0	0	5	3	0	0	0	0	19	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	3	0	4	2	62	0	0	1	0	1	64	5	0	0	0	0	142	0
4:15 PM	4	0	5	4	64	0	0	2	0	1	61	5	0	0	0	0	146	0
4:30 PM	4	1	3	6	67	0	0	2	0	3	66	7	0	0	0	0	159	0
4:45 PM	6	1	2	9	73	0	0	4	1	2	65	6	0	0	0	0	169	0
5:00 PM	5	1	1	11	80	0	0	3	1	2	62	9	0	0	0	0	175	0

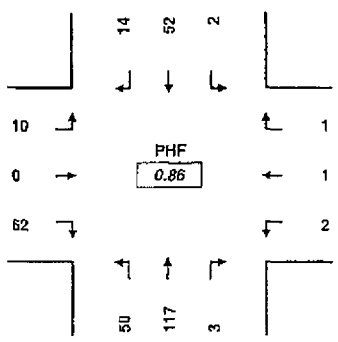
Version 3.1

INTERSECTION: *Glencoe Rd--/North Ave--*
PROJECT ID#:
QC JOB #: *10062915*

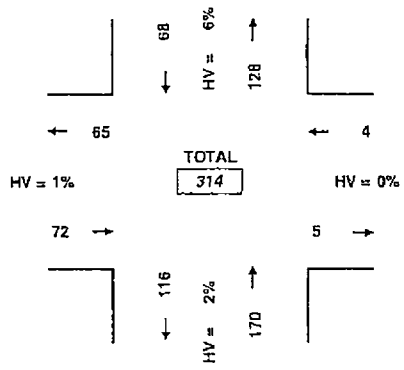
START TIME: *4:00 AM*
END TIME: *5:00 AM*
DATE: *10/26/2004*

QUALITY COUNTS
16285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

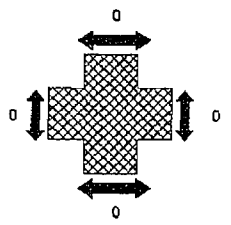
PEAK HOUR TURNING MOVEMENTS



PEAK HOUR LINK VOLUMES



PEAK HOUR PED CROSSING VOLUMES



PEAK HOUR: 4:00 AM TO 5:00 AM

PEAK 15 MINUTES: 4:00 AM TO 4:15 AM

5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe Rd--* (Southbound)			*North Ave--* (Westbound)			*Glencoe Rd--* (Northbound)			*North Ave--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 AM	0	3	0	0	0	0	0	17	8	19	0	1	0	0	0	0	48	0
4:05 AM	3	4	0	0	0	0	0	7	3	5	0	1	0	0	0	0	23	0
4:10 AM	0	3	1	0	0	1	1	9	1	2	0	2	0	0	0	0	20	0
4:15 AM	2	5	0	0	0	0	0	10	4	5	0	0	0	0	0	0	26	0
4:20 AM	2	5	1	1	1	0	1	6	4	3	0	1	0	0	0	0	25	0
4:25 AM	0	4	0	0	0	0	1	9	4	3	0	0	0	0	0	0	21	0
4:30 AM	1	8	0	0	0	0	0	7	5	2	0	0	0	0	0	0	23	0
4:35 AM	2	6	0	0	0	0	0	11	3	6	0	2	0	0	0	0	30	0
4:40 AM	1	2	0	0	0	1	0	9	3	3	0	2	0	0	0	0	21	0
4:45 AM	3	6	0	0	0	0	0	11	4	5	0	1	0	0	0	0	30	0
4:50 AM	0	4	0	0	0	0	0	12	6	8	0	0	0	0	0	0	30	0
4:55 AM	0	2	0	0	0	0	0	9	5	1	0	0	0	0	0	0	17	0
5:00 AM	1	3	0	0	0	0	0	8	3	10	0	1	0	0	0	0	26	0
5:05 AM	1	2	0	0	0	0	0	3	9	5	0	3	0	0	0	0	23	0
5:10 AM	2	8	0	0	0	0	0	3	7	5	0	2	0	0	0	0	27	0
5:15 AM	0	4	0	0	0	0	1	11	8	3	1	1	0	0	0	0	29	0
5:20 AM	0	1	0	0	0	0	0	6	6	4	0	0	0	0	0	0	17	0
5:25 AM	1	6	0	0	0	0	0	6	5	5	0	0	0	0	0	0	23	0
5:30 AM	0	7	0	0	0	0	0	7	5	5	0	2	0	0	0	0	26	0
5:35 AM	1	4	0	0	0	0	0	5	7	4	0	0	0	0	0	0	21	0
5:40 AM	0	5	0	0	0	0	0	7	9	1	0	2	0	0	0	0	24	0
5:45 AM	0	6	0	0	0	0	0	12	10	3	0	0	0	0	0	0	31	0
5:50 AM	2	1	0	0	0	0	0	5	5	4	0	0	0	0	0	0	17	0
5:55 AM	0	3	0	0	0	0	0	6	10	3	0	2	0	0	0	0	24	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 AM	14	52	2	1	1	2	3	117	50	62	0	10	0	0	0	0	314	0
4:15 AM	15	56	1	1	1	1	2	98	57	56	0	12	0	0	0	0	299	0
4:30 AM	12	52	0	0	0	1	1	96	64	57	1	12	0	0	0	0	296	0
4:45 AM	9	52	0	0	0	0	1	88	74	56	1	12	0	0	0	0	293	0
5:00 AM	8	50	0	0	0	0	1	79	84	52	1	13	0	0	0	0	288	0

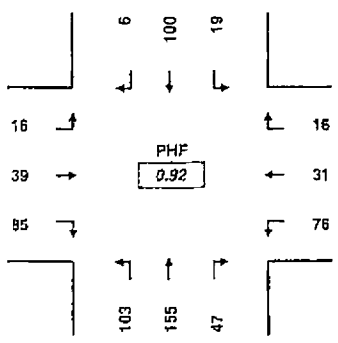
Version 3.1

INTERSECTION: *NW Glencoe Rd--From North/West Union Rd--From East*
PROJECT ID#:
QC JOB #: *10052914*

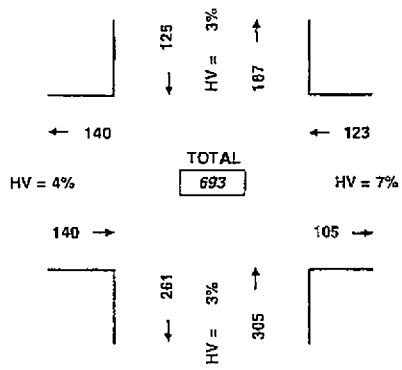
START TIME: *4:00 PM*
END TIME: *6:00 PM*
DATE: *10/26/2004*

QUALITY COUNTS
16285 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



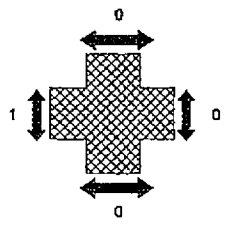
PEAK HOUR LINK VOLUMES



PEAK HOUR: 4:00 PM TO 5:00 PM

PEAK 15 MINUTES: 4:00 PM TO 4:15 PM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	NW Glencoe Rd--From North (Southbound)			West Union Rd--From East (Westbound)			NW Glencoe Rd--From South (Northbound)			NW Commercial St--From West (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	1	22	3	3	1	6	3	22	14	12	3	0	0	0	0	0	90	0
4:05 PM	0	9	1	3	4	3	1	7	8	6	2	2	0	0	0	0	46	0
4:10 PM	3	5	1	1	2	6	5	11	7	6	6	0	0	0	0	0	53	0
4:15 PM	0	4	3	0	3	9	1	16	9	5	2	1	0	0	0	0	53	0
4:20 PM	0	7	1	0	3	4	6	13	5	6	2	1	0	0	0	0	48	0
4:25 PM	1	4	2	1	3	8	7	9	9	4	5	2	0	0	0	1	55	1
4:30 PM	0	13	2	2	1	4	4	8	7	6	6	2	0	0	0	0	55	0
4:35 PM	0	8	2	1	3	7	1	13	8	11	3	3	0	0	0	0	60	0
4:40 PM	0	5	1	0	1	6	2	11	10	5	2	2	0	0	0	0	46	0
4:45 PM	1	7	2	0	3	12	7	17	10	9	3	1	0	0	0	0	72	0
4:50 PM	0	12	0	3	5	8	6	16	6	6	3	1	0	0	0	0	64	0
4:55 PM	0	4	1	2	2	5	4	12	10	8	2	1	0	0	0	0	51	0
5:00 PM	0	14	1	1	4	6	3	8	6	7	2	0	0	0	0	0	52	0
5:05 PM	0	7	1	2	1	4	5	12	10	5	1	2	0	0	0	0	50	0
5:10 PM	0	12	2	3	0	9	4	12	6	3	2	2	0	0	0	0	55	0
5:15 PM	0	8	0	2	3	10	4	19	10	3	2	0	0	0	0	0	61	0
5:20 PM	1	6	1	4	3	6	3	8	5	4	2	1	0	0	0	0	44	0
5:25 PM	0	14	0	0	2	5	7	17	5	5	3	1	0	0	0	0	59	0
5:30 PM	2	12	1	2	0	3	4	9	9	5	2	0	0	0	0	0	49	0
5:35 PM	0	7	1	1	3	6	3	11	4	3	3	1	0	0	0	0	43	0
5:40 PM	0	8	0	3	2	2	2	17	9	3	0	1	0	0	0	1	47	1
5:45 PM	0	8	1	2	3	2	7	17	5	3	1	0	0	0	0	0	49	0
5:50 PM	0	6	0	1	0	6	2	14	7	8	4	0	0	0	0	0	48	0
5:55 PM	0	8	0	3	2	6	1	12	8	3	3	0	0	0	0	0	46	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	6	100	19	16	31	76	47	155	103	85	39	16	0	0	0	1	693	1
4:15 PM	2	97	18	15	29	80	50	147	96	76	33	18	0	0	0	1	661	1
4:30 PM	2	110	13	20	28	80	50	153	93	73	31	16	0	0	0	0	669	0
4:45 PM	4	111	10	23	28	74	52	158	90	61	25	11	0	0	0	1	647	1
5:00 PM	3	110	8	24	23	65	45	156	84	52	25	8	0	0	0	1	603	1

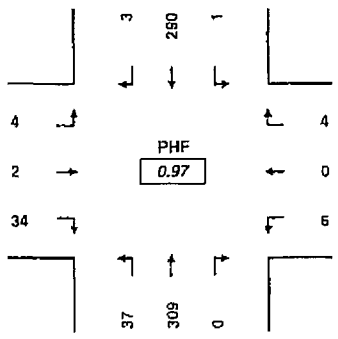
Version 3.1

INTERSECTION: *Glencoe--/Pacific--*
PROJECT ID#:
QC JOB #: *10062913*

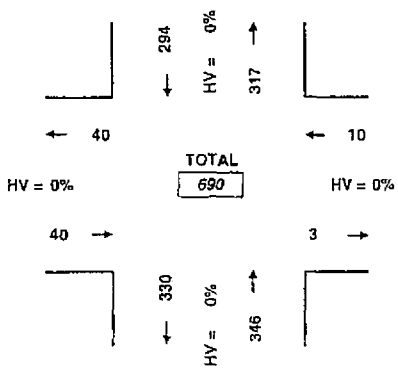
START TIME: *4:00 PM*
END TIME: *6:00 PM*
DATE: *9/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



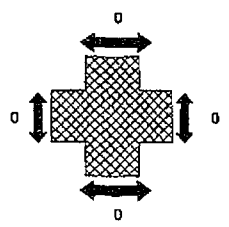
PEAK HOUR LINK VOLUMES



PEAK HOUR: 4:00 PM TO 5:00 PM

PEAK 15 MINUTES: 4:00 PM TO 4:15 PM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe--* (Southbound)			*Pacific--* (Westbound)			*Glencoe--* (Northbound)			*Pacific--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	0	36	1	0	0	0	0	33	1	5	0	1	0	0	0	0	77	0
4:05 PM	0	24	0	0	0	1	0	19	2	1	0	0	0	0	0	0	47	0
4:10 PM	1	20	0	0	0	0	0	26	4	2	0	1	0	0	0	0	54	0
4:15 PM	1	22	0	1	0	1	0	25	4	4	1	1	0	0	0	0	60	0
4:20 PM	0	19	0	0	0	0	0	27	3	4	0	0	0	0	0	0	53	0
4:25 PM	1	20	0	1	0	0	0	29	2	0	0	0	0	0	0	0	53	0
4:30 PM	0	29	0	1	0	0	0	20	5	2	1	1	0	0	0	0	59	0
4:35 PM	0	23	0	0	0	0	0	21	0	2	0	0	0	0	0	0	46	0
4:40 PM	0	21	0	1	0	2	0	28	7	6	0	0	0	0	0	0	65	0
4:45 PM	0	33	0	0	0	1	0	29	4	2	0	0	0	0	0	0	69	0
4:50 PM	0	21	0	0	0	0	0	28	3	3	0	0	0	0	0	0	55	0
4:55 PM	0	22	0	0	0	1	0	24	2	3	0	0	0	0	0	0	52	0
5:00 PM	1	64	1	0	0	0	0	77	9	7	0	0	0	0	0	0	159	0
5:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:15 PM	2	62	1	1	2	0	1	70	6	11	1	0	0	0	0	0	157	0
5:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:25 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:30 PM	1	53	0	3	0	1	1	73	17	6	1	0	0	0	0	0	156	0
5:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:40 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:45 PM	2	52	0	2	0	1	1	73	6	9	0	0	0	0	0	0	146	0
5:50 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	3	290	1	4	0	6	0	309	37	34	2	4	0	0	0	0	690	0
4:15 PM	3	274	1	4	0	5	0	308	39	33	2	2	0	0	0	0	671	0
4:30 PM	3	275	2	3	2	4	1	297	36	36	2	1	0	0	0	0	662	0
4:45 PM	4	255	2	4	2	3	2	301	41	32	2	0	0	0	0	0	648	0
5:00 PM	6	231	2	6	2	2	3	293	38	33	2	0	0	0	0	0	618	0

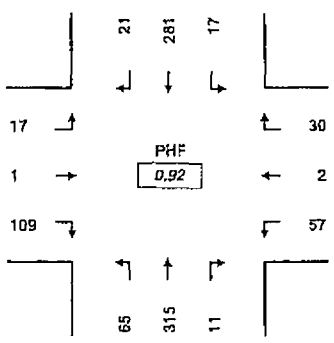
Version 3.1

INTERSECTION: *NW Glencoe Rd–/NW Highland Ct–*
PROJECT ID#:
QC JOB #: *10062912*

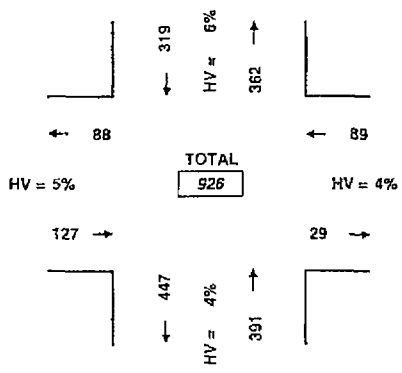
START TIME: *4:00 PM*
END TIME: *6:00 PM*
DATE: *10/26/2004*

QUALITY COUNTS
16255 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



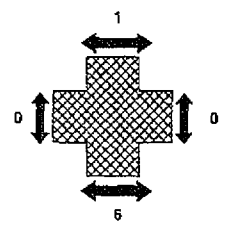
PEAK HOUR LINK VOLUMES



PEAK HOUR: 4:00 PM TO 5:00 PM

PEAK 15 MINUTES: 4:00 PM TO 4:15 PM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	NW Glencoe Rd– (Southbound)			NW Highland Ct– (Westbound)			Glencoe– (Northbound)			Highland– (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	3	32	2	3	1	4	1	32	5	11	1	3	0	0	2	0	98	2
4:05 PM	3	27	0	1	0	7	0	25	7	8	0	0	0	0	0	0	78	0
4:10 PM	1	21	2	2	0	2	3	30	4	12	0	0	0	0	0	0	77	0
4:15 PM	3	23	0	3	0	9	0	30	8	10	0	1	0	0	0	0	87	0
4:20 PM	0	24	1	1	0	7	0	23	2	10	0	1	0	0	2	0	69	2
4:25 PM	0	18	0	4	0	1	0	28	5	7	0	2	0	0	0	0	63	0
4:30 PM	0	21	2	3	0	4	2	19	3	7	0	2	0	0	0	0	63	0
4:35 PM	4	22	1	4	0	8	0	17	4	6	0	0	0	0	0	0	66	0
4:40 PM	2	26	2	4	0	4	1	28	13	9	0	2	0	0	0	0	91	0
4:45 PM	2	25	2	1	1	3	3	33	4	14	0	1	1	0	0	0	89	1
4:50 PM	1	24	3	1	0	4	1	26	4	8	0	1	0	0	2	0	73	2
4:55 PM	2	18	2	3	0	4	0	26	6	7	0	4	0	0	0	0	72	0
5:00 PM	0	23	0	3	0	4	1	18	2	5	1	0	0	0	0	0	57	0
5:05 PM	1	16	0	2	0	5	0	31	14	10	0	1	0	0	2	0	80	2
5:10 PM	0	26	0	1	1	9	1	23	8	9	0	1	0	0	0	0	79	0
5:15 PM	2	18	0	4	0	4	3	32	4	7	1	0	0	0	0	0	75	0
5:20 PM	4	24	0	3	0	6	0	16	3	8	0	2	0	0	0	0	66	0
5:25 PM	1	16	3	0	0	1	0	29	8	5	0	4	0	0	0	0	67	0
5:30 PM	2	21	4	2	0	4	2	19	4	8	0	2	0	0	0	0	68	0
5:35 PM	1	17	1	4	0	4	0	25	8	5	0	2	0	0	2	0	67	2
5:40 PM	0	14	0	2	0	1	0	26	11	8	0	1	0	0	0	0	63	0
5:45 PM	0	14	0	2	0	3	0	24	5	7	0	2	0	0	0	0	57	0
5:50 PM	2	26	1	2	1	2	0	31	3	11	0	0	0	0	0	0	79	0
5:55 PM	2	21	0	0	0	5	1	26	2	4	0	1	0	0	0	0	62	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	21	281	17	30	2	57	11	315	65	109	1	17	1	0	6	0	926	7
4:15 PM	15	266	13	30	2	62	9	300	73	102	1	16	1	0	6	0	889	7
4:30 PM	19	259	15	29	2	56	12	298	73	95	2	18	1	0	4	0	878	5
4:45 PM	16	242	15	26	2	49	11	304	76	94	2	19	1	0	6	0	856	7
5:00 PM	15	236	9	25	2	48	8	300	72	87	2	16	0	0	4	0	820	4

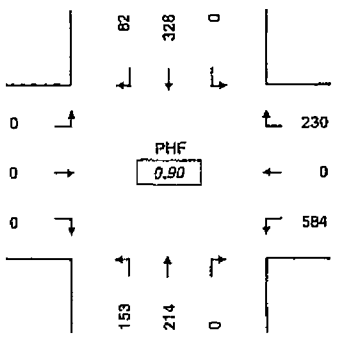
Version 3.1

INTERSECTION: *Glencoe Rd-/Sunset WB Ramp-*
PROJECT ID#:
QC JOB #: *10052911*

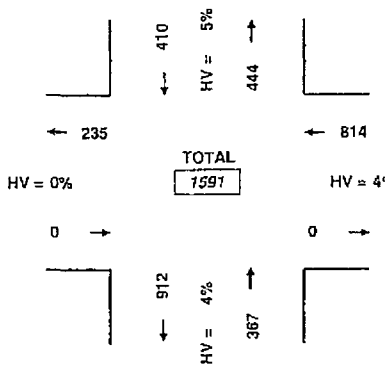
START TIME: *4:00 PM*
END TIME: *6:00 PM*
DATE: *10/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



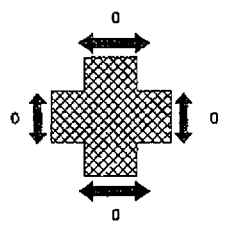
PEAK HOUR LINK VOLUMES



PEAK HOUR: 4:30 PM TO 5:30 PM

PEAK 15 MINUTES: 5:00 PM TO 5:15 PM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe Rd-* (Southbound)			*Sunset WB Ramp-* (Westbound)			*Glencoe-* (Northbound)			*Sunset WB Ramp-* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	5	39	0	17	0	46	0	16	9	0	0	0	0	0	0	0	132	0
4:05 PM	4	34	0	24	0	51	0	11	5	0	0	0	0	0	0	0	129	0
4:10 PM	10	25	0	26	0	49	0	25	7	0	0	0	0	0	0	0	142	0
4:15 PM	12	39	0	12	0	52	0	18	4	0	0	0	0	0	0	0	137	0
4:20 PM	2	30	0	9	1	44	0	24	11	0	0	0	0	0	0	0	121	0
4:25 PM	7	21	0	20	0	50	0	8	4	0	0	0	0	1	0	0	110	1
4:30 PM	4	30	0	19	0	45	0	12	7	0	0	0	0	0	0	0	117	0
4:35 PM	6	29	0	20	0	49	0	20	14	0	0	0	0	0	0	0	138	0
4:40 PM	12	24	0	23	0	54	0	16	10	0	0	0	0	0	0	0	139	0
4:45 PM	9	36	0	18	0	44	0	19	9	0	0	0	0	0	0	0	135	0
4:50 PM	8	22	0	17	0	37	0	22	14	0	0	0	0	0	0	0	120	0
4:55 PM	6	24	0	11	0	51	0	18	12	0	0	0	0	0	0	0	122	0
5:00 PM	7	28	0	19	0	48	0	21	17	0	0	0	0	0	0	0	140	0
5:05 PM	7	30	0	22	0	53	0	17	15	0	0	0	0	0	0	0	144	0
5:10 PM	9	32	0	26	0	50	0	24	19	0	0	0	0	0	0	0	160	0
5:15 PM	5	26	0	22	0	48	0	13	14	0	0	0	0	0	0	0	128	0
5:20 PM	5	28	0	16	0	55	0	11	13	0	0	0	0	0	0	0	128	0
5:25 PM	4	19	0	17	0	50	0	21	9	0	0	0	0	0	0	0	120	0
5:30 PM	9	32	0	19	0	40	0	15	14	0	0	0	0	0	0	0	129	0
5:35 PM	4	16	0	16	0	58	0	23	11	0	0	0	0	0	0	0	128	0
5:40 PM	5	26	0	23	0	43	0	18	18	0	0	0	0	1	0	0	133	1
5:45 PM	3	24	0	14	0	37	0	20	11	0	0	0	0	0	0	0	109	0
5:50 PM	12	25	0	25	0	49	0	13	7	0	0	0	0	0	0	0	131	0
5:55 PM	9	21	0	9	0	40	0	17	9	0	0	0	0	0	0	0	105	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	85	353	0	216	1	572	0	209	106	0	0	0	0	1	0	0	1542	1
4:15 PM	89	345	0	216	1	577	0	219	136	0	0	0	0	1	0	0	1583	1
4:30 PM	82	328	0	230	0	584	0	214	153	0	0	0	0	0	0	0	1591	0
4:45 PM	78	319	0	226	0	577	0	222	165	0	0	0	0	1	0	0	1587	1
5:00 PM	79	307	0	228	0	571	0	213	157	0	0	0	0	1	0	0	1555	1

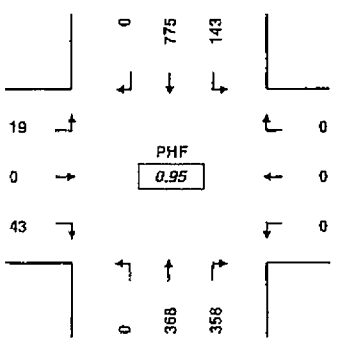
Version 3.1

INTERSECTION: *Glencoe--/Sunset Hwy EB Ramps--*
PROJECT ID#:
QC JOB #: *10062910*

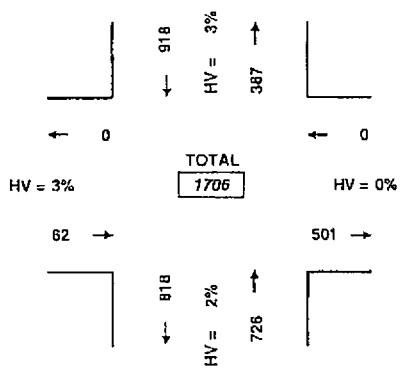
START TIME: *4:00 PM*
END TIME: *6:00 PM*
DATE: *10/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

PEAK HOUR TURNING MOVEMENTS



PEAK HOUR LINK VOLUMES

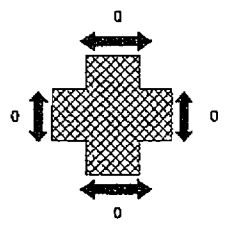


PHF
0.95

PEAK HOUR: 4:45 PM TO 5:45 PM

PEAK 15 MINUTES: 5:15 PM TO 5:30 PM

PEAK HOUR PED CROSSING VOLUMES



5-MINUTE COUNT PERIOD BEGINNING AT	*Glencoe--* (Southbound)			*Sunset Hwy EB Ramps--* (Westbound)			*Glencoe--* (Northbound)			*Sunset Hwy EB Ramps--* (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	0	72	11	0	0	0	23	30	0	6	0	3	0	0	0	0	145	0
4:05 PM	0	75	14	0	0	0	32	17	0	4	0	1	0	0	0	0	143	0
4:10 PM	0	69	14	0	0	0	21	25	0	5	0	2	0	0	0	0	136	0
4:15 PM	0	74	8	0	0	0	32	31	0	8	0	1	0	0	0	0	154	0
4:20 PM	0	69	17	0	0	0	30	27	0	10	0	0	0	0	0	0	153	0
4:25 PM	0	61	13	0	0	0	28	20	0	4	0	2	0	0	0	0	128	0
4:30 PM	0	59	11	0	0	0	28	14	0	5	0	2	0	0	0	0	119	0
4:35 PM	0	77	10	0	0	0	23	26	0	3	0	0	0	0	0	0	139	0
4:40 PM	0	68	10	0	0	0	20	34	0	4	1	1	0	0	0	0	138	0
4:45 PM	0	58	17	0	0	0	33	23	0	4	0	3	0	0	0	0	138	0
4:50 PM	0	64	10	0	0	0	28	29	0	4	0	2	0	0	0	0	137	0
4:55 PM	0	60	10	0	0	0	22	35	0	4	0	1	0	0	0	0	132	0
5:00 PM	0	57	12	0	0	0	16	34	0	2	0	2	0	0	0	0	123	0
5:05 PM	0	71	14	0	0	0	34	32	0	5	0	3	0	0	0	0	159	0
5:10 PM	0	70	17	0	0	0	25	35	0	5	0	1	0	0	0	0	153	0
5:15 PM	0	71	11	0	0	0	37	37	0	5	0	1	0	0	0	0	162	0
5:20 PM	0	71	8	0	0	0	31	23	0	4	0	1	0	0	0	0	138	0
5:25 PM	0	60	17	0	0	0	44	27	0	0	0	2	0	0	0	0	150	0
5:30 PM	0	57	9	0	0	0	36	24	0	2	0	1	0	0	0	0	129	0
5:35 PM	0	73	9	0	0	0	22	34	0	4	0	0	0	0	0	0	142	0
5:40 PM	0	63	9	0	0	0	30	35	0	4	0	2	0	0	0	0	143	0
5:45 PM	0	57	12	0	0	0	31	26	0	3	0	0	0	0	0	0	129	0
5:50 PM	0	55	19	0	0	0	19	32	0	7	0	1	0	0	0	0	133	0
5:55 PM	0	42	12	0	0	0	27	17	0	6	0	1	0	0	0	0	105	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	0	806	145	0	0	0	320	311	0	61	1	18	0	0	0	0	1662	0
4:15 PM	0	788	149	0	0	0	319	340	0	58	1	18	0	0	0	0	1673	0
4:30 PM	0	786	147	0	0	0	341	349	0	45	1	19	0	0	0	0	1688	0
4:45 PM	0	775	143	0	0	0	358	368	0	43	0	19	0	0	0	0	1706	0
5:00 PM	0	747	149	0	0	0	352	356	0	47	0	15	0	0	0	0	1666	0

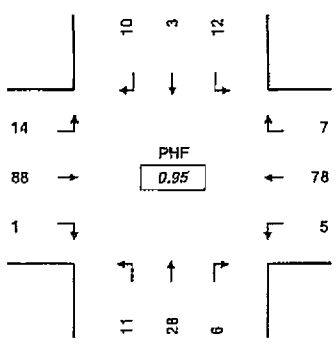
Version 3.1

INTERSECTION: *NW Jackson School Rd-/NW West Linn Rd-*
PROJECT ID#:
QC JOB #: *10062918*

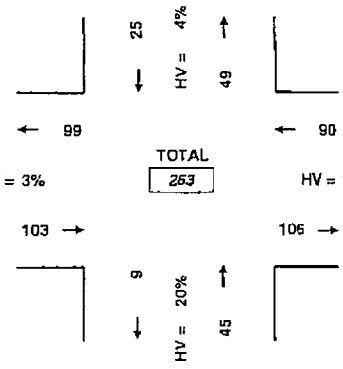
START TIME: *4:00 PM*
END TIME: *5:00 PM*
DATE: *10/26/2004*

QUALITY COUNTS
16265 SW 85th Avenue, Ste. 105
Tigard, OR 97224
Phone: 503-620-4242
Fax: 503 620-4545
email: jrw@qualitycounts.net
www.qualitycounts.net

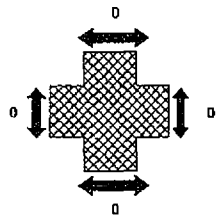
PEAK HOUR TURNING MOVEMENTS



PEAK HOUR LINK VOLUMES



PEAK HOUR PED CROSSING VOLUMES



PEAK HOUR: 4:15 PM TO 5:15 PM

PEAK 15 MINUTES: 4:45 PM TO 5:00 PM

5-MINUTE COUNT PERIOD BEGINNING AT	NW Jackson School Rd– (Southbound)			NW West Linn Rd– (Westbound)			Jackson School Rd– (Northbound)			West Linn Rd– (Eastbound)			Crosswalk Usage (Peds By Approach)				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	1	0	1	0	5	1	0	0	1	0	11	0	0	0	0	0	20	0
4:05 PM	0	0	1	0	7	0	0	1	1	0	5	0	0	0	0	0	15	0
4:10 PM	0	0	1	1	5	1	1	1	3	0	9	0	0	0	0	0	22	0
4:15 PM	2	0	1	1	7	0	0	3	0	0	6	0	0	0	0	0	20	0
4:20 PM	2	1	1	0	3	0	0	3	0	1	10	1	0	0	0	0	22	0
4:25 PM	0	0	0	1	6	0	1	4	2	0	8	3	0	0	0	0	25	0
4:30 PM	2	0	0	0	4	1	1	0	2	0	12	2	0	0	0	0	24	0
4:35 PM	2	0	0	0	8	1	1	0	2	0	8	0	0	0	0	0	22	0
4:40 PM	0	0	0	1	6	0	1	0	0	0	2	3	0	0	0	0	13	0
4:45 PM	0	0	1	1	12	2	0	4	3	0	7	0	0	0	0	0	30	0
4:50 PM	1	1	2	1	6	0	1	3	1	0	5	2	0	0	0	0	23	0
4:55 PM	0	0	0	0	5	0	0	4	1	0	5	1	0	0	0	0	16	0
5:00 PM	1	0	1	0	5	0	0	3	0	0	10	1	0	0	0	0	21	0
5:05 PM	0	1	3	2	3	1	0	1	0	0	4	1	0	0	0	0	16	0
5:10 PM	0	0	3	0	13	0	1	3	0	0	11	0	0	0	0	0	31	0
5:15 PM	0	1	1	1	9	0	2	3	1	0	4	1	0	0	0	0	23	0
5:20 PM	1	0	0	0	8	0	0	2	0	0	7	1	0	0	0	0	19	0
5:25 PM	0	0	0	0	4	1	0	1	0	0	6	0	0	0	0	0	12	0
5:30 PM	2	0	0	0	10	0	0	2	0	0	10	0	0	0	0	0	24	0
5:35 PM	1	0	3	1	2	0	0	1	0	1	5	0	0	0	0	0	14	0
5:40 PM	0	0	0	2	4	0	0	4	0	0	2	1	0	0	0	0	13	0
5:45 PM	0	1	0	1	8	0	0	1	0	0	2	3	0	0	0	0	16	0
5:50 PM	2	0	1	2	7	0	0	2	0	0	7	2	0	0	0	0	23	0
5:55 PM	1	0	2	1	5	1	0	1	1	1	4	5	0	0	0	0	22	0

HOURLY TOTALS	Southbound			Westbound			Northbound			Eastbound			Pedestrians By Approach				TOTAL	
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	North	East	South	West	Veh	Peds
4:00 PM	10	2	8	6	74	6	6	23	16	1	88	12	0	0	0	0	252	0
4:15 PM	10	3	12	7	78	5	6	28	11	1	88	14	0	0	0	0	263	0
4:30 PM	7	3	11	6	83	6	7	24	10	0	81	12	0	0	0	0	250	0
4:45 PM	6	3	14	8	81	4	4	31	6	1	76	8	0	0	0	0	242	0
5:00 PM	8	3	14	10	78	3	3	24	2	2	72	15	0	0	0	0	234	0

Version 3.1

Appendix B

Description of Level-of-Service Methods and Criteria

Appendix B

Level of Service Concept

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from A to F.[1]

Signalized Intersections

The six level of service grades are described qualitatively for signalized intersections in Table B1. Additionally, Table B2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service "D" is generally considered to represent the minimum acceptable design standard.

Table B1
Level of Service Definitions (Signalized Intersections)

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a Level of Service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

[1]**Most of the material in this appendix is adapted from the Transportation Research Board, *Highway Capacity Manual*, (2000).**

Table B2
Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Unsignalized Intersections

Unsignalized intersections include two-way stop controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2000 Highway Capacity Manual provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table B3. A quantitative definition of level of service for unsignalized intersections is presented in Table B4. Using this definition, Level of Service E is generally considered to represent the minimum acceptable design standard.

Table B3
Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the delay an inconvenience. • Occasionally there is more than one vehicle in queue.
C	• Many times there is more than one vehicle in queue. • Most drivers feel restricted, but not objectionably so.
D	• Often there is more than one vehicle in queue. • Drivers feel quite restricted.
E	• Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement. • There is almost always more than one vehicle in queue. • Drivers find the delays approaching intolerable levels.
F	• Forced flow. • Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table B4
Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

It should be noted that the level of service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level-of-service is only calculated for each minor street lane.

In the performance evaluation of TWSC intersections, it is important to consider other measures of effectiveness (MOE's) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

Appendix C

Existing Traffic Conditions
Level-of-Service
Worksheets

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Scenario Report

Scenario:	Default Scenario
Command:	Default Command
Volume:	Default Volume
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Paths
Routes:	Default Routes
Configuration:	Default Configuration

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 313/North	A	9.9	0.000	A	9.9	0.000	+ 0.000 D/V
# 2 309/North	A	9.7	0.000	A	9.7	0.000	+ 0.000 D/V
# 3 Glencoe/North	B	11.0	0.000	B	11.0	0.000	+ 0.000 D/V
# 4 Glencoe/West Union	A	9.5	0.357	A	9.5	0.357	+ 0.000 V/C
# 5 Glencoe/Pacific	B	14.5	0.000	B	14.5	0.000	+ 0.000 D/V
# 6 Glencoe/Highland	D	27.4	0.000	D	27.4	0.000	+ 0.000 D/V
# 7 Glencoe/ORE 26 WB	B	13.1	0.586	B	13.1	0.586	+ 0.000 D/V
# 8 Glencoe/OR 26 EB	F	265.9	0.000	F	265.9	0.000	+ 0.000 D/V
# 9 Jackson School/West Union	A	9.6	0.000	A	9.6	0.000	+ 0.000 D/V

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1 313/North

Average Delay (sec/veh): 1.2 Worst Case Level Of Service: A[9.9]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 0 0 0 0			0 0 0 1 0			0 1 0 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	15	0	5	0	0	0	0	90	5	5	75	0
Growth 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
Initial Bse:	15	0	5	0	0	0	0	90	5	5	75	0
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	15	0	5	0	0	0	0	90	5	5	75	0
User 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
PHF Adj:	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
PHF Volume:	22	0	7	0	0	0	0	130	7	7	109	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	22	0	7	0	0	0	0	130	7	7	109	0
Critical Gap Module:												
Critical Gp:	6.4	xxxx		6.2	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx		3.3	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	257	xxxx		134	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	138	xxxx	xxxxx
Potent Cap.:	732	xxxx		915	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1446	xxxx	xxxxx
Move Cap.:	729	xxxx		915	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1446	xxxx	xxxxx
Volume/Cap:	0.03	xxxx	0.01	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	0.01	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.5	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	*	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	768	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx
Shrd StpDel:	xxxxx	9.9	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.5	xxxx	xxxxx
Shared LOS:	*	A	*	*	*	*	*	*	*	A	*	*
ApproachDel:		9.9			xxxxxx			xxxxxx			xxxxxx	
ApproachLOS:		A			*			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 309/North

Average Delay (sec/veh): 1.5 Worst Case Level Of Service: A[9.7]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	3	0	1	10	1	10	3	90	2	2	60	5
Growth 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
Initial Bse:	3	0	1	10	1	10	3	90	2	2	60	5
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	3	0	1	10	1	10	3	90	2	2	60	5
User 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
PHF Adj:	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
PHF Volume:	4	0	1	13	1	13	4	115	3	3	77	6
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	4	0	1	13	1	13	4	115	3	3	77	6
Critical Gap Module:												
Critical Gp:	7.1	xxxx	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	217	xxxx	117	210	211	80	83	xxxx	xxxxx	118	xxxx	xxxxx
Potent Cap.:	744	xxxx	941	751	690	986	1514	xxxx	xxxxx	1470	xxxx	xxxxx
Move Cap.:	731	xxxx	941	748	687	986	1514	xxxx	xxxxx	1470	xxxx	xxxxx
Volume/Cap:	0.01	xxxx	0.00	0.02	0.00	0.01	0.00	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx	7.5	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	774	xxxxx	xxxx	841	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.0	xxxxx	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	9.7	xxxxx	xxxxx	9.4	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	A	*	*	A	*	*	*	*	*	*	*
ApproachDel:		9.7			9.4			xxxxxx			xxxxxx	
ApproachLOS:		A			A			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Glencoe/North

Average Delay (sec/veh): 4.2 Worst Case Level Of Service: B[11.0]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	35	40	1	2	110	25	5	1	95	3	5	1
Growth 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
Initial Bse:	35	40	1	2	110	25	5	1	95	3	5	1
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	35	40	1	2	110	25	5	1	95	3	5	1
User 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
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	39	45	1	2	124	28	6	1	107	3	6	1
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	39	45	1	2	124	28	6	1	107	3	6	1
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.1	6.5	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	152	xxxx	xxxxx	46	xxxx	xxxxx	270	267	138	320	280	46
Potent Cap.:	1429	xxxx	xxxxx	1536	xxxx	xxxxx	683	639	911	633	628	1024
Move Cap.:	1429	xxxx	xxxxx	1536	xxxx	xxxxx	662	620	911	545	609	1024
Volume/Cap:	0.03	xxxx	xxxx	0.00	xxxx	xxxx	0.01	0.00	0.12	0.01	0.01	0.00
Level Of Service Module:												
Queue:	0.1	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	7.6	xxxx	xxxxx	7.3	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	890	xxxxx	xxxx	613	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	0.4	xxxxx	xxxxx	0.1	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	9.6	xxxxx	xxxxx	11.0	xxxxx
Shared LOS:	*	*	*	*	*	*	*	A	*	*	B	*
ApproachDel:	xxxxxx			xxxxxx			9.6			11.0		
ApproachLOS:	*			*			A			B		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #4 Glencoe/West Union

Cycle (sec): 100 Critical Vol./Cap. (X): 0.357
Loss Time (sec): 0 (Y+R = 4 sec) Average Delay (sec/veh): 9.5
Optimal Cycle: 0 Level Of Service: A

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	45	75	70	15	210	3	4	25	60	60	15	15
Growth 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
Initial Bse:	45	75	70	15	210	3	4	25	60	60	15	15
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	45	75	70	15	210	3	4	25	60	60	15	15
User 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
PHF Adj:	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
PHF Volume:	52	86	80	17	241	3	5	29	69	69	17	17
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	52	86	80	17	241	3	5	29	69	69	17	17
PCE 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
MLF 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
Final Vol.:	52	86	80	17	241	3	5	29	69	69	17	17
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.24	0.39	0.37	0.07	0.92	0.01	0.04	0.28	0.68	0.66	0.17	0.17
Final Sat.:	177	296	276	48	677	10	31	192	460	419	105	105
Capacity Analysis Module:												
Vol/Sat:	0.29	0.29	0.29	0.36	0.36	0.36	0.15	0.15	0.15	0.16	0.16	0.16
Crit Moves:		****		****				****			****	
Delay/Veh:	9.4	9.4	9.4	10.2	10.2	10.2	8.6	8.6	8.6	9.2	9.2	9.2
Delay 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
AdjDel/Veh:	9.4	9.4	9.4	10.2	10.2	10.2	8.6	8.6	8.6	9.2	9.2	9.2
LOS by Move:	A	A	A	B	B	B	A	A	A	A	A	A
ApproachDel:		9.4			10.2			8.6			9.2	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		9.4			10.2			8.6			9.2	
LOS by Appr:		A			B			A			A	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #5 Glencoe/Pacific

Average Delay (sec/veh): 1.3 Worst Case Level Of Service: B[14.5]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0	0 1!	0 0	0	0 1!	0 0	0	0 1!	0 0	0	0 1!	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	20	180	5	2	305	5	2	0	40	2	3	1
Growth 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
Initial Bse:	20	180	5	2	305	5	2	0	40	2	3	1
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	20	180	5	2	305	5	2	0	40	2	3	1
User 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
PHF Adj:	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
PHF Volume:	25	225	6	3	381	6	3	0	50	3	4	1
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	25	225	6	3	381	6	3	0	50	3	4	1
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx	7.1	xxxx	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx	3.5	xxxx	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	388	xxxx	xxxxx	231	xxxx	xxxxx	670	xxxx	384	693	671	228
Potent Cap.:	1171	xxxx	xxxxx	1337	xxxx	xxxxx	371	xxxx	663	358	378	811
Move Cap.:	1171	xxxx	xxxxx	1337	xxxx	xxxxx	361	xxxx	663	325	369	811
Volume/Cap:	0.02	xxxx	xxxx	0.00	xxxx	xxxx	0.01	xxxx	0.08	0.01	0.01	0.00
Level Of Service Module:												
Queue:	0.1	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	8.1	xxxx	xxxxx	7.7	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	638	xxxxx	xxxx	387	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	0.3	xxxxx	xxxxx	0.1	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	11.2	xxxxx	xxxxx	14.5	xxxxx
Shared LOS:	*	*	*	*	*	*	*	B	*	*	B	*
ApproachDel:	xxxxxx			xxxxxx			11.2			14.5		
ApproachLOS:	*			*			B			B		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #6 Glencoe/Highland

Average Delay (sec/veh): 5.0 Worst Case Level Of Service: D[27.4]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	1	0 0	1 0	1	0 0	1 0	0	1 0	0 1	0	0 1!	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	70	200	5	20	305	20	15	3	135	40	3	10
Growth 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
Initial Bse:	70	200	5	20	305	20	15	3	135	40	3	10
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	70	200	5	20	305	20	15	3	135	40	3	10
User 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
PHF Adj:	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
PHF Volume:	81	233	6	23	355	23	17	3	157	47	3	12
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	81	233	6	23	355	23	17	3	157	47	3	12
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.2	6.6	6.3	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	378	xxxx	xxxxx	238	xxxx	xxxxx	819	814	366	891	823	235
Potent Cap.:	1170	xxxx	xxxxx	1305	xxxx	xxxxx	291	309	672	261	306	799
Move Cap.:	1170	xxxx	xxxxx	1305	xxxx	xxxxx	265	282	672	185	280	799
Volume/Cap:	0.07	xxxx	xxxx	0.02	xxxx	xxxx	0.07	0.01	0.23	0.25	0.01	0.01
Level Of Service Module:												
Queue:	0.2	xxxx	xxxxx	0.1	xxxx	xxxxx	xxxxx	xxxx	0.9	xxxxx	xxxx	xxxxx
Stopped Del:	8.3	xxxx	xxxxx	7.8	xxxx	xxxxx	xxxxx	xxxx	12.0	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	B	*	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	268	xxxx	xxxxx	xxxx	221	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.3	xxxx	xxxxx	xxxxx	1.1	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	19.6	xxxx	xxxxx	xxxxx	27.4	xxxxx
Shared LOS:	*	*	*	*	*	*	C	*	*	*	D	*
ApproachDel:	xxxxxx			xxxxxx			12.9			27.4		
ApproachLOS:	*			*			B			D		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #7 Glencoe/ORE 26 WB

Cycle (sec): 60 Critical Vol./Cap. (X): 0.586
Loss Time (sec): 8 (Y+R = 4 sec) Average Delay (sec/veh): 13.1
Optimal Cycle: 35 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Split Phase			Split Phase		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	1	0 0	0	0	1 0 1	0	0	0 0 0	1	0	0 1 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	35	175	0	0	425	55	0	0	0	370	3	145
Growth 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
Initial Bse:	35	175	0	0	425	55	0	0	0	370	3	145
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	35	175	0	0	425	55	0	0	0	370	3	145
User 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
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
PHF Volume:	38	188	0	0	457	59	0	0	0	398	3	156
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	38	188	0	0	457	59	0	0	0	398	3	156
PCE 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
MLF 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
Final Vol.:	38	188	0	0	457	59	0	0	0	398	3	156
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.86	0.86	1.00	1.00	0.95	0.81	1.00	1.00	1.00	0.82	0.82	0.82
Lanes:	0.17	0.83	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.02	0.98
Final Sat.:	272	1360	0	0	1809	1537	0	0	0	1559	32	1528
Capacity Analysis Module:												
Vol/Sat:	0.14	0.14	0.00	0.00	0.25	0.04	0.00	0.00	0.00	0.26	0.10	0.10
Crit Moves:					****					****		
Green/Cycle:	0.43	0.43	0.00	0.00	0.43	0.43	0.00	0.00	0.00	0.44	0.44	0.44
Volume/Cap:	0.32	0.32	0.00	0.00	0.59	0.09	0.00	0.00	0.00	0.59	0.23	0.23
Delay/Veh:	11.5	11.5	0.0	0.0	14.1	10.2	0.0	0.0	0.0	14.2	10.8	10.8
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	11.5	11.5	0.0	0.0	14.1	10.2	0.0	0.0	0.0	14.2	10.8	10.8
HCM2kAvg:	3	3	0	0	7	1	0	0	0	7	2	2

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	R	L	-	T	R	L	-	T	R	L	-	T	R
HCM Ops Adjusted Lane Utilization Module:																
Lanes:	0	1	0	0 0	0	0	1	0 1	0	0	0	0 0	1	0	0	1 0
Lane Group:	LT		LT	xxxx	xxxx		T	R	xxxx	xxxx		xxxx	L		RT	RT
#LnsInGrps:	1		1	0	0		1	1	0	0		0	1		1	1
HCM Ops Input Saturation Adj Module:																
Lane Width:	12		12	12	12		12	12	12	12		12	12		12	12
CrosswalkWid			8				8			8					8	
% Hev Veh:			4				5			0					4	
Grade:			0%				0%			0%					0%	
Parking/Hr:			No				No			No					No	
Bus Stp/Hr:			0				0			0					0	
Area Type:	< < < < < < < < < < < < < < < Other > > > > > > > > > > > > > > >															
Cnft Ped/Hr:			0				0			0					0	
ExclusiveRT:	Include				Include				Include				Include			
% RT Prtct:			0				0			0					0	
HCM Ops f(lt) Adj Case Module:																
f(lt) Case:	5		5	xxxx	xxxx	xxxx		xxxx	xxxx	xxxx		5r	xxxx		xxxx	
HCM Ops Saturation Adj Module:																
Ln Wid Adj:	1.00	1.00	xxxxx	xxxx	1.00	1.00	xxxx	xxxx	xxxxx	1.00	1.00	1.00				
Hev Veh Adj:	0.96	0.96	xxxxx	xxxx	0.95	0.95	xxxx	xxxx	xxxxx	0.96	0.96	0.96				
Grade Adj:	1.00	1.00	xxxxx	xxxx	1.00	1.00	xxxx	xxxx	xxxxx	1.00	1.00	1.00				
Parking Adj:	1.00	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx	xxxx	1.00	1.00				
Bus Stp Adj:	1.00	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx	xxxx	1.00	1.00				
Area Adj:	1.00	1.00	xxxxx	xxxx	1.00	1.00	xxxx	xxxx	xxxxx	1.00	1.00	1.00				
RT Adj:	xxxx	xxxx	xxxxx	xxxx	xxxx	0.85	xxxx	xxxx	xxxxx	xxxx	0.85	0.85				
LT Adj:	0.89	0.89	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	0.85	xxxx	xxxxx				
PedBike 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				
HCM Sat Adj:	0.86	0.86	1.00	1.00	0.95	0.81	1.00	1.00	1.00	0.82	0.82	0.82				
Usr Sat 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				
MLF Sat 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				
Fnl Sat Adj:	0.86	0.86	1.00	1.00	0.95	0.81	1.00	1.00	1.00	0.82	0.82	0.82				
Delay Adjustment Factor Module:																
Coordinated:	< < < < < < < < < < < < < No > > > > > > > > > > > > > > >															
Signal Type:	< < < < < < < < < < < < < Actuated > > > > > > > > > > > > >															
DelAdjFctr:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00				

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report (Permitted Left Turn Sat Adj)
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North	South	East	West
Cycle Length, C:	60	xxxxxx	xxxxxx	xxxxxx
Actual Green Time Per Lane Group, G:	25.87	xxxxxx	xxxxxx	xxxxxx
Effective Green Time Per Lane Group, g:	25.87	xxxxxx	xxxxxx	xxxxxx
Opposing Effective Green Time, go:	25.87	xxxxxx	xxxxxx	xxxxxx
Number Of Opposing Lanes, No:	1	xxxxxx	xxxxxx	xxxxxx
Number Of Lanes In Lane Group, N:	1	xxxxxx	xxxxxx	xxxxxx
Adjusted Left-Turn Flow Rate, Vlt:	38	xxxxxx	xxxxxx	xxxxxx
Proportion of Left Turns in Lane Group, Plt:	0.17	xxxxxx	xxxxxx	xxxxxx
Proportion of Left Turns in Opp Flow, Plto:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Left Turns Per Cycle, LTC:	0.63	xxxxxx	xxxxxx	xxxxxx
Adjusted Opposing Flow Rate, Vo:	457	xxxxxx	xxxxxx	xxxxxx
Opposing Flow Per Lane Per Cycle, Volc:	7.62	xxxxxx	xxxxxx	xxxxxx
Opposing Platoon Ratio, Rpo:	1.00	xxxxxx	xxxxxx	xxxxxx
Lost Time Per Phase, tl:	4.00	xxxxxx	xxxxxx	xxxxxx
Eff grn until arrival of left-turn car, gf:	9.62	xxxxxx	xxxxxx	xxxxxx
Opposing Queue Ratio, qro:	0.57	xxxxxx	xxxxxx	xxxxxx
Eff grn blocked by opposing queue, gq:	7.61	xxxxxx	xxxxxx	xxxxxx
Eff grn while left turns filter thru, gu:	16.25	xxxxxx	xxxxxx	xxxxxx
Max opposing cars arriving during gq-gf, n:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Proportion of Opposing Thru & RT cars, ptho:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Left-turn Saturation Factor, fs:	0.59	xxxxxx	xxxxxx	xxxxxx
Proportion of Left Turns in Shared Lane, pl:	0.17	xxxxxx	xxxxxx	xxxxxx
Through-car Equivalents, el1:	2.21	xxxxxx	xxxxxx	xxxxxx
Single Lane Through-car Equivalents, el2:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Minimum Left Turn Adjustment Factor, fmin:	0.09	xxxxxx	xxxxxx	xxxxxx
Single Lane Left Turn Adjustment Factor, fm:	0.89	xxxxxx	xxxxxx	xxxxxx
Left Turn Adjustment Factor, flt:	0.89	xxxxxx	xxxxxx	xxxxxx

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.43	0.43	0.00	0.00	0.43	0.43	0.00	0.00	0.00	0.44	0.44	0.44
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	2.8	2.8	0.0	0.0	5.8	0.6	0.0	0.0	0.0	5.9	1.7	1.7
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00
Q2:	0.5	0.5	0.0	0.0	1.4	0.1	0.0	0.0	0.0	1.4	0.3	0.3
HCM2KQueue:	3.3	3.3	0.0	0.0	7.2	0.7	0.0	0.0	0.0	7.3	2.0	2.0
70th%Factor:	1.19	1.19	1.20	1.20	1.18	1.20	1.20	1.20	1.20	1.18	1.20	1.20
70th%HCM2kQ:	3.9	3.9	0.0	0.0	8.5	0.8	0.0	0.0	0.0	8.6	2.4	2.4
85th%Factor:	1.57	1.57	1.60	1.60	1.54	1.59	1.60	1.60	1.60	1.54	1.58	1.58
85th%HCM2kQ:	5.1	5.1	0.0	0.0	11.0	1.1	0.0	0.0	0.0	11.1	3.1	3.1
90th%Factor:	1.74	1.74	1.80	1.80	1.68	1.79	1.80	1.80	1.80	1.68	1.76	1.76
90th%HCM2kQ:	5.7	5.7	0.0	0.0	12.0	1.2	0.0	0.0	0.0	12.2	3.5	3.5
95th%Factor:	2.00	2.00	2.10	2.10	1.90	2.08	2.10	2.10	2.10	1.90	2.04	2.04
95th%HCM2kQ:	6.5	6.5	0.0	0.0	13.6	1.4	0.0	0.0	0.0	13.8	4.0	4.0
98th%Factor:	2.48	2.48	2.70	2.70	2.28	2.65	2.70	2.70	2.70	2.27	2.56	2.56
98th%HCM2kQ:	8.1	8.1	0.0	0.0	16.3	1.8	0.0	0.0	0.0	16.5	5.0	5.0

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #8 Glencoe/OR 26 EB

Average Delay (sec/veh): 24.8 Worst Case Level Of Service: F[265.9]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:		Include			Include			Include			Include	
Lanes:	0 0	0	1 0	0	1 0	0 0	0	1 0	0 1	0	0 0	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	0	185	610	240	555	0	25	0	120	0	0	0
Growth 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
Initial Bse:	0	185	610	240	555	0	25	0	120	0	0	0
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	185	610	240	555	0	25	0	120	0	0	0
User 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
PHF Adj:	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
PHF Volume:	0	213	701	276	638	0	29	0	138	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	0	213	701	276	638	0	29	0	138	0	0	0
Critical Gap Module:												
Critical Gp:	xxxxx	xxxx	xxxxx	4.1	xxxx	xxxxx	6.4	xxxx	6.2	xxxxx	xxxx	xxxxx
FollowUpTim:	xxxxx	xxxx	xxxxx	2.2	xxxx	xxxxx	3.5	xxxx	3.3	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	xxxx	xxxx	xxxxx	876	xxxx	xxxxx	2529	xxxx	638	xxxx	xxxx	xxxxx
Potent Cap.:	xxxx	xxxx	xxxxx	531	xxxx	xxxxx	21	xxxx	475	xxxx	xxxx	xxxxx
Move Cap.:	xxxx	xxxx	xxxxx	531	xxxx	xxxxx	11	xxxx	475	xxxx	xxxx	xxxxx
Volume/Cap:	xxxx	xxxx	xxxx	0.52	xxxx	xxxx	2.69	xxxx	0.29	xxxx	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	3.0	xxxx	xxxxx	xxxxx	xxxx	1.2	xxxxx	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	18.9	xxxx	xxxxx	xxxxx	xxxx	15.7	xxxxx	xxxx	xxxxx
LOS by Move:	*	*	*	C	*	*	*	*	C	*	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	11	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	3.0	xxxx	xxxxx	4.6	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	18.9	xxxx	xxxxx	1467	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	*	C	*	*	F	*	*	*	*	*
ApproachDel:	xxxxxx			xxxxxx			265.9			xxxxxx		
ApproachLOS:	*			*			F			*		

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #9 Jackson School/West Union

Average Delay (sec/veh): 2.7 Worst Case Level Of Service: A[9.6]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:		Include			Include			Include			Include	
Lanes:	1 0	0	1 0	0	0 1!	0 0	0	0 1!	0 0	0	0 1!	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	5	4	4	25	1	20	3	80	5	2	60	10
Growth 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
Initial Bse:	5	4	4	25	1	20	3	80	5	2	60	10
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	5	4	4	25	1	20	3	80	5	2	60	10
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	6	4	4	28	1	22	3	89	6	2	67	11
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	6	4	4	28	1	22	3	89	6	2	67	11
Critical Gap Module:												
Critical Gp:	7.2	6.6	6.3	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	187	181	92	179	178	72	78	xxxx	xxxxx	94	xxxx	xxxxx
Potent Cap.:	767	708	958	778	712	984	1514	xxxx	xxxxx	1481	xxxx	xxxxx
Move Cap.:	747	705	958	768	710	984	1514	xxxx	xxxxx	1481	xxxx	xxxxx
Volume/Cap:	0.01	0.01	0.00	0.04	0.00	0.02	0.00	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	9.9	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx	7.4	xxxx	xxxxx
LOS by Move:	A	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	812	xxxx	848	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	xxxx	0.0	xxxxx	0.2	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	9.5	xxxxx	9.5	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	A	*	A	*	*	*	*	*	*	*
ApproachDel:	9.6			9.5			xxxxxx			xxxxxx		
ApproachLOS:	A			A			*			*		

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Scenario Report

Scenario:	Default Scenario
Command:	Default Command
Volume:	Default Volume
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Paths
Routes:	Default Routes
Configuration:	Default Configuration

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 313/North	A	9.1	0.000	A	9.1	0.000	+ 0.000 D/V
# 2 309/North	A	9.6	0.000	A	9.6	0.000	+ 0.000 D/V
# 3 Glencoe/North	B	10.5	0.000	B	10.5	0.000	+ 0.000 D/V
# 4 Glencoe/West Union	B	10.5	0.469	B	10.5	0.469	+ 0.000 V/C
# 5 Glencoe/Pacific	B	13.7	0.000	B	13.7	0.000	+ 0.000 D/V
# 6 Glencoe/Highland	C	22.7	0.000	C	22.7	0.000	+ 0.000 D/V
# 7 Glencoe/ORE 26 WB	C	27.0	0.926	C	27.0	0.926	+ 0.000 D/V
# 8 Glencoe/OR 26 EB	F	722.9	0.000	F	722.9	0.000	+ 0.000 D/V
# 9 Jackson School/West Union	B	10.3	0.000	B	10.3	0.000	+ 0.000 D/V

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1 313/North

Average Delay (sec/veh): 0.5 Worst Case Level Of Service: A[9.1]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 0 0 0			0 0 0 1 0			0 1 0 0 0		
Volume Module:												
Base Vol:	2	0	2	0	0	0	0	70	2	5	65	0
Growth 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
Initial Bse:	2	0	2	0	0	0	0	70	2	5	65	0
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	0	2	0	0	0	0	70	2	5	65	0
User 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
PHF Adj:	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
PHF Volume:	3	0	3	0	0	0	0	89	3	6	82	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	3	0	3	0	0	0	0	89	3	6	82	0
Critical Gap Module:												
Critical Gp:	6.4	xxxx		6.2	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx		3.3	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	185	xxxx		90	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	91	xxxx	xxxxx
Potent Cap.:	804	xxxx		968	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1504	xxxx	xxxxx
Move Cap.:	802	xxxx		968	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1504	xxxx	xxxxx
Volume/Cap:	0.00	xxxx		0.00	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx		0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx		7.4	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	*	*	*		A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT		LT -	LTR -	RT
Shared Cap.:	xxxx	877	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.0	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx		0.0	xxxx	xxxxx
Shrd StpDel:	xxxxx	9.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx		7.4	xxxx	xxxxx
Shared LOS:	*	A	*	*	*	*	*	*	*		A	*	*
ApproachDel:		9.1			xxxxxx			xxxxxx			xxxxxx		
ApproachLOS:		A			*			*			*		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 309/North

Average Delay (sec/veh): 1.3 Worst Case Level Of Service: A[9.6]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	2	2	2	5	2	5	5	65	5	2	65	5
Growth 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
Initial Bse:	2	2	2	5	2	5	5	65	5	2	65	5
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	2	2	5	2	5	5	65	5	2	65	5
User 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
PHF Adj:	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
PHF Volume:	3	3	3	6	3	6	6	83	6	3	83	6
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	3	3	3	6	3	6	6	83	6	3	83	6
Critical Gap Module:												
Critical Gp:	7.1	6.5	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	196	194	87	194	194	87	90	xxxx	xxxxx	90	xxxx	xxxxx
Potent Cap.:	768	705	978	770	705	978	1506	xxxx	xxxxx	1506	xxxx	xxxxx
Move Cap.:	757	700	978	763	700	978	1506	xxxx	xxxxx	1506	xxxx	xxxxx
Volume/Cap:	0.00	0.00	0.00	0.01	0.00	0.01	0.00	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx	7.4	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	796	xxxxx	xxxx	826	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.0	xxxxx	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	9.6	xxxxx	xxxxx	9.4	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	A	*	*	A	*	*	*	*	*	*	*
ApproachDel:		9.6			9.4			xxxxxx			xxxxxx	
ApproachLOS:		A			A			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Glencoe/North

Average Delay (sec/veh): 4.0 Worst Case Level Of Service: B[10.5]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	65	95	2	2	50	10	10	2	55	2	2	2
Growth 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
Initial Bse:	65	95	2	2	50	10	10	2	55	2	2	2
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	65	95	2	2	50	10	10	2	55	2	2	2
User 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
PHF Adj:	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PHF Volume:	68	99	2	2	52	10	10	2	57	2	2	2
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	68	99	2	2	52	10	10	2	57	2	2	2
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.1	6.5	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	63	xxxx	xxxxx	101	xxxx	xxxxx	299	298	57	327	302	100
Potent Cap.:	1540	xxxx	xxxxx	1467	xxxx	xxxxx	653	614	1009	627	611	956
Move Cap.:	1540	xxxx	xxxxx	1467	xxxx	xxxxx	627	585	1009	568	582	956
Volume/Cap:	0.04	xxxx	xxxx	0.00	xxxx	xxxx	0.02	0.00	0.06	0.00	0.00	0.00
Level Of Service Module:												
Queue:	0.1	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	7.4	xxxx	xxxxx	7.5	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	907	xxxxx	xxxx	663	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	0.2	xxxxx	xxxxx	0.0	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	9.3	xxxxx	xxxxx	10.5	xxxxx
Shared LOS:	*	*	*	*	*	*	*	A	*	*	B	*
ApproachDel:	xxxxxx			xxxxxx				9.3			10.5	
ApproachLOS:	*			*				A			B	

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #4 Glencoe/West Union

Cycle (sec): 100 Critical Vol./Cap. (X): 0.469
Loss Time (sec): 0 (Y+R = 4 sec) Average Delay (sec/veh): 10.5
Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	95	155	50	15	110	2	15	30	75	80	30	20
Growth 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
Initial Bse:	95	155	50	15	110	2	15	30	75	80	30	20
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	95	155	50	15	110	2	15	30	75	80	30	20
User 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
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	107	174	56	17	124	2	17	34	84	90	34	22
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	107	174	56	17	124	2	17	34	84	90	34	22
PCE 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
MLF 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
Final Vol.:	107	174	56	17	124	2	17	34	84	90	34	22
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.31	0.52	0.17	0.12	0.87	0.01	0.12	0.25	0.63	0.62	0.23	0.15
Final Sat.:	228	371	120	78	573	10	83	165	413	380	143	95
Capacity Analysis Module:												
Vol/Sat:	0.47	0.47	0.47	0.22	0.22	0.22	0.20	0.20	0.20	0.24	0.24	0.24
Crit Moves:	****				****				****		****	
Delay/Veh:	11.7	11.7	11.7	9.4	9.4	9.4	9.1	9.1	9.1	9.9	9.9	9.9
Delay 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
AdjDel/Veh:	11.7	11.7	11.7	9.4	9.4	9.4	9.1	9.1	9.1	9.9	9.9	9.9
LOS by Move:	B	B	B	A	A	A	A	A	A	A	A	A
ApproachDel:	11.7				9.4			9.1			9.9	
Delay Adj:	1.00				1.00			1.00			1.00	
ApprAdjDel:	11.7				9.4			9.1			9.9	
LOS by Appr:	B				A			A			A	

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #5 Glencoe/Pacific

Average Delay (sec/veh): 1.3 Worst Case Level Of Service: B[13.7]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Uncontrolled				Uncontrolled				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module:																
Base Vol:	35	295	2		2	275	5		2	2	35		5	2	5	
Growth 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	
Initial Bse:	35	295	2		2	275	5		2	2	35		5	2	5	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	35	295	2		2	275	5		2	2	35		5	2	5	
User 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	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	37	314	2		2	293	5		2	2	37		5	2	5	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Final Vol.:	37	314	2		2	293	5		2	2	37		5	2	5	
Critical Gap Module:																
Critical Gp:	4.1	xxxx	xxxxx		4.1	xxxx	xxxxx		7.1	6.5	6.2		7.1	6.5	6.2	
FollowUpTim:	2.2	xxxx	xxxxx		2.2	xxxx	xxxxx		3.5	4.0	3.3		3.5	4.0	3.3	
Capacity Module:																
Cnflict Vol:	298	xxxx	xxxxx		316	xxxx	xxxxx		693	690	295		709	691	315	
Potent Cap.:	1263	xxxx	xxxxx		1244	xxxx	xxxxx		358	368	744		349	368	726	
Move Cap.:	1263	xxxx	xxxxx		1244	xxxx	xxxxx		345	357	744		322	356	726	
Volume/Cap:	0.03	xxxx	xxxx		0.00	xxxx	xxxx		0.01	0.01	0.05		0.02	0.01	0.01	
Level Of Service Module:																
Queue:	0.1	xxxx	xxxxx		0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx			
Stopped Del:	7.9	xxxx	xxxxx		7.9	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx			
LOS by Move:	A	*	*		A	*	*	*	*	*	*	*	*			
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		xxxx	667	xxxxx		xxxx	428	xxxxx	
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	0.2	xxxxx		xxxxx	0.1	xxxxx	
Shrd StpDel:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	10.8	xxxxx		xxxxx	13.7	xxxxx	
Shared LOS:	*	*	*		*	*	*		*	B	*		*	B	*	
ApproachDel:	xxxxxx				xxxxxx				10.8				13.7			
ApproachLOS:	*				*				B				B			

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #6 Glencoe/Highland

Average Delay (sec/veh): 4.7 Worst Case Level Of Service: C[22.7]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Uncontrolled				Uncontrolled				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Lanes:	1	0	0	1 0	1	0	0	1 0	0	1	0	0 1	0	0	1!	0 0
Volume Module:																
Base Vol:	75	300	10		15	260	20		20	2	95		55	2	30	
Growth 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	
Initial Bse:	75	300	10		15	260	20		20	2	95		55	2	30	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	75	300	10		15	260	20		20	2	95		55	2	30	
User 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	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	80	319	11		16	277	21		21	2	101		59	2	32	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Final Vol.:	80	319	11		16	277	21		21	2	101		59	2	32	
Critical Gap Module:																
Critical Gp:	4.1	xxxx	xxxxx		4.2	xxxx	xxxxx		7.2	6.6	6.3		7.1	6.5	6.2	
FollowUpTim:	2.2	xxxx	xxxxx		2.3	xxxx	xxxxx		3.5	4.0	3.3		3.5	4.0	3.3	
Capacity Module:																
Cnflict Vol:	298	xxxx	xxxxx		330	xxxx	xxxxx		820	809	287		855	814	324	
Potent Cap.:	1252	xxxx	xxxxx		1208	xxxx	xxxxx		290	311	745		276	310	712	
Move Cap.:	1252	xxxx	xxxxx		1208	xxxx	xxxxx		260	287	745		224	286	712	
Volume/Cap:	0.06	xxxx	xxxx		0.01	xxxx	xxxx		0.08	0.01	0.14		0.26	0.01	0.04	
Level Of Service Module:																
Queue:	0.2	xxxx	xxxxx		0.0	xxxx	xxxxx	xxxxx	xxxx	0.5	xxxxx	xxxx	xxxxx			
Stopped Del:	8.1	xxxx	xxxxx		8.0	xxxx	xxxxx	xxxxx	xxxx	10.6	xxxxx	xxxx	xxxxx			
LOS by Move:	A	*	*		A	*	*	*	*	B	*	*	*			
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		262	xxxx	xxxxx		xxxx	295	xxxxx	
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		0.3	xxxx	xxxxx		xxxxx	1.3	xxxxx	
Shrd StpDel:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		20.1	xxxx	xxxxx		xxxxx	22.7	xxxxx	
Shared LOS:	*	*	*		*	*	*		C	*	*		*	C	*	
ApproachDel:	xxxxxx				xxxxxx				12.4				22.7			
ApproachLOS:	*				*				B				C			

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #7 Glencoe/ORE 26 WB

Cycle (sec): 60 Critical Vol./Cap. (X): 0.926
Loss Time (sec): 8 (Y+R = 4 sec) Average Delay (sec/veh): 27.0
Optimal Cycle: 87 Level Of Service: C

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Permitted			Permitted			Split Phase			Split Phase		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	1	0	0	0	0	1	0	1	0	0	0	0	0	1	0
Volume Module:												
Base Vol:	155	215	0	0	330	80	0	0	0	585	2	230
Growth 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
Initial Bse:	155	215	0	0	330	80	0	0	0	585	2	230
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	155	215	0	0	330	80	0	0	0	585	2	230
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	172	239	0	0	367	89	0	0	0	650	2	256
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	172	239	0	0	367	89	0	0	0	650	2	256
PCE 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
MLF 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
Final Vol.:	172	239	0	0	367	89	0	0	0	650	2	256
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.56	0.56	1.00	1.00	0.95	0.81	1.00	1.00	1.00	0.82	0.82	0.82
Lanes:	0.42	0.58	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	0.01	0.99
Final Sat.:	448	621	0	0	1809	1537	0	0	0	1555	13	1542
Capacity Analysis Module:												
Vol/Sat:	0.38	0.38	0.00	0.00	0.20	0.06	0.00	0.00	0.00	0.42	0.17	0.17
Crit Moves:		****								****		
Green/Cycle:	0.42	0.42	0.00	0.00	0.42	0.42	0.00	0.00	0.00	0.45	0.45	0.45
Volume/Cap:	0.93	0.93	0.00	0.00	0.49	0.14	0.00	0.00	0.00	0.93	0.37	0.37
Delay/Veh:	42.0	42.0	0.0	0.0	13.4	11.0	0.0	0.0	0.0	33.7	11.2	11.2
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	42.0	42.0	0.0	0.0	13.4	11.0	0.0	0.0	0.0	33.7	11.2	11.2
HCM2kAvg:	18	18	0	0	5	1	0	0	0	19	3	3

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HCM Ops Adjusted Lane Utilization Module:												
Lanes:	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	1	0
Lane Group:	LT		LT	xxxx	xxxx	T		R	xxxx	xxxx	xxxx	L	RT	RT
#LnsInGrps:	1		1	0	0	1		1	0	0	0	1	1	1
HCM Ops Input Saturation Adj Module:												
Lane Width:	12	12	12	12	12	12	12	12	12	12	12	12
CrosswalkWid	8			8			8			8		
% Hev Veh:	4			5			0			4		
Grade:	0%			0%			0%			0%		
Parking/Hr:	No			No			No			No		
Bus Stp/Hr:	0			0			0			0		
Area Type:	< < < < < < < < < < < < < Other > > > > > > > > > > > > >
Cnft Ped/Hr:	0			0			0			0		
ExclusiveRT:	Include			Include			Include			Include		
% RT Prtct:	0			0			0			0		
HCM Ops f(lt) Adj Case Module:												
f(lt) Case:	5	5	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	5r	xxxx	xxxx
HCM Ops Saturation Adj Module:												
Ln Wid Adj:	1.00	1.00	xxxxx	xxxx	1.00	1.00	xxxx	xxxx	xxxxx	1.00	1.00	1.00
Hev Veh Adj:	0.96	0.96	xxxxx	xxxx	0.95	0.95	xxxx	xxxx	xxxxx	0.96	0.96	0.96
Grade Adj:	1.00	1.00	xxxxx	xxxx	1.00	1.00	xxxx	xxxx	xxxxx	1.00	1.00	1.00
Parking Adj:	1.00	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx	xxxx	1.00	1.00
Bus Stp Adj:	1.00	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx	xxxx	1.00	1.00
Area Adj:	1.00	1.00	xxxxx	xxxx	1.00	1.00	xxxx	xxxx	xxxxx	1.00	1.00	1.00
RT Adj:	xxxx	xxxx	xxxxx	xxxx	xxxx	0.85	xxxx	xxxx	xxxxx	xxxx	0.85	0.85
LT Adj:	0.59	0.59	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	0.85	xxxx	xxxxx
PedBike 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
HCM Sat Adj:	0.56	0.56	1.00	1.00	0.95	0.81	1.00	1.00	1.00	0.82	0.82	0.82
Usr Sat 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
MLF Sat 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
Fnl Sat Adj:	0.56	0.56	1.00	1.00	0.95	0.81	1.00	1.00	1.00	0.82	0.82	0.82
Delay Adjustment Factor Module:												
Coordinated:	< < < < < < < < < < < < < No > > > > > > > > > > > > >
Signal Type:	< < < < < < < < < < < < < Actuated > > > > > > > > > > > > >
DelAdjFctr:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report (Permitted Left Turn Sat Adj)
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North	South	East	West
Cycle Length, C:	60	xxxxxx	xxxxxx	xxxxxx
Actual Green Time Per Lane Group, G:	24.91	xxxxxx	xxxxxx	xxxxxx
Effective Green Time Per Lane Group, g:	24.91	xxxxxx	xxxxxx	xxxxxx
Opposing Effective Green Time, go:	24.91	xxxxxx	xxxxxx	xxxxxx
Number Of Opposing Lanes, No:	1	xxxxxx	xxxxxx	xxxxxx
Number Of Lanes In Lane Group, N:	1	xxxxxx	xxxxxx	xxxxxx
Adjusted Left-Turn Flow Rate, Vlt:	172	xxxxxx	xxxxxx	xxxxxx
Proportion of Left Turns in Lane Group, Plt:	0.42	xxxxxx	xxxxxx	xxxxxx
Proportion of Left Turns in Opp Flow, Plto:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Left Turns Per Cycle, LTC:	2.87	xxxxxx	xxxxxx	xxxxxx
Adjusted Opposing Flow Rate, Vo:	367	xxxxxx	xxxxxx	xxxxxx
Opposing Flow Per Lane Per Cycle, Volc:	6.12	xxxxxx	xxxxxx	xxxxxx
Opposing Platoon Ratio, Rpo:	1.00	xxxxxx	xxxxxx	xxxxxx
Lost Time Per Phase, tl:	4.00	xxxxxx	xxxxxx	xxxxxx
Eff grn until arrival of left-turn car, gf:	0.69	xxxxxx	xxxxxx	xxxxxx
Opposing Queue Ratio, qro:	0.58	xxxxxx	xxxxxx	xxxxxx
Eff grn blocked by opposing queue, gq:	4.99	xxxxxx	xxxxxx	xxxxxx
Eff grn while left turns filter thru, gu:	19.92	xxxxxx	xxxxxx	xxxxxx
Max opposing cars arriving during gq-gf, n:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Proportion of Opposing Thru & RT cars, ptho:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Left-turn Saturation Factor, fs:	0.65	xxxxxx	xxxxxx	xxxxxx
Proportion of Left Turns in Shared Lane, pl:	0.42	xxxxxx	xxxxxx	xxxxxx
Through-car Equivalents, el1:	2.03	xxxxxx	xxxxxx	xxxxxx
Single Lane Through-car Equivalents, el2:	xxxxxx	xxxxxx	xxxxxx	xxxxxx
Minimum Left Turn Adjustment Factor, fmin:	0.11	xxxxxx	xxxxxx	xxxxxx
Single Lane Left Turn Adjustment Factor, fm:	0.59	xxxxxx	xxxxxx	xxxxxx
Left Turn Adjustment Factor, flt:	0.59	xxxxxx	xxxxxx	xxxxxx

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.42	0.42	0.00	0.00	0.42	0.42	0.00	0.00	0.00	0.45	0.45	0.45
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	11.1	11.1	0.0	0.0	4.5	0.9	0.0	0.0	0.0	12.0	2.8	2.8
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00
Q2:	6.5	6.5	0.0	0.0	0.9	0.2	0.0	0.0	0.0	6.7	0.6	0.6
HCM2KQueue:	17.6	17.6	0.0	0.0	5.4	1.1	0.0	0.0	0.0	18.7	3.4	3.4
70th%Factor:	1.16	1.16	1.20	1.20	1.19	1.20	1.20	1.20	1.20	1.16	1.19	1.19
70th%HCM2kQ:	20.5	20.5	0.0	0.0	6.4	1.3	0.0	0.0	0.0	21.7	4.1	4.1
85th%Factor:	1.47	1.47	1.60	1.60	1.55	1.59	1.60	1.60	1.60	1.46	1.57	1.57
85th%HCM2kQ:	25.8	25.8	0.0	0.0	8.4	1.7	0.0	0.0	0.0	27.3	5.3	5.3
90th%Factor:	1.57	1.57	1.80	1.80	1.71	1.78	1.80	1.80	1.80	1.56	1.74	1.74
90th%HCM2kQ:	27.6	27.6	0.0	0.0	9.2	1.9	0.0	0.0	0.0	29.1	5.9	5.9
95th%Factor:	1.73	1.73	2.10	2.10	1.94	2.07	2.10	2.10	2.10	1.71	2.00	2.00
95th%HCM2kQ:	30.4	30.4	0.0	0.0	10.5	2.2	0.0	0.0	0.0	32.0	6.8	6.8
98th%Factor:	1.96	1.96	2.70	2.70	2.36	2.62	2.70	2.70	2.70	1.94	2.47	2.47
98th%HCM2kQ:	34.5	34.5	0.0	0.0	12.8	2.8	0.0	0.0	0.0	36.2	8.4	8.4

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #8 Glencoe/OR 26 EB

Average Delay (sec/veh): 30.1 Worst Case Level Of Service: F[722.9]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Uncontrolled				Uncontrolled				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Lanes:	0	0	0	1 0	0	1	0	0 0	0	1	0	0 1	0	0	0	0 0
Volume Module:																
Base Vol:	0	350	340		145	770	0		20	2	45		0	0	0	
Growth 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	
Initial Bse:	0	350	340		145	770	0		20	2	45		0	0	0	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	0	350	340		145	770	0		20	2	45		0	0	0	
User 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	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	0	372	362		154	819	0		21	2	48		0	0	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Final Vol.:	0	372	362		154	819	0		21	2	48		0	0	0	
Critical Gap Module:																
Critical Gp:	xxxxx	xxxx	xxxxx		4.1	xxxx	xxxxx		6.4	6.5	6.2		xxxxx	xxxx	xxxxx	
FollowUpTim:	xxxxx	xxxx	xxxxx		2.2	xxxx	xxxxx		3.5	4.0	3.3		xxxxx	xxxx	xxxxx	
Capacity Module:																
Cnflict Vol:	xxxx	xxxx	xxxxx		535	xxxx	xxxxx		2936	3252	819		xxxx	xxxx	xxxxx	
Potent Cap.:	xxxx	xxxx	xxxxx		588	xxxx	xxxxx		9	5	374		xxxx	xxxx	xxxxx	
Move Cap.:	xxxx	xxxx	xxxxx		588	xxxx	xxxxx		7	4	374		xxxx	xxxx	xxxxx	
Volume/Cap:	xxxx	xxxx	xxxx		0.26	xxxx	xxxx		2.91	0.57	0.13		xxxx	xxxx	xxxx	
Level Of Service Module:																
Queue:	xxxxx	xxxx	xxxxx		1.0	xxxx	xxxxx		xxxxx	xxxx	0.4		xxxxx	xxxx	xxxxx	
Stopped Del:	xxxxx	xxxx	xxxxx		13.3	xxxx	xxxxx		xxxxx	xxxx	16.0		xxxxx	xxxx	xxxxx	
LOS by Move:	*	*	*		B	*	*		*	*	C		*	*	*	
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		7	xxxx	xxxxx		xxxx	xxxx	xxxxx	
SharedQueue:	xxxxx	xxxx	xxxxx		1.0	xxxx	xxxxx		4.2	xxxx	xxxxx		xxxxx	xxxx	xxxxx	
Shrd StpDel:	xxxxx	xxxx	xxxxx		13.3	xxxx	xxxxx		2169	xxxx	xxxxx		xxxxx	xxxx	xxxxx	
Shared LOS:	*	*	*		B	*	*		F	*	*		*	*	*	
ApproachDel:	xxxxxx				xxxxxx				722.9				xxxxxx			
ApproachLOS:	*				*				F				*			

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2005 Existing Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #9 Jackson School/West Union

Average Delay (sec/veh): 2.9 Worst Case Level Of Service: B[10.3]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Uncontrolled				Uncontrolled			
Rights:	Include				Include				Include				Include			
Lanes:	1	0	0	1 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module:																
Base Vol:	10	25	5		10	5	5		10	80	2		5	85	5	
Growth 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	
Initial Bse:	10	25	5		10	5	5		10	80	2		5	85	5	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	10	25	5		10	5	5		10	80	2		5	85	5	
User 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	
PHF Adj:	0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91		0.91	0.91	0.91	
PHF Volume:	11	27	5		11	5	5		11	88	2		5	93	5	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Final Vol.:	11	27	5		11	5	5		11	88	2		5	93	5	
Critical Gap Module:																
Critical Gp:	7.2	6.6	6.3		7.1	6.5	6.2		4.1	xxxx	xxxxx		4.1	xxxx	xxxxx	
FollowUpTim:	3.5	4.0	3.3		3.5	4.0	3.3		2.2	xxxx	xxxxx		2.2	xxxx	xxxxx	
Capacity Module:																
Cnflict Vol:	224	221	89		235	219	96		99	xxxx	xxxxx		90	xxxx	xxxxx	
Potent Cap.:	726	672	961		716	676	955		1488	xxxx	xxxxx		1486	xxxx	xxxxx	
Move Cap.:	711	665	961		683	668	955		1488	xxxx	xxxxx		1486	xxxx	xxxxx	
Volume/Cap:	0.02	0.04	0.01		0.02	0.01	0.01		0.01	xxxx	xxxx		0.00	xxxx	xxxx	
Level Of Service Module:																
Queue:	0.0	xxxx	xxxxx		xxxxx	xxxx	xxxxx		0.0	xxxx	xxxxx		0.0	xxxx	xxxxx	
Stopped Del:	10.1	xxxx	xxxxx		xxxxx	xxxx	xxxxx		7.4	xxxx	xxxxx		7.4	xxxx	xxxxx	
LOS by Move:	B	*	*		*	*	*		A	*	*		A	*	*	
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	701		xxxx	731	xxxxx		xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx	
SharedQueue:	xxxxx	xxxx	0.1		xxxxx	0.1	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	
Shrd StpDel:	xxxxx	xxxx	10.4		xxxxx	10.1	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	
Shared LOS:	*	*	B		*	B	*		*	*	*		*	*	*	
ApproachDel:	10.3				10.1				xxxxxx				xxxxxx			
ApproachLOS:	B				B				*				*			

Appendix D

Year 2015 Background
Traffic Level-of-Service
Worksheets

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Scenario Report

Scenario:	Default Scenario
Command:	Default Command
Volume:	Default Volume
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Paths
Routes:	Default Routes
Configuration:	Default Configuration

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 313/North	B	10.1	0.000	B	10.1	0.000	+ 0.000 D/V
# 2 309/North	A	9.8	0.000	A	9.8	0.000	+ 0.000 D/V
# 3 Glencoe/North	B	11.3	0.000	B	11.3	0.000	+ 0.000 D/V
# 4 Glencoe/West Union	B	10.0	0.401	B	10.0	0.401	+ 0.000 V/C
# 5 Glencoe/Pacific	C	15.8	0.000	C	15.8	0.000	+ 0.000 D/V
# 6 Glencoe/Highland	E	37.4	0.000	E	37.4	0.000	+ 0.000 D/V
# 7 Glencoe/ORE 26 WB	B	14.0	0.390	B	14.0	0.390	+ 0.000 D/V
# 8 Glencoe/OR 26 EB	B	16.5	0.458	B	16.5	0.458	+ 0.000 D/V
# 9 Jackson School/West Union	A	9.7	0.000	A	9.7	0.000	+ 0.000 D/V

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1 313/North

Average Delay (sec/veh): 1.2 Worst Case Level Of Service: B[10.1]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0	0	1! 0	0	0	0	0	0	0	1	0	0	1	0	0	0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.																
Base Vol:	15	0	5	0	0	0	0	90	5	5	75	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	17	0	6	0	0	0	0	99	6	6	83	0
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	17	0	6	0	0	0	0	99	6	6	83	0
User 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
PHF Adj:	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
PHF Volume:	24	0	8	0	0	0	0	143	8	8	120	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	24	0	8	0	0	0	0	143	8	8	120	0
Critical Gap Module:												
Critical Gp:	6.4	xxxx	6.2	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx	3.3	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	283	xxxx	147	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	151	xxxx	xxxxx
Potent Cap.:	707	xxxx	899	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1429	xxxx	xxxxx
Move Cap.:	704	xxxx	899	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1429	xxxx	xxxxx
Volume/Cap:	0.03	xxxx	0.01	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	0.01	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.5	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	*	*	*	A	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	745	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx
Shrd StpDel:	xxxxx	10.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.5	xxxx	xxxxx
Shared LOS:	*	B	*	*	*	*	*	*	*	A	*	*
ApproachDel:		10.1			xxxxxx			xxxxxx			xxxxxx	
ApproachLOS:		B			*			*			*	

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 309/North

Average Delay (sec/veh): 1.5 Worst Case Level Of Service: A[9.8]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0	0	1! 0	0	0	0	0	1! 0	0	0	0	1! 0	0	0	1! 0	0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.																
Base Vol:	3	0	1	10	1	10	3	90	2	2	60	5
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	3	0	1	11	1	11	3	99	2	2	66	6
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	3	0	1	11	1	11	3	99	2	2	66	6
User 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
PHF Adj:	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
PHF Volume:	4	0	1	14	1	14	4	127	3	3	85	7
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	4	0	1	14	1	14	4	127	3	3	85	7
Critical Gap Module:												
Critical Gp:	7.1	xxxx	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	238	xxxx	128	231	232	88	92	xxxx	xxxxx	130	xxxx	xxxxx
Potent Cap.:	720	xxxx	927	728	672	976	1503	xxxx	xxxxx	1456	xxxx	xxxxx
Move Cap.:	706	xxxx	927	724	668	976	1503	xxxx	xxxxx	1456	xxxx	xxxxx
Volume/Cap:	0.01	xxxx	0.00	0.02	0.00	0.01	0.00	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx	7.5	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	751	xxxxx	xxxx	822	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.0	xxxxx	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	9.8	xxxxx	xxxxx	9.5	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	A	*	*	A	*	*	*	*	*	*	*
ApproachDel:		9.8			9.5			xxxxxx			xxxxxx	
ApproachLOS:		A			A			*			*	

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Glencoe/North

Average Delay (sec/veh): 4.3 Worst Case Level Of Service: B[11.3]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	35	40	1	2	110	25	5	1	95	3	5	1
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	39	44	1	2	121	28	6	1	105	3	6	1
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	39	44	1	2	121	28	6	1	105	3	6	1
User 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
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	43	49	1	2	136	31	6	1	117	4	6	1
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	43	49	1	2	136	31	6	1	117	4	6	1
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.1	6.5	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	167	xxxx	xxxxx	51	xxxx	xxxxx	297	294	151	352	308	50
Potent Cap.:	1411	xxxx	xxxxx	1530	xxxx	xxxxx	656	617	895	603	606	1018
Move Cap.:	1411	xxxx	xxxxx	1530	xxxx	xxxxx	633	597	895	510	586	1018
Volume/Cap:	0.03	xxxx	xxxx	0.00	xxxx	xxxx	0.01	0.00	0.13	0.01	0.01	0.00
Level Of Service Module:												
Queue:	0.1	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	7.6	xxxx	xxxxx	7.4	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	873	xxxxx	xxxx	584	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	0.5	xxxxx	xxxxx	0.1	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	9.8	xxxxx	xxxxx	11.3	xxxxx
Shared LOS:	*	*	*	*	*	*	*	A	*	*	B	*
ApproachDel:	xxxxxx			xxxxxx				9.8			11.3	
ApproachLOS:	*			*				A			B	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #4 Glencoe/West Union

Cycle (sec): 100 Critical Vol./Cap. (X): 0.401
Loss Time (sec): 0 (Y+R = 4 sec) Average Delay (sec/veh): 10.0
Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	45	75	70	15	210	3	4	25	60	60	15	15
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	50	83	77	17	231	3	4	28	66	66	17	17
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	50	83	77	17	231	3	4	28	66	66	17	17
User 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
PHF Adj:	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
PHF Volume:	57	95	89	19	266	4	5	32	76	76	19	19
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	57	95	89	19	266	4	5	32	76	76	19	19
PCE 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
MLF 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
Final Vol.:	57	95	89	19	266	4	5	32	76	76	19	19
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.24	0.39	0.37	0.07	0.92	0.01	0.04	0.28	0.68	0.66	0.17	0.17
Final Sat.:	173	288	269	47	662	9	30	185	443	405	101	101
Capacity Analysis Module:												
Vol/Sat:	0.33	0.33	0.33	0.40	0.40	0.40	0.17	0.17	0.17	0.19	0.19	0.19
Crit Moves:		****			****			****			****	
Delay/Veh:	9.9	9.9	9.9	10.8	10.8	10.8	8.9	8.9	8.9	9.6	9.6	9.6
Delay 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
AdjDel/Veh:	9.9	9.9	9.9	10.8	10.8	10.8	8.9	8.9	8.9	9.6	9.6	9.6
LOS by Move:	A	A	A	B	B	B	A	A	A	A	A	A
ApproachDel:		9.9			10.8			8.9			9.6	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		9.9			10.8			8.9			9.6	
LOS by Appr:		A			B			A			A	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #5 Glencoe/Pacific

Average Delay (sec/veh): 1.4 Worst Case Level Of Service: C[15.8]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Uncontrolled				Uncontrolled				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.																
Base Vol:	20	180		5	2	305		5	2	0		40	2	3		1
Growth Adj:	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10
Initial Bse:	22	198		6	2	336		6	2	0		44	2	3		1
Added Vol:	0	0		0	0	0		0	0	0		0	0	0		0
PasserByVol:	0	0		0	0	0		0	0	0		0	0	0		0
Initial Fut:	22	198		6	2	336		6	2	0		44	2	3		1
User 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
PHF Adj:	0.80	0.80		0.80	0.80	0.80		0.80	0.80	0.80		0.80	0.80	0.80		0.80
PHF Volume:	28	248		7	3	419		7	3	0		55	3	4		1
Reduct Vol:	0	0		0	0	0		0	0	0		0	0	0		0
Final Vol.:	28	248		7	3	419		7	3	0		55	3	4		1
Critical Gap Module:																
Critical Gp:	4.1	xxxx	xxxxx		4.1	xxxx	xxxxx		7.1	xxxx		6.2	7.1	6.5		6.2
FollowUpTim:	2.2	xxxx	xxxxx		2.2	xxxx	xxxxx		3.5	xxxx		3.3	3.5	4.0		3.3
Capacity Module:																
Cnflict Vol:	426	xxxx	xxxxx		258	xxxx	xxxxx		748	xxxx		423	773	748		255
Potent Cap.:	1133	xxxx	xxxxx		1288	xxxx	xxxxx		324	xxxx		631	312	336		773
Move Cap.:	1133	xxxx	xxxxx		1288	xxxx	xxxxx		314	xxxx		631	279	327		773
Volume/Cap:	0.02	xxxx	xxxx		0.00	xxxx	xxxx		0.01	xxxx		0.09	0.01	0.01		0.00
Level Of Service Module:																
Queue:	0.1	xxxx	xxxxx		0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx			
Stopped Del:	8.3	xxxx	xxxxx		7.8	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx			
LOS by Move:	A	*	*		A	*	*	*	*	*	*	*	*			
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx	xxxx	602	xxxxx	xxxx	340	xxxxx			
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	xxxxx	0.3	xxxxx	xxxxx	0.1	xxxxx			
Shrd StpDel:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	xxxxx	11.6	xxxxx	xxxxx	15.8	xxxxx			
Shared LOS:	*	*	*		*	*	*	*	B	*	*	C	*			
ApproachDel:	xxxxxx				xxxxxx				11.6			15.8				
ApproachLOS:	*				*				B			C				

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #6 Glencoe/Highland

Average Delay (sec/veh): 5.9 Worst Case Level Of Service: E[37.4]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Uncontrolled				Uncontrolled				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Lanes:	1	0	0	1 0	1	0	0	1 0	0	1	0	0 1	0	0	1!	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.																
Base Vol:	70	200		5	20	305		20	15	3		135	40	3		10
Growth Adj:	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10
Initial Bse:	77	220		6	22	336		22	17	3		149	44	3		11
Added Vol:	0	0		0	0	0		0	0	0		0	0	0		0
PasserByVol:	0	0		0	0	0		0	0	0		0	0	0		0
Initial Fut:	77	220		6	22	336		22	17	3		149	44	3		11
User 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
PHF Adj:	0.86	0.86		0.86	0.86	0.86		0.86	0.86	0.86		0.86	0.86	0.86		0.86
PHF Volume:	90	256		6	26	390		26	19	4		173	51	4		13
Reduct Vol:	0	0		0	0	0		0	0	0		0	0	0		0
Final Vol.:	90	256		6	26	390		26	19	4		173	51	4		13
Critical Gap Module:																
Critical Gp:	4.1	xxxx	xxxxx		4.2	xxxx	xxxxx		7.2	6.6		6.3	7.1	6.5		6.2
FollowUpTim:	2.2	xxxx	xxxxx		2.3	xxxx	xxxxx		3.5	4.0		3.3	3.5	4.0		3.3
Capacity Module:																
Cnflict Vol:	416	xxxx	xxxxx		266	xxxx	xxxxx		913	908		403	994	918		263
Potent Cap.:	1133	xxxx	xxxxx		1257	xxxx	xxxxx		247	268		641	219	266		760
Move Cap.:	1133	xxxx	xxxxx		1257	xxxx	xxxxx		222	242		641	146	240		760
Volume/Cap:	0.08	xxxx	xxxx		0.02	xxxx	xxxx		0.09	0.02		0.27	0.35	0.02		0.02
Level Of Service Module:																
Queue:	0.3	xxxx	xxxxx		0.1	xxxx	xxxxx	xxxxx	xxxx		1.1	xxxxx	xxxx	xxxxx		
Stopped Del:	8.5	xxxx	xxxxx		7.9	xxxx	xxxxx	xxxxx	xxxx		12.7	xxxxx	xxxx	xxxxx		
LOS by Move:	A	*	*		A	*	*	*	*		B	*	*	*		
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx	xxxx	225	xxxx	xxxxx	xxxx	177	xxxxx		
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	xxxxx	0.3	xxxx	xxxxx	xxxxx	1.7	xxxxx		
Shrd StpDel:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx	xxxxx	22.8	xxxx	xxxxx	xxxxx	37.4	xxxxx		
Shared LOS:	*	*	*		*	*	*	C	*	*	*	E	*			
ApproachDel:	xxxxxx				xxxxxx				13.9			37.4				
ApproachLOS:	*				*				B			E				

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              Kittelson & Associates, Inc. -- Project #6953
              North Plains Residential -- City of Bend, Oregon
      Year 2015 Background Traffic Conditions, Weekday AM Peak Hour
---------------------------------------------------------------------------------

                  Level Of Service Computation Report
         2000 HCM Operations Method (Future Volume Alternative)
*********************************************************************************
Intersection #7 Glencoe/ORE 26 WB
*********************************************************************************
Cycle (sec):          60              Critical Vol./Cap. (X):        0.390
Loss Time (sec):      12 (Y+R =  4 sec) Average Delay (sec/veh):      14.0
Optimal Cycle:        33              Level Of Service:                  B
*********************************************************************************
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
-------------|----------------||----------------||----------------||----------------|
Control:         Protected        Protected       Split Phase      Split Phase
Rights:           Include          Include          Include           Ovl
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:        1  0  1  0  0   0  0  2  0  1   0  0  0  0  0   1  1  0  0  1
-------------|----------------||----------------||----------------||----------------|
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.
Base Vol:      35  175    0     0  425   55     0    0    0   370    3  145
Growth Adj:  1.10 1.10 1.10  1.10 1.10 1.10  1.10 1.10 1.10  1.10 1.10 1.10
Initial Bse:   39  193    0     0  468   61     0    0    0   407    3  160
Added Vol:      0    0    0     0    0    0     0    0    0     0    0    0
PasserByVol:    0    0    0     0    0    0     0    0    0     0    0    0
Initial Fut:   39  193    0     0  468   61     0    0    0   407    3  160
User 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
PHF Adj:     0.93 0.93 0.93  0.93 0.93 0.93  0.93 0.93 0.93  0.93 0.93 0.93
PHF Volume:    41  207    0     0  503   65     0    0    0   438    4  172
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:   41  207    0     0  503   65     0    0    0   438    4  172
PCE 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
MLF 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
Final Vol.:    41  207    0     0  503   65     0    0    0   438    4  172
-------------|----------------||----------------||----------------||----------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  0.91 0.96 1.00  1.00 0.90 0.81  1.00 1.00 1.00  0.82 0.82 0.82
Lanes:       1.00 1.00 0.00  0.00 2.00 1.00  0.00 0.00 0.00  1.98 0.02 1.00
Final Sat.:  1736 1828    0     0 3437 1537     0    0    0  3082   25 1554
-------------|----------------||----------------||----------------||----------------|
Capacity Analysis Module:
Vol/Sat:     0.02 0.11 0.00  0.00 0.15 0.04  0.00 0.00 0.00  0.14 0.14 0.11
Crit Moves:  ****                  ****                         ****
Green/Cycle: 0.06 0.44 0.00  0.00 0.37 0.37  0.00 0.00 0.00  0.36 0.36 0.36
Volume/Cap:  0.39 0.26 0.00  0.00 0.39 0.11  0.00 0.00 0.00  0.39 0.39 0.30
Delay/Veh:   29.5 10.9  0.0   0.0 13.9 12.3   0.0  0.0  0.0  14.4 14.4 13.9
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:  29.5 10.9  0.0   0.0 13.9 12.3   0.0  0.0  0.0  14.4 14.4 13.9
HCM2kAvg:       1    3    0     0    4    1     0    0    0     4    4    2
*********************************************************************************
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---------------------------------------------------------------------------------
              Kittelson & Associates, Inc. -- Project #6953
              North Plains Residential -- City of Bend, Oregon
      Year 2015 Background Traffic Conditions, Weekday AM Peak Hour
---------------------------------------------------------------------------------
              Level Of Service Detailed Computation Report
                       2000 HCM Operations Method
                       Future Volume Alternative
*********************************************************************************
Intersection #7 Glencoe/ORE 26 WB
*********************************************************************************
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R   L  -  T  -  R   L  -  T  -  R   L  -  T  -  R
-------------|----------------||----------------||----------------||----------------|
HCM Ops Adjusted Lane Utilization Module:
Lanes:        1  0  1  0  0   0  0  2  0  1   0  0  0  0  0   1  1  0  0  1
Lane Group:    L    T  xxxx  xxxx    T    R  xxxx xxxx xxxx    LT   LT    R
#LnsInGrps:    1    1    0     0    2    1     0    0    0     2    2    1
-------------|----------------||----------------||----------------||----------------|
HCM Ops Input Saturation Adj Module:
Lane Width:    12   12   12    12   12   12    12   12   12    12   12   12
CrosswalkWid        8               8               8               8
% Hev Veh:          4               5               0               4
Grade:             0%              0%              0%              0%
Parking/Hr:        No              No              No              No
Bus Stp/Hr:         0               0               0               0
Area Type:    < < < < < < < < < < < < < < Other > > > > > > > > > > > > > > >
Cnft Ped/Hr:        0               0               0               0
ExclusiveRT:     Include         Include         Include         Include
% RT Prtct:         0               0               0               0
-------------|----------------||----------------||----------------||----------------|
HCM Ops f(lt) Adj Case Module:
f(lt) Case:     1 xxxx xxxx  xxxx xxxx xxxx  xxxx xxxx xxxx    2r   2r xxxx
-------------|----------------||----------------||----------------||----------------|
HCM Ops Saturation Adj Module:
Ln Wid Adj:  1.00 1.00 xxxxx  xxxx 1.00 1.00  xxxx xxxx xxxxx  1.00 1.00 1.00
Hev Veh Adj: 0.96 0.96 xxxxx  xxxx 0.95 0.95  xxxx xxxx xxxxx  0.96 0.96 0.96
Grade Adj:   1.00 1.00 xxxxx  xxxx 1.00 1.00  xxxx xxxx xxxxx  1.00 1.00 1.00
Parking Adj: xxxx 1.00 xxxxx  xxxx xxxx 1.00  xxxx xxxx xxxxx  xxxx xxxx 1.00
Bus Stp Adj: xxxx 1.00 xxxxx  xxxx xxxx 1.00  xxxx xxxx xxxxx  xxxx xxxx 1.00
Area Adj:    1.00 1.00 xxxxx  xxxx 1.00 1.00  xxxx xxxx xxxxx  1.00 1.00 1.00
RT Adj:      xxxx xxxx xxxxx  xxxx xxxx 0.85  xxxx xxxx xxxxx  xxxx xxxx 0.85
LT Adj:      0.95 xxxx xxxxx  xxxx xxxx xxxxx xxxx xxxx xxxxx  0.85 0.85 xxxxx
PedBike 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
HCM Sat Adj: 0.91 0.96 1.00  1.00 0.95 0.81  1.00 1.00 1.00  0.82 0.82 0.82
Usr Sat 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
MLF Sat Adj: 1.00 1.00 1.00  1.00 0.95 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Fnl Sat Adj: 0.91 0.96 1.00  1.00 0.90 0.81  1.00 1.00 1.00  0.82 0.82 0.82
-------------|----------------||----------------||----------------||----------------|
Delay Adjustment Factor Module:
Coordinated: < < < < < < < < < < < < < < No   > > > > > > > > > > > > > > > >
Signal Type: < < < < < < < < < < < <    Actuated    > > > > > > > > > > > > > >
DelAdjFctr:  1.00 1.00 0.00  0.00 1.00 1.00  0.00 0.00 0.00  1.00 1.00 1.00
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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

****

Intersection #7 Glencoe/ORE 26 WB

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.06	0.44	0.00	0.00	0.37	0.37	0.00	0.00	0.00	0.36	0.36	0.36
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	0.7	2.2	0.0	0.0	3.1	0.7	0.0	0.0	0.0	3.2	3.2	2.0
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00
Q2:	0.6	0.3	0.0	0.0	0.6	0.1	0.0	0.0	0.0	0.6	0.6	0.4
HCM2kQueue:	1.3	2.5	0.0	0.0	3.7	0.8	0.0	0.0	0.0	3.8	3.8	2.5
70th%Factor:	1.20	1.19	1.20	1.20	1.19	1.20	1.20	1.20	1.20	1.19	1.19	1.19
70th%HCM2kQ:	1.6	3.0	0.0	0.0	4.4	1.0	0.0	0.0	0.0	4.6	4.6	3.0
85th%Factor:	1.59	1.58	1.60	1.60	1.57	1.59	1.60	1.60	1.60	1.56	1.56	1.58
85th%HCM2kQ:	2.1	4.0	0.0	0.0	5.8	1.3	0.0	0.0	0.0	6.0	6.0	3.9
90th%Factor:	1.77	1.75	1.80	1.80	1.73	1.78	1.80	1.80	1.80	1.73	1.73	1.75
90th%HCM2kQ:	2.3	4.5	0.0	0.0	6.4	1.5	0.0	0.0	0.0	6.6	6.6	4.3
95th%Factor:	2.06	2.02	2.10	2.10	1.99	2.07	2.10	2.10	2.10	1.98	1.98	2.02
95th%HCM2kQ:	2.7	5.1	0.0	0.0	7.4	1.7	0.0	0.0	0.0	7.6	7.6	5.0
98th%Factor:	2.61	2.52	2.70	2.70	2.45	2.64	2.70	2.70	2.70	2.44	2.44	2.53
98th%HCM2kQ:	3.4	6.4	0.0	0.0	9.1	2.2	0.0	0.0	0.0	9.4	9.4	6.3

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

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Intersection #8 Glencoe/OR 26 EB

****

Cycle (sec): 90 Critical Vol./Cap. (X): 0.458
Loss Time (sec): 12 (Y+R = 4 sec) Average Delay (sec/veh): 16.5
Optimal Cycle: 38 Level Of Service: B

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0 1	0 1	1	0 2	0 0	0	1 0	0 1	0	0 0	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	0	185	610	240	555	0	25	0	120	0	0	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	0	204	671	264	611	0	28	0	132	0	0	0
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	204	671	264	611	0	28	0	132	0	0	0
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.87	0.87	0.00	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
PHF Volume:	0	234	0	303	702	0	32	0	152	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	234	0	303	702	0	32	0	152	0	0	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	0	234	0	303	702	0	32	0	152	0	0	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.97	1.00	0.92	0.97	1.00	0.92	1.00	0.83	1.00	1.00	1.00
Lanes:	0.00	1.00	1.00	1.00	2.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Final Sat.:	0	1845	1900	1753	3690	0	1756	0	1568	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.13	0.00	0.17	0.19	0.00	0.02	0.00	0.10	0.00	0.00	0.00
Crit Moves:		****		****					****			
Green/Cycle:	0.00	0.28	0.00	0.38	0.66	0.00	0.21	0.00	0.21	0.00	0.00	0.00
Volume/Cap:	0.00	0.46	0.00	0.46	0.29	0.00	0.09	0.00	0.46	0.00	0.00	0.00
Delay/Veh:	0.0	27.6	0.0	21.5	6.7	0.0	28.6	0.0	32.0	0.0	0.0	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	27.6	0.0	21.5	6.7	0.0	28.6	0.0	32.0	0.0	0.0	0.0
HCM2kAvg:	0	6	0	7	4	0	1	0	4	0	0	0

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

Intersection #8 Glencoe/OR 26 EB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HCM Ops Adjusted Lane Utilization Module:												
Lanes:	0.0	1.0	1.0	1.0	2.0	0.0	0.1	0.0	1.0	0.0	0.0	0.0
Lane Group:	xxxx	T	R	L	T	xxxx	LT	LT	R	xxxx	xxxx	xxxx
#LnsInGrps:	0	1	1	1	2	0	1	1	1	0	0	0
HCM Ops Input Saturation Adj Module:												
Lane Width:	12	12	12	12	12	12	12	12	12	12	12	12
CrosswalkWid		8			8			8			8	
% Hev Veh:		3			3			3			0	
Grade:		0%			0%			0%			0%	
Parking/Hr:		No			No			No			No	
Bus Stp/Hr:		0			0			0			0	
Area Type:	< < < < < < < < < < < < < < < Other > > > > > > > > > > > > > > >											
Cnft Ped/Hr:		0			0			0			0	
ExclusiveRT:		Include			Include			Include			Include	
% RT Prtct:		0			0			0			0	
HCM Ops f(lt) Adj Case Module:												
f(lt) Case:	xxxx	xxxx	xxxx	1	xxxx	xxxx	4	xxxx	xxxx	xxxx	xxxx	xxxx
HCM Ops Saturation Adj Module:												
Ln Wid Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	xxxx	1.00	xxxx	xxxx	xxxxx
Hev Veh Adj:	xxxx	0.97	xxxxx	0.97	0.97	xxxxx	0.97	xxxx	0.97	xxxx	xxxx	xxxxx
Grade Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	xxxx	1.00	xxxx	xxxx	xxxxx
Parking Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Bus Stp Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Area Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	xxxx	1.00	xxxx	xxxx	xxxxx
RT Adj:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	0.85	xxxx	xxxx	xxxxx
LT Adj:	xxxx	xxxx	xxxxx	0.95	xxxx	xxxxx	0.95	xxxx	xxxxx	xxxx	xxxx	xxxxx
PedBike 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
HCM Sat Adj:	1.00	0.97	1.00	0.92	0.97	1.00	0.92	1.00	0.83	1.00	1.00	1.00
Usr Sat 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
MLF Sat 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
Fnl Sat Adj:	1.00	0.97	1.00	0.92	0.97	1.00	0.92	1.00	0.83	1.00	1.00	1.00
Delay Adjustment Factor Module:												
Coordinated:	< < < < < < < < < < < < < < < No > > > > > > > > > > > > > > >											
Signal Type:	< < < < < < < < < < < < < Actuated > > > > > > > > > > > > >											
DelAdjFctr:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

Intersection #8 Glencoe/OR 26 EB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.00	0.28	0.00	0.38	0.66	0.00	0.21	0.00	0.21	0.00	0.00	0.00
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	0.0	4.8	0.0	6.0	3.7	0.0	0.7	0.0	3.3	0.0	0.0	0.0
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Q2:	0.0	0.8	0.0	0.8	0.4	0.0	0.1	0.0	0.8	0.0	0.0	0.0
HCM2kQueue:	0.0	5.7	0.0	6.8	4.1	0.0	0.8	0.0	4.1	0.0	0.0	0.0
70th%Factor:	1.20	1.19	1.20	1.18	1.19	1.20	1.20	1.20	1.19	1.20	1.20	1.20
70th%HCM2kQ:	0.0	6.7	0.0	8.1	4.9	0.0	0.9	0.0	4.9	0.0	0.0	0.0
85th%Factor:	1.60	1.55	1.60	1.54	1.56	1.60	1.59	1.60	1.56	1.60	1.60	1.60
85th%HCM2kQ:	0.0	8.8	0.0	10.5	6.5	0.0	1.2	0.0	6.4	0.0	0.0	0.0
90th%Factor:	1.80	1.70	1.80	1.68	1.73	1.80	1.79	1.80	1.73	1.80	1.80	1.80
90th%HCM2kQ:	0.0	9.6	0.0	11.5	7.1	0.0	1.4	0.0	7.1	0.0	0.0	0.0
95th%Factor:	2.10	1.94	2.10	1.91	1.98	2.10	2.08	2.10	1.98	2.10	2.10	2.10
95th%HCM2kQ:	0.0	11.0	0.0	13.1	8.2	0.0	1.6	0.0	8.2	0.0	0.0	0.0
98th%Factor:	2.70	2.35	2.70	2.29	2.43	2.70	2.64	2.70	2.43	2.70	2.70	2.70
98th%HCM2kQ:	0.0	13.3	0.0	15.7	10.1	0.0	2.0	0.0	10.0	0.0	0.0	0.0

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

****

Intersection #9 Jackson School/West Union

****

Average Delay (sec/veh): 2.8 Worst Case Level Of Service: A[9.7]

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	1 0	0	1 0	0	0	1! 0	0	0	1! 0	0	0	1! 0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	5	4	4	25	1	20	3	80	5	2	60	10
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	6	4	4	28	1	22	3	88	6	2	66	11
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	6	4	4	28	1	22	3	88	6	2	66	11
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	6	5	5	31	1	24	4	98	6	2	73	12
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	6	5	5	31	1	24	4	98	6	2	73	12
Critical Gap Module:												
Critical Gp:	7.2	6.6	6.3	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	205	199	101	197	196	79	86	xxxx	xxxxx	104	xxxx	xxxxx
Potent Cap.:	746	692	946	757	696	975	1505	xxxx	xxxxx	1469	xxxx	xxxxx
Move Cap.:	724	689	946	747	693	975	1505	xxxx	xxxxx	1469	xxxx	xxxxx
Volume/Cap:	0.01	0.01	0.01	0.04	0.00	0.03	0.00	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	10.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx	7.5	xxxx	xxxxx
LOS by Move:	B	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	xxxx	797	xxxx	830	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	xxxx	0.0	xxxxx	0.2	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	9.6	xxxxx	9.7	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	A	*	A	*	*	*	*	*	*	*
ApproachDel:		9.7			9.7			xxxxxx			xxxxxx	
ApproachLOS:		A			A			*			*	

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Scenario Report

Scenario:	Default Scenario
Command:	Default Command
Volume:	Default Volume
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Paths
Routes:	Default Routes
Configuration:	Default Configuration

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 313/North	A	9.2	0.000	A	9.2	0.000	+ 0.000 D/V
# 2 309/North	A	9.7	0.000	A	9.7	0.000	+ 0.000 D/V
# 3 Glencoe/North	B	10.7	0.000	B	10.7	0.000	+ 0.000 D/V
# 4 Glencoe/West Union	B	11.3	0.528	B	11.3	0.528	+ 0.000 V/C
# 5 Glencoe/Pacific	C	15.8	0.000	C	15.8	0.000	+ 0.000 D/V
# 6 Glencoe/Highland	D	34.1	0.000	D	34.1	0.000	+ 0.000 D/V
# 7 Glencoe/ORE 26 WB	B	17.1	0.572	B	17.1	0.572	+ 0.000 D/V
# 8 Glencoe/OR 26 EB	B	10.1	0.407	B	10.1	0.407	+ 0.000 D/V
# 9 Jackson School/West Union	B	10.5	0.000	B	10.5	0.000	+ 0.000 D/V

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1 313/North

Average Delay (sec/veh): 0.5 Worst Case Level Of Service: A[9.2]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0	1! 0	0	0 0	0 0	0	0 0	0 1	0	0 1	0 0	0
Volume Module:												
Base Vol:	2	0	2	0	0	0	0	70	2	5	65	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	2	0	2	0	0	0	0	77	2	6	72	0
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	0	2	0	0	0	0	77	2	6	72	0
User 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
PHF Adj:	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
PHF Volume:	3	0	3	0	0	0	0	97	3	7	91	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	3	0	3	0	0	0	0	97	3	7	91	0
Critical Gap Module:												
Critical Gp:	6.4	xxxx	6.2	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx	3.3	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	203	xxxx	99	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	100	xxxx	xxxxx
Potent Cap.:	785	xxxx	957	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1492	xxxx	xxxxx
Move Cap.:	782	xxxx	957	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1492	xxxx	xxxxx
Volume/Cap:	0.00	xxxx	0.00	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	*	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	861	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.0	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx
Shrd StpDel:	xxxxx	9.2	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx
Shared LOS:	*	A	*	*	*	*	*	*	*	A	*	*
ApproachDel:		9.2			xxxxxx			xxxxxx			xxxxxx	
ApproachLOS:		A			*			*			*	

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North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 309/North

Average Delay (sec/veh): 1.4 Worst Case Level Of Service: A[9.7]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module:												
Base Vol:	2	2	2	5	2	5	5	65	5	2	65	5
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	2	2	2	6	2	6	6	72	6	2	72	6
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	2	2	6	2	6	6	72	6	2	72	6
User 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
PHF Adj:	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
PHF Volume:	3	3	3	7	3	7	7	92	7	3	92	7
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	3	3	3	7	3	7	7	92	7	3	92	7
Critical Gap Module:												
Critical Gp:	7.1	6.5	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	215	214	95	213	214	95	99	xxxx	xxxxx	99	xxxx	xxxxx
Potent Cap.:	746	687	967	748	687	967	1494	xxxx	xxxxx	1494	xxxx	xxxxx
Move Cap.:	734	683	967	740	683	967	1494	xxxx	xxxxx	1494	xxxx	xxxxx
Volume/Cap:	0.00	0.00	0.00	0.01	0.00	0.01	0.00	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx	7.4	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	777	xxxxx	xxxx	808	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.0	xxxxx	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	9.7	xxxxx	xxxxx	9.6	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	A	*	*	A	*	*	*	*	*	*	*
ApproachDel:		9.7			9.6			xxxxxx			xxxxxx	
ApproachLOS:		A			A			*			*	

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North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Glencoe/North

Average Delay (sec/veh): 4.0 Worst Case Level Of Service: B[10.7]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	65	95	2	2	50	10	10	2	55	2	2	2
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	72	105	2	2	55	11	11	2	61	2	2	2
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	72	105	2	2	55	11	11	2	61	2	2	2
User 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
PHF Adj:	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PHF Volume:	74	109	2	2	57	11	11	2	63	2	2	2
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	74	109	2	2	57	11	11	2	63	2	2	2
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.1	6.5	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	69	xxxx	xxxxx	111	xxxx	xxxxx	329	328	63	359	332	110
Potent Cap.:	1532	xxxx	xxxxx	1454	xxxx	xxxxx	624	591	1002	596	587	943
Move Cap.:	1532	xxxx	xxxxx	1454	xxxx	xxxxx	596	560	1002	535	557	943
Volume/Cap:	0.05	xxxx	xxxx	0.00	xxxx	xxxx	0.02	0.00	0.06	0.00	0.00	0.00
Level Of Service Module:												
Queue:	0.2	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	7.5	xxxx	xxxxx	7.5	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	890	xxxxx	xxxx	635	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	0.3	xxxxx	xxxxx	0.0	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	9.4	xxxxx	xxxxx	10.7	xxxxx
Shared LOS:	*	*	*	*	*	*	*	A	*	*	B	*
ApproachDel:	xxxxxx			xxxxxx				9.4			10.7	
ApproachLOS:	*			*				A			B	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #4 Glencoe/West Union

Cycle (sec): 100 Critical Vol./Cap. (X): 0.528
Loss Time (sec): 0 (Y+R = 4 sec) Average Delay (sec/veh): 11.3
Optimal Cycle: 0 Level Of Service: B

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	95	155	50	15	110	2	15	30	75	80	30	20
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	105	171	55	17	121	2	17	33	83	88	33	22
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	105	171	55	17	121	2	17	33	83	88	33	22
User 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
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	117	192	62	19	136	2	19	37	93	99	37	25
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	117	192	62	19	136	2	19	37	93	99	37	25
PCE 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
MLF 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
Final Vol.:	117	192	62	19	136	2	19	37	93	99	37	25
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.31	0.52	0.17	0.12	0.87	0.01	0.13	0.25	0.62	0.62	0.23	0.15
Final Sat.:	222	363	117	75	553	10	79	158	396	366	137	92
Capacity Analysis Module:												
Vol/Sat:	0.53	0.53	0.53	0.25	0.25	0.25	0.23	0.23	0.23	0.27	0.27	0.27
Crit Moves:		****		****					****		****	
Delay/Veh:	13.0	13.0	13.0	9.8	9.8	9.8	9.6	9.6	9.6	10.4	10.4	10.4
Delay 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
AdjDel/Veh:	13.0	13.0	13.0	9.8	9.8	9.8	9.6	9.6	9.6	10.4	10.4	10.4
LOS by Move:	B	B	B	A	A	A	A	A	A	B	B	B
ApproachDel:		13.0			9.8			9.6			10.4	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		13.0			9.8			9.6			10.4	
LOS by Appr:		B			A			A			B	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #5 Glencoe/Pacific

Average Delay (sec/veh): 1.4 Worst Case Level Of Service: C[15.8]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	35	295	2	2	275	5	2	2	35	5	2	5
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	39	325	2	2	303	6	2	2	39	6	2	6
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	39	325	2	2	303	6	2	2	39	6	2	6
User 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
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	41	345	2	2	322	6	2	2	41	6	2	6
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	41	345	2	2	322	6	2	2	41	6	2	6
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx	7.1	6.5	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	328	xxxx	xxxxx	367	xxxx	xxxxx	805	802	325	824	804	366
Potent Cap.:	1232	xxxx	xxxxx	1127	xxxx	xxxxx	284	300	716	276	299	642
Move Cap.:	1232	xxxx	xxxxx	1127	xxxx	xxxxx	272	289	716	252	289	642
Volume/Cap:	0.03	xxxx	xxxx	0.00	xxxx	xxxx	0.01	0.01	0.06	0.02	0.01	0.01
Level Of Service Module:												
Queue:	0.1	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	8.0	xxxx	xxxxx	8.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	618	xxxxx	xxxx	347	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	0.2	xxxxx	xxxxx	0.1	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	11.3	xxxxx	xxxxx	15.8	xxxxx
Shared LOS:	*	*	*	*	*	*	*	B	*	*	C	*
ApproachDel:	xxxxxx			xxxxxx			11.3			15.8		
ApproachLOS:	*			*			B			C		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #6 Glencoe/Highland

Average Delay (sec/veh): 6.0 Worst Case Level Of Service: D[34.1]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	1 0 0 1 0			1 0 0 1 0			0 1 0 0 1			0 0 1! 0 0		
Volume Module:												
Base Vol:	75	300	10	15	260	20	20	2	95	55	2	30
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	83	330	11	17	286	22	22	2	105	61	2	33
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	83	330	11	17	286	22	22	2	105	61	2	33
User 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
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	88	351	12	18	304	23	23	2	111	64	2	35
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	88	351	12	18	304	23	23	2	111	64	2	35
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.2	6.6	6.3	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	328	xxxx	xxxxx	383	xxxx	xxxxx	954	940	316	994	946	377
Potent Cap.:	1221	xxxx	xxxxx	1091	xxxx	xxxxx	223	247	718	210	245	629
Move Cap.:	1221	xxxx	xxxxx	1091	xxxx	xxxxx	195	225	718	164	224	629
Volume/Cap:	0.07	xxxx	xxxx	0.02	xxxx	xxxx	0.12	0.01	0.15	0.39	0.01	0.06
Level Of Service Module:												
Queue:	0.2	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	0.5	xxxxx	xxxx	xxxxx
Stopped Del:	8.2	xxxx	xxxxx	8.4	xxxx	xxxxx	xxxxx	xxxx	10.9	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	B	*	*	*
Movement:	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT	LT	- LTR	- RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	197	xxxx	xxxxx	xxxx	223	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.4	xxxx	xxxxx	xxxxx	2.2	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	26.0	xxxx	xxxxx	xxxxx	34.1	xxxxx
Shared LOS:	*	*	*	*	*	*	D	*	*	*	D	*
ApproachDel:	xxxxxx			xxxxxx			13.8			34.1		
ApproachLOS:	*			*			B			D		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #7 Glencoe/ORE 26 WB

Cycle (sec): 60 Critical Vol./Cap. (X): 0.572
Loss Time (sec): 12 (Y+R = 4 sec) Average Delay (sec/veh): 17.1
Optimal Cycle: 42 Level Of Service: B

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
Control:	Protected				Protected				Split Phase				Split Phase			
Rights:		Include				Include				Include				Ovl		
Min. Green:	0	0	0		0	0	0		0	0	0		0	0	0	
Lanes:	1	0 1	0	0	0	0 2	0	1	0	0 0	0	0	1	1 0	0	1
Volume Module:																
Base Vol:	155	215	0		0	330	80		0	0	0		585	2	230	
Growth Adj:	1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10	
Initial Bse:	171	237	0		0	363	88		0	0	0		644	2	253	
Added Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	171	237	0		0	363	88		0	0	0		644	2	253	
User 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	
PHF Adj:	0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90	
PHF Volume:	189	263	0		0	403	98		0	0	0		715	2	281	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Reduced Vol:	189	263	0		0	403	98		0	0	0		715	2	281	
PCE 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	
MLF 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	
Final Vol.:	189	263	0		0	403	98		0	0	0		715	2	281	
Saturation Flow Module:																
Sat/Lane:	1900	1900	1900		1900	1900	1900		1900	1900	1900		1900	1900	1900	
Adjustment:	0.91	0.96	1.00		1.00	0.90	0.81		1.00	1.00	1.00		0.82	0.82	0.82	
Lanes:	1.00	1.00	0.00		0.00	2.00	1.00		0.00	0.00	0.00		1.99	0.01	1.00	
Final Sat.:	1736	1828	0		0	3437	1537		0	0	0		3097	11	1554	
Capacity Analysis Module:																
Vol/Sat:	0.11	0.14	0.00		0.00	0.12	0.06		0.00	0.00	0.00		0.23	0.23	0.18	
Crit Moves:	****					****							****			
Green/Cycle:	0.19	0.40	0.00		0.00	0.21	0.21		0.00	0.00	0.00		0.40	0.40	0.40	
Volume/Cap:	0.57	0.36	0.00		0.00	0.57	0.31		0.00	0.00	0.00		0.57	0.57	0.45	
Delay/Veh:	24.4	13.1	0.0		0.0	22.6	20.8		0.0	0.0	0.0		14.5	14.5	13.5	
User DelAdj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
AdjDel/Veh:	24.4	13.1	0.0		0.0	22.6	20.8		0.0	0.0	0.0		14.5	14.5	13.5	
HCM2kAvg:	4	4	0		0	4	2		0	0	0		7	7	4	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	- T	- R		L	- T	- R		L	- T	- R		L	- T	- R	
HCM Ops Adjusted Lane Utilization Module:																
Lanes:	1	0 1	0	0	0	0 2	0	1	0	0 0	0	0	1	1 0	0	1
Lane Group:	L	T	xxxx		xxxx	T	R		xxxx	xxxx	xxxx		LT	LT	R	
#LnsInGrps:	1	1	0		0	2	1		0	0	0		2	2	1	
HCM Ops Input Saturation Adj Module:																
Lane Width:	12	12	12		12	12	12		12	12	12		12	12	12	
CrosswalkWid		8				8				8				8		
% Hev Veh:		4				5				0				4		
Grade:		0%				0%				0%				0%		
Parking/Hr:		No				No				No				No		
Bus Stp/Hr:		0				0				0				0		
Area Type:	< < < < < < < < < < < < < < <								Other				> > > > > > > > > > > > > > >			
Cnft Ped/Hr:		0				0				0				0		
ExclusiveRT:		Include				Include				Include				Include		
% RT Prtct:		0				0				0				0		
NCM Ops f(lt) Adj Case Module:																
f(lt) Case:	1	xxxx	xxxx		xxxx	xxxx	xxxx		xxxx	xxxx	xxxx		2r	2r	xxxx	
NCM Ops Saturation Adj Module:																
Ln Wid Adj:	1.00	1.00	xxxxx		xxxx	1.00	1.00		xxxx	xxxx	xxxxx		1.00	1.00	1.00	
Hev Veh Adj:	0.96	0.96	xxxxx		xxxx	0.95	0.95		xxxx	xxxx	xxxxx		0.96	0.96	0.96	
Grade Adj:	1.00	1.00	xxxxx		xxxx	1.00	1.00		xxxx	xxxx	xxxxx		1.00	1.00	1.00	
Parking Adj:	xxxx	1.00	xxxxx		xxxx	xxxx	1.00		xxxx	xxxx	xxxxx		xxxx	xxxx	1.00	
Bus Stp Adj:	xxxx	1.00	xxxxx		xxxx	xxxx	1.00		xxxx	xxxx	xxxxx		xxxx	xxxx	1.00	
Area Adj:	1.00	1.00	xxxxx		xxxx	1.00	1.00		xxxx	xxxx	xxxxx		1.00	1.00	1.00	
RT Adj:	xxxx	xxxx	xxxxx		xxxx	xxxx	0.85		xxxx	xxxx	xxxxx		xxxx	xxxx	0.85	
LT Adj:	0.95	xxxx	xxxxx		xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		0.85	0.85	xxxxx	
PedBike 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	
HCM Sat Adj:	0.91	0.96	1.00		1.00	0.95	0.81		1.00	1.00	1.00		0.82	0.82	0.82	
Usr Sat 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	
MLF Sat Adj:	1.00	1.00	1.00		1.00	0.95	1.00		1.00	1.00	1.00		1.00	1.00	1.00	
Fnl Sat Adj:	0.91	0.96	1.00		1.00	0.90	0.81		1.00	1.00	1.00		0.82	0.82	0.82	
Delay Adjustment Factor Module:																
Coordinated:	< < < < < < < < < < < < < < <								No				> > > > > > > > > > > > > > >			
Signal Type:	< < < < < < < < < < < <								Actuated				> > > > > > > > > > > >			
DelAdjFctr:	1.00	1.00	0.00		0.00	1.00	1.00		0.00	0.00	0.00		1.00	1.00	1.00	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

****

Intersection #7 Glencoe/ORE 26 WB

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Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.19	0.40	0.00	0.00	0.21	0.21	0.00	0.00	0.00	0.40	0.40	0.40
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	3.0	3.1	0.0	0.0	3.0	1.4	0.0	0.0	0.0	5.5	5.5	3.4
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00
Q2:	1.3	0.6	0.0	0.0	1.3	0.4	0.0	0.0	0.0	1.3	1.3	0.8
HCM2kQueue:	4.3	3.7	0.0	0.0	4.3	1.8	0.0	0.0	0.0	6.7	6.7	4.2
70th%Factor:	1.19	1.19	1.20	1.20	1.19	1.20	1.20	1.20	1.20	1.18	1.18	1.19
70th%HCM2kQ:	5.1	4.4	0.0	0.0	5.1	2.2	0.0	0.0	0.0	8.0	8.0	5.0
85th%Factor:	1.56	1.57	1.60	1.60	1.56	1.58	1.60	1.60	1.60	1.54	1.54	1.56
85th%HCM2kQ:	6.7	5.7	0.0	0.0	6.7	2.9	0.0	0.0	0.0	10.4	10.4	6.6
90th%Factor:	1.72	1.73	1.80	1.80	1.72	1.77	1.80	1.80	1.80	1.69	1.69	1.72
90th%HCM2kQ:	7.4	6.3	0.0	0.0	7.4	3.2	0.0	0.0	0.0	11.4	11.4	7.3
95th%Factor:	1.97	1.99	2.10	2.10	1.97	2.04	2.10	2.10	2.10	1.91	1.91	1.97
95th%HCM2kQ:	8.4	7.3	0.0	0.0	8.4	3.7	0.0	0.0	0.0	12.9	12.9	8.3
98th%Factor:	2.42	2.46	2.70	2.70	2.42	2.57	2.70	2.70	2.70	2.30	2.30	2.42
98th%HCM2kQ:	10.3	9.0	0.0	0.0	10.4	4.7	0.0	0.0	0.0	15.5	15.5	10.2

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

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Intersection #8 Glencoe/OR 26 EB

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Cycle (sec): 90 Critical Vol./Cap. (X): 0.407
Loss Time (sec): 12 (Y+R = 4 sec) Average Delay (sec/veh): 10.1
Optimal Cycle: 35 Level Of Service: B

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Ignore			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1	0	1	1	0	2	0	0	0	1	0	0	0	0	0
Volume Module:												
Base Vol:	0	350	340	145	770	0	20	2	45	0	0	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	0	385	374	160	847	0	22	2	50	0	0	0
Added Vol:	0	0	0	0	0	0	0	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	0	385	374	160	847	0	22	2	50	0	0	0
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PHF Adj:	0.94	0.94	0.00	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	0	410	0	170	901	0	23	2	53	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	0	410	0	170	901	0	23	2	53	0	0	0
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Final Vol.:	0	410	0	170	901	0	23	2	53	0	0	0
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	1.00	0.97	1.00	0.92	0.92	1.00	0.83	0.83	0.83	1.00	1.00	1.00
Lanes:	0.00	1.00	1.00	1.00	2.00	0.00	0.91	0.09	1.00	0.00	0.00	0.00
Final Sat.:	0	1845	1900	1753	3505	0	1426	143	1568	0	0	0
Capacity Analysis Module:												
Vol/Sat:	0.00	0.22	0.00	0.10	0.26	0.00	0.02	0.02	0.03	0.00	0.00	0.00
Crit Moves:		****		****					****			
Green/Cycle:	0.00	0.55	0.00	0.24	0.78	0.00	0.08	0.08	0.08	0.00	0.00	0.00
Volume/Cap:	0.00	0.41	0.00	0.41	0.33	0.00	0.20	0.20	0.41	0.00	0.00	0.00
Delay/Veh:	0.0	12.2	0.0	29.6	2.9	0.0	39.3	39.3	41.3	0.0	0.0	0.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	0.0	12.2	0.0	29.6	2.9	0.0	39.3	39.3	41.3	0.0	0.0	0.0
HCM2kAvg:	0	7	0	4	4	0	1	1	2	0	0	0

****

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

Intersection #8 Glencoe/OR 26 EB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HCM Ops Adjusted Lane Utilization Module:												
Lanes:	0	0 1.0	1.0	1.0	2.0	0.0	0.1	0.0	1.0	0.0	0.0	0.0
Lane Group:	xxxx	T	R	L	T	xxxx	LT	LT	R	xxxx	xxxx	xxxx
#LnsInGrps:	0	1	1	1	2	0	1	1	1	0	0	0
HCM Ops Input Saturation Adj Module:												
Lane Width:	12	12	12	12	12	12	12	12	12	12	12	12
CrosswalkWid		8			8			8			8	
% Hev Veh:		3			3			3			0	
Grade:		0%			0%			0%			0%	
Parking/Hr:		No			No			No			No	
Bus Stp/Hr:		0			0			0			0	
Area Type:	< < < < < < < < < < < < < < < < < < < < < Other >											
Cnft Ped/Hr:		0			0			0			0	
ExclusiveRT:		Include			Include			Include			Include	
% RT Prtct:		0			0			0			0	
HCM Ops f(lt) Adj Case Module:												
f(lt) Case:	xxxx	xxxx	xxxx	1	xxxx	xxxx	2r	2r	xxxx	xxxx	xxxx	xxxx
HCM Ops Saturation Adj Module:												
Ln Wid Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	1.00	1.00	xxxx	xxxx	xxxxx
Hev Veh Adj:	xxxx	0.97	xxxxx	0.97	0.97	xxxxx	0.97	0.97	0.97	xxxx	xxxx	xxxxx
Grade Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	1.00	1.00	xxxx	xxxx	xxxxx
Parking Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Bus Stp Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Area Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	1.00	1.00	xxxx	xxxx	xxxxx
RT Adj:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	0.85	xxxx	xxxx	xxxxx
LT Adj:	xxxx	xxxx	xxxxx	0.95	xxxx	xxxxx	0.85	0.85	xxxxx	xxxx	xxxx	xxxxx
PedBike 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
HCM Sat Adj:	1.00	0.97	1.00	0.92	0.97	1.00	0.83	0.83	0.83	1.00	1.00	1.00
Usr Sat 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
MLF Sat Adj:	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fnl Sat Adj:	1.00	0.97	1.00	0.92	0.92	1.00	0.83	0.83	0.83	1.00	1.00	1.00
Delay Adjustment Factor Module:												
Coordinated:	< < < < < < < < < < < < < < < < < < < < < No >											
Signal Type:	< < < < < < < < < < < < < < < < < < < < < Actuated >											
DelAdjFctr:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

Intersection #8 Glencoe/OR 26 EB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.00	0.55	0.00	0.24	0.78	0.00	0.08	0.08	0.08	0.00	0.00	0.00
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	0.0	6.0	0.0	3.8	3.3	0.0	0.7	0.7	1.2	0.0	0.0	0.0
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00
Q2:	0.0	0.7	0.0	0.7	0.5	0.0	0.2	0.2	0.6	0.0	0.0	0.0
HCM2kQueue:	0.0	6.7	0.0	4.4	3.8	0.0	1.0	1.0	1.9	0.0	0.0	0.0
70th%Factor:	1.20	1.18	1.20	1.19	1.19	1.20	1.20	1.20	1.20	1.20	1.20	1.20
70th%HCM2kQ:	0.0	7.9	0.0	5.3	4.5	0.0	1.1	1.1	2.3	0.0	0.0	0.0
85th%Factor:	1.60	1.54	1.60	1.56	1.56	1.60	1.59	1.59	1.58	1.60	1.60	1.60
85th%HCM2kQ:	0.0	10.3	0.0	6.9	5.9	0.0	1.5	1.5	3.0	0.0	0.0	0.0
90th%Factor:	1.80	1.69	1.80	1.72	1.73	1.80	1.78	1.78	1.76	1.80	1.80	1.80
90th%HCM2kQ:	0.0	11.2	0.0	7.6	6.5	0.0	1.7	1.7	3.3	0.0	0.0	0.0
95th%Factor:	2.10	1.91	2.10	1.97	1.99	2.10	2.07	2.07	2.04	2.10	2.10	2.10
95th%HCM2kQ:	0.0	12.7	0.0	8.7	7.5	0.0	2.0	2.0	3.9	0.0	0.0	0.0
98th%Factor:	2.70	2.30	2.70	2.41	2.45	2.70	2.63	2.63	2.56	2.70	2.70	2.70
98th%HCM2kQ:	0.0	15.3	0.0	10.7	9.2	0.0	2.5	2.5	4.9	0.0	0.0	0.0

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Background Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

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Intersection #9 Jackson School/West Union

****

Average Delay (sec/veh): 3.0 Worst Case Level Of Service: B[10.5]

****

Approach:	North Bound						South Bound						East Bound						West Bound					
Movement:	L	-	T	-	R		L	-	T	-	R		L	-	T	-	R		L	-	T	-	R	
Control:	Stop Sign						Stop Sign						Uncontrolled						Uncontrolled					
Rights:	Include						Include						Include						Include					
Lanes:	1	0	0	1	0		0	0	1!	0	0		0	0	1!	0	0		0	0	1!	0	0	
Volume Module:																								
Base Vol:	10	25	5				10	5	5				10	80	2				5	85	5			
Growth Adj:	1.10	1.10	1.10				1.10	1.10	1.10				1.10	1.10	1.10				1.10	1.10	1.10			
Initial Bse:	11	28	6				11	6	6				11	88	2				6	94	6			
Added Vol:	0	0	0				0	0	0				0	0	0				0	0	0			
PasserByVol:	0	0	0				0	0	0				0	0	0				0	0	0			
Initial Fut:	11	28	6				11	6	6				11	88	2				6	94	6			
User 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			
PHF Adj:	0.91	0.91	0.91				0.91	0.91	0.91				0.91	0.91	0.91				0.91	0.91	0.91			
PHF Volume:	12	30	6				12	6	6				12	97	2				6	103	6			
Reduct Vol:	0	0	0				0	0	0				0	0	0				0	0	0			
Final Vol.:	12	30	6				12	6	6				12	97	2				6	103	6			
Critical Gap Module:																								
Critical Gp:	7.2	6.6	6.3				7.1	6.5	6.2				4.1	xxxx	xxxxx				4.1	xxxx	xxxxx			
FollowUpTim:	3.5	4.0	3.3				3.5	4.0	3.3				2.2	xxxx	xxxxx				2.2	xxxx	xxxxx			
Capacity Module:																								
Cnflict Vol:	246	243	98				258	241	106				109	xxxx	xxxxx				99	xxxx	xxxxx			
Potent Cap.:	702	654	950				691	657	943				1475	xxxx	xxxxx				1475	xxxx	xxxxx			
Move Cap.:	686	646	950				656	649	943				1475	xxxx	xxxxx				1475	xxxx	xxxxx			
Volume/Cap:	0.02	0.05	0.01				0.02	0.01	0.01				0.01	xxxx	xxxx				0.00	xxxx	xxxx			
Level Of Service Module:																								
Queue:	0.1	xxxx	xxxxx				xxxxx	xxxx	xxxxx				0.0	xxxx	xxxxx				0.0	xxxx	xxxxx			
Stopped Del:	10.3	xxxx	xxxxx				xxxxx	xxxx	xxxxx				7.5	xxxx	xxxxx				7.5	xxxx	xxxxx			
LOS by Move:	B	*	*				*	*	*				A	*	*				A	*	*			
Movement:	LT	-	LTR	-	RT		LT	-	LTR	-	RT		LT	-	LTR	-	RT		LT	-	LTR	-	RT	
Shared Cap.:	xxxx	xxxx	682				xxxx	708	xxxxx				xxxx	xxxx	xxxxx				xxxx	xxxx	xxxxx			
SharedQueue:	xxxxx	xxxx	0.2				xxxxx	0.1	xxxxx				xxxxx	xxxx	xxxxx				xxxxx	xxxx	xxxxx			
Shrd StpDel:	xxxxx	xxxx	10.6				xxxxx	10.3	xxxxx				xxxxx	xxxx	xxxxx				xxxxx	xxxx	xxxxx			
Shared LOS:	*	*	B				*	B	*				*	*	*				*	*	*			
ApproachDel:		10.5						10.3						xxxxxx						xxxxxx				
ApproachLOS:		B						B						*						*				

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Appendix E

Year 2015 Total Traffic
Level-of-Service
Worksheets

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Scenario Report

Scenario:	Default Scenario
Command:	Default Command
Volume:	Default Volume
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Paths
Routes:	Default Routes
Configuration:	Default Configuration

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 313/North	B	10.1	0.000	C	17.1	0.000	+ 7.025 D/V
# 2 309/North	A	9.8	0.000	B	13.7	0.000	+ 3.900 D/V
# 3 Glencoe/North	B	11.3	0.000	C	16.2	0.000	+ 4.939 D/V
# 4 Glencoe/West Union	B	10.0	0.401	D	30.8	0.942	+ 0.541 V/C
# 5 Glencoe/Pacific	C	15.8	0.000	D	28.9	0.000	+13.087 D/V
# 6 Glencoe/Highland	E	37.4	0.000	F	177.4	0.000	+139.957 D/V
# 7 Glencoe/ORE 26 WB	B	14.0	0.390	B	13.8	0.456	-0.220 D/V
# 8 Glencoe/OR 26 EB	B	16.9	0.385	B	16.6	0.465	-0.317 D/V
# 9 Jackson School/West Union	A	9.7	0.000	B	10.6	0.000	+ 0.886 D/V
# 10 NW West Union Road Access Dwy	A	0.0	0.000	B	12.1	0.000	+12.101 D/V
# 11 NW Jackson School Road Site Ac	A	0.0	0.000	A	9.1	0.000	+ 9.130 D/V

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #1 313/North

Average Delay (sec/veh): 7.9 Worst Case Level Of Service: C[17.1]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0	1! 0	0	1 0	0 1	0	0 0	1! 0	0	0 0	1! 0	0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	15	0	5	0	0	0	0	90	5	5	75	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	17	0	6	0	0	0	0	99	6	6	83	0
Added Vol:	0	3	0	211	4	11	3	0	0	0	0	84
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	17	3	6	211	4	11	3	99	6	6	83	84
User 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
PHF Adj:	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
PHF Volume:	24	4	8	306	6	16	4	143	8	8	120	122
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	24	4	8	306	6	16	4	143	8	8	120	122
Critical Gap Module:												
Critical Gp:	7.1	6.5	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	363	413	147	359	357	180	241	xxxx	xxxxx	151	xxxx	xxxxx
Potent Cap.:	593	529	899	601	573	867	1325	xxxx	xxxxx	1429	xxxx	xxxxx
Move Cap.:	573	524	899	587	568	867	1325	xxxx	xxxxx	1429	xxxx	xxxxx
Volume/Cap:	0.04	0.01	0.01	0.52	0.01	0.02	0.00	xxxx	xxxx	0.01	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	3.0	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	17.6	xxxx	xxxxx	7.7	xxxx	xxxxx	7.5	xxxx	xxxxx
LOS by Move:	*	*	*	C	*	*	A	*	*	A	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	615	xxxxx	xxxx	xxxx	760	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.2	xxxxx	xxxxx	xxxx	0.1	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	11.2	xxxxx	xxxxx	xxxx	9.9	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	B	*	*	*	A	*	*	*	*	*	*
ApproachDel:		11.2			17.1			xxxxxx			xxxxxx	
ApproachLOS:		B			C			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #1 313/North

Approach:	North Bound	South Bound	East Bound	West Bound
Movement:	L - T - R	L - T - R	L - T - R	L - T - R
HevVeh:	2%	0%	2%	2%
Grade:	0%	0%	0%	0%
Peds/Hour:	0	0	0	0
Pedestrian Walk Speed: 4.00 feet/sec				
LaneWidth:	12 feet	12 feet	12 feet	12 feet
Time Period: 0.25 hour				

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

****

Intersection #2 309/North

****

Average Delay (sec/veh): 0.9 Worst Case Level Of Service: B[13.7]

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	3	0	1	10	1	10	3	90	2	2	60	5
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	3	0	1	11	1	11	3	99	2	2	66	6
Added Vol:	4	0	0	0	0	0	0	205	6	0	80	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	7	0	1	11	1	11	3	304	8	2	146	6
User 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
PHF Adj:	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
PHF Volume:	9	0	1	14	1	14	4	390	11	3	187	7
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	9	0	1	14	1	14	4	390	11	3	187	7
Critical Gap Module:												
Critical Gp:	7.1	xxxx	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	608	xxxx	395	601	605	191	194	xxxx	xxxxx	400	xxxx	xxxxx
Potent Cap.:	411	xxxx	659	415	415	856	1379	xxxx	xxxxx	1158	xxxx	xxxxx
Move Cap.:	401	xxxx	659	413	412	856	1379	xxxx	xxxxx	1158	xxxx	xxxxx
Volume/Cap:	0.02	xxxx	0.00	0.03	0.00	0.02	0.00	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.6	xxxx	xxxxx	8.1	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	423	xxxxx	xxxx	548	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.1	xxxxx	xxxxx	0.2	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	13.7	xxxxx	xxxxx	11.9	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	B	*	*	B	*	*	*	*	*	*	*
ApproachDel:		13.7			11.9			xxxxxx			xxxxxx	
ApproachLOS:		B			B			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

****

Intersection #2 309/North

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	0%			0%			2%			2%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		

Time Period: 0.25 hour

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Glencoe/North

Average Delay (sec/veh): 7.5 Worst Case Level Of Service: C[16.2]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	35	40	1	2	110	25	5	1	95	3	5	1
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	39	44	1	2	121	28	6	1	105	3	6	1
Added Vol:	79	6	0	0	8	1	1	0	204	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	118	50	1	2	129	29	7	1	309	3	6	1
User 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
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	132	56	1	2	145	32	7	1	347	4	6	1
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	132	56	1	2	145	32	7	1	347	4	6	1
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.1	6.5	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	177	xxxx	xxxxx	57	xxxx	xxxxx	490	487	161	661	503	57
Potent Cap.:	1399	xxxx	xxxxx	1522	xxxx	xxxxx	488	481	884	376	471	1010
Move Cap.:	1399	xxxx	xxxxx	1522	xxxx	xxxxx	444	431	884	210	422	1010
Volume/Cap:	0.09	xxxx	xxxx	0.00	xxxx	xxxx	0.02	0.00	0.39	0.02	0.01	0.00
Level Of Service Module:												
Queue:	0.3	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	7.8	xxxx	xxxxx	7.4	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	863	xxxxx	xxxx	332	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	2.0	xxxxx	xxxxx	0.1	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	12.1	xxxxx	xxxxx	16.2	xxxxx
Shared LOS:	*	*	*	*	*	*	*	B	*	*	C	*
ApproachDel:	xxxxxx			xxxxxx			12.1			16.2		
ApproachLOS:	*			*			B			C		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #3 Glencoe/North

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	2%			6%			2%			2%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		
Time Period: 0.25 hour												

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #4 Glencoe/West Union

Cycle (sec): 100 Critical Vol./Cap. (X): 0.942
Loss Time (sec): 0 (Y+R = 4 sec) Average Delay (sec/veh): 30.8
Optimal Cycle: 0 Level Of Service: D

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1! 0	0	0	1! 0	0	0	1! 0	0	0	1! 0	0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	45	75	70	15	210	3	4	25	60	60	15	15
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	50	83	77	17	231	3	4	28	66	66	17	17
Added Vol:	0	62	77	43	168	1	2	42	0	84	36	21
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	50	145	154	60	399	4	6	70	66	150	53	38
User 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
PHF Adj:	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
PHF Volume:	57	166	177	68	459	5	7	80	76	172	60	43
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	57	166	177	68	459	5	7	80	76	172	60	43
PCE 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
MLF 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
Final Vol.:	57	166	177	68	459	5	7	80	76	172	60	43
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.14	0.42	0.44	0.13	0.86	0.01	0.04	0.49	0.47	0.62	0.22	0.16
Final Sat.:	78	226	241	73	487	5	20	219	208	295	103	74
Capacity Analysis Module:												
Vol/Sat:	0.73	0.73	0.73	0.94	0.94	0.94	0.37	0.37	0.37	0.58	0.58	0.58
Crit Moves:	****				****			****			****	
Delay/Veh:	23.1	23.1	23.1	48.1	48.1	48.1	13.8	13.8	13.8	18.7	18.7	18.7
Delay 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
AdjDel/Veh:	23.1	23.1	23.1	48.1	48.1	48.1	13.8	13.8	13.8	18.7	18.7	18.7
LOS by Move:	C	C	C	E	E	E	B	B	B	C	C	C
ApproachDel:		23.1			48.1			13.8			18.7	
Delay Adj:		1.00			1.00			1.00			1.00	
ApprAdjDel:		23.1			48.1			13.8			18.7	
LOS by Appr:		C			E			B			C	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Base Volume Alternative

Intersection #4 Glencoe/West Union

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Time Period: 0.25 hour												
HevVeh:	3%			3%			4%			7%		
Alpha Value: 0.01												
GroupType:	1			1			1			1		
P[C1]:	0.43			0.48			0.35			0.36		
P[C2]:	0.27			0.22			0.07			0.07		
P[C3]:	0.17			0.19			0.38			0.39		
P[C4]:	0.12			0.10			0.18			0.17		
P[C5]:	0.01			0.01			0.02			0.02		
Padj[C1]:	0.010			0.009			0.015			0.014		
Padj[C2]:	0.002			0.002			0.007			0.007		
Padj[C3]:	-0.004			-0.004			-0.009			-0.009		
Padj[C4]:	-0.007			-0.006			-0.011			-0.010		
Padj[C5]:	-0.001			-0.001			-0.002			-0.002		
Lane:	L1			L1			L1			L1		
LaneType:	LEFTTHRURITE			LEFTTHRURITE			LEFTTHRURITE			LEFTTHRURITE		
HeadwayAdj:	-0.123			0.056			-0.328			0.152		
Volume:	240			288			113			114		
Capacity:	731			719			658			607		
DegOfUtil:	0.31			0.39			0.16			0.17		
DepHeadway:	4.72			4.83			4.97			5.43		
ServiceTime:	2.7			2.8			3.0			3.4		
Delay:	9.9			10.8			8.9			9.6		
Approach:	North Bound			South Bound			East Bound			West Bound		
ApproachDel:	9.9			10.8			8.9			9.6		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	9.9			10.8			8.9			9.6		
LOS by Appr:	A			B			A			A		
OverallDel:					10.0							
OverallLOS:					B							

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #5 Glencoe/Pacific

Average Delay (sec/veh): 2.3 Worst Case Level Of Service: D[28.9]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0	0	1! 0	0	0	1! 0	0	0	1! 0	0	0	1! 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	20	180	5	2	305	5	2	0	40	2	3	1
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	22	198	6	2	336	6	2	0	44	2	3	1
Added Vol:	0	116	0	0	231	21	23	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	22	314	6	2	567	27	25	0	44	2	3	1
User 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
PHF Adj:	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
PHF Volume:	28	393	7	3	708	33	32	0	55	3	4	1
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	28	393	7	3	708	33	32	0	55	3	4	1
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx	7.1	xxxx	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx	3.5	xxxx	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	741	xxxx	xxxxx	419	xxxx	xxxxx	1243	xxxx	725	1269	1258	416
Potent Cap.:	866	xxxx	xxxxx	1085	xxxx	xxxxx	144	xxxx	425	138	163	606
Move Cap.:	866	xxxx	xxxxx	1085	xxxx	xxxxx	137	xxxx	425	117	157	606
Volume/Cap:	0.03	xxxx	xxxx	0.00	xxxx	xxxx	0.23	xxxx	0.13	0.02	0.03	0.00
Level Of Service Module:												
Queue:	0.1	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	9.3	xxxx	xxxxx	8.3	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	241	xxxxx	xxxx	159	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	1.6	xxxxx	xxxxx	0.2	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	28.1	xxxxx	xxxxx	28.9	xxxxx
Shared LOS:	*	*	*	*	*	*	*	D	*	*	D	*
ApproachDel:	xxxxxx			xxxxxx			28.1			28.9		
ApproachLOS:	*			*			D			D		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #5 Glencoe/Pacific

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	2%			2%			2%			2%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		
Time Period: 0.25 hour												
Upstream Signals:												
Link Index:	#11											
Dist(miles):	0.125											
Speed (mph):	40.00											
SignalIndex:	#7											
Cycle Time:	60 secs											
InitVolume:	0	193										
Saturation:	0	1828										
ArrivalType:	0	3										
G/C:	0.00	0.44										
*** Computation 1: Time for Queue to Clear at Each Upstream Intersection												
P:	0.000	0.436										
gq1:	0.00	3.56										
gq2:	0.00	0.42										
gq:	0.00	3.98										
*** Computation 2: Time Intersection Blocked Because of Upstream Platoons												
alpha:	0.550											
beta:	0.645											
ta (secs):	11.250											
F:	0.200											
f:	1.000	1.000										
vcmax:	0	1078										
vcg:	0	199										
vcmin:	1000	1000										
tp:	0.0	0.8										
p:	0.014											
*** Computation 3: Platoon Event Periods												
pdom/psubo:	0.014/0.000/Unconstrained											
*** Computation 4: Conflicting Flows During Each Unblocked Period												
InitCnflVol:	426	xxxxx	xxxxx	254	xxxxx	xxxxx	737	0	423	762	738	251
UpstreamAdj:	1.00	x.xxx	x.xxx	0.99	x.xxx	x.xxx	0.99	0.986	1.000	0.99	0.986	0.986
ConflictVol:	426	xxxxx	xxxxx	258	xxxxx	xxxxx	748	0	423	773	748	255
*** Computation 5: Capactiy for Subject Movement During Unblocked Period												
InitPotCap:	1133	xxxxx	xxxxx	1307	xxxxx	xxxxx	329	900	631	316	341	784
UpstreamAdj:	1.00	x.xxx	x.xxx	0.99	x.xxx	x.xxx	0.99	0.986	1.000	0.99	0.986	0.986
PotentCap:	1133	xxxxx	xxxxx	1288	xxxxx	xxxxx	324	887	631	312	336	773

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

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Intersection #6 Glencoe/Highland

****

Average Delay (sec/veh): 12.9 Worst Case Level Of Service: F[177.4]

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Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Uncontrolled				Uncontrolled				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Lanes:	1	0	0	1 0	1	0	0	1 0	0	1	0	0 1	0	0	1!	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.																
Base Vol:	70	200		5	20	305		20	15		3	135	40		3	10
Growth Adj:	1.10	1.10		1.10	1.10	1.10		1.10	1.10		1.10	1.10	1.10		1.10	1.10
Initial Bse:	77	220		6	22	336		22	17		3	149	44		3	11
Added Vol:	0	97		0	0	216		15	19		0	0	0		0	0
PasserByVol:	0	0		0	0	0		0	0		0	0	0		0	0
Initial Fut:	77	317		6	22	552		37	36		3	149	44		3	11
User 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
PHF Adj:	0.86	0.86		0.86	0.86	0.86		0.86	0.86		0.86	0.86	0.86		0.86	0.86
PHF Volume:	90	369		6	26	641		43	41		4	173	51		4	13
Reduct Vol:	0	0		0	0	0		0	0		0	0	0		0	0
Final Vol.:	90	369		6	26	641		43	41		4	173	51		4	13
Critical Gap Module:																
Critical Gp:	4.1	xxxx	xxxxx		4.2	xxxx	xxxxx		7.2	6.6		6.3	7.1	6.5		6.2
FollowUpTim:	2.2	xxxx	xxxxx		2.3	xxxx	xxxxx		3.5	4.0		3.3	3.5	4.0		3.3
Capacity Module:																
Cnflict Vol:	684	xxxx	xxxxx		394	xxxx	xxxxx		1337	1332		663	1421	1351		390
Potent Cap.:	900	xxxx	xxxxx		1089	xxxx	xxxxx		122	145		456	107	142		622
Move Cap.:	900	xxxx	xxxxx		1089	xxxx	xxxxx		106	127		456	59	125		622
Volume/Cap:	0.10	xxxx	xxxx		0.02	xxxx	xxxx		0.39	0.03		0.38	0.86	0.03		0.02
Level Of Service Module:																
Queue:	0.3	xxxx	xxxxx		0.1	xxxx	xxxxx	xxxxx	xxxx			1.7	xxxxx	xxxx	xxxxx	
Stopped Del:	9.4	xxxx	xxxxx		8.4	xxxx	xxxxx	xxxxx	xxxx			17.6	xxxxx	xxxx	xxxxx	
LOS by Move:	A	*		*	A	*		*	*			C	*		*	
Movement:	LT -	LTR -		RT	LT -	LTR -		RT	LT -	LTR -		RT	LT -	LTR -		RT
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		108	xxxx	xxxxx		xxxx	74	xxxxx	
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		1.8	xxxx	xxxxx		xxxxx	4.7	xxxxx	
Shrd StpDel:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		60.7	xxxx	xxxxx		xxxxx	177	xxxxx	
Shared LOS:	*	*		*	*	*		*	F	*		*	*	F		*
ApproachDel:	xxxxxx				xxxxxx				26.5				177.4			
ApproachLOS:	*				*				D				F			

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

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Intersection #6 Glencoe/Highland

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Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
HevVeh:	4%				6%				5%				4%			
Grade:	0%				0%				0%				0%			
Peds/Hour:	0				0				0				0			
Pedestrian Walk Speed: 4.00 feet/sec																
LaneWidth:	12 feet				12 feet				12 feet				12 feet			
Time Period: 0.25 hour																
Upstream Signals:																
Link Index:	#11															
Dist(miles):	0.125															
Speed (mph):	40.00															
SignalIndex:	#7															
Cycle Time:	60 secs															
InitVolume:	0	193														
Saturation:	0	1828														
ArrivalType:	0	3														
G/C:	0.00	0.44														
*** Computation 1: Time for Queue to Clear at Each Upstream Intersection																
P:	0.000	0.436														
gq1:	0.00	3.56														
gq2:	0.00	0.42														
gq:	0.00	3.98														
*** Computation 2: Time Intersection Blocked Because of Upstream Platoons																
alpha:	0.550															
beta:	0.645															
ta (secs):	11.250															
F:	0.200															
f:	1.000	1.000														
vcmax:	0	1078														
vcg:	0	199														
vcmin:	1000	1000														
tp:	0.0	0.8														
p:	0.014															
*** Computation 3: Platoon Event Periods																
pdom/psubo:	0.014/0.000/Unconstrained															
*** Computation 4: Conflicting Flows During Each Unblocked Period																
InitCnflVol:	416	xxxxx	xxxxx	262	xxxxx	xxxxx	900	895	403	980	905	259				
UpstreamAdj:	1.00	x.xxx	x.xxx	0.99	x.xxx	x.xxx	0.99	0.986	1.000	0.99	0.986	0.986				
ConflictVol:	416	xxxxx	xxxxx	266	xxxxx	xxxxx	913	908	403	994	918	263				
*** Computation 5: Capactiy for Subject Movement During Unblocked Period																
InitPotCap:	1133	xxxxx	xxxxx	1275	xxxxx	xxxxx	251	272	641	222	270	771				
UpstreamAdj:	1.00	x.xxx	x.xxx	0.99	x.xxx	x.xxx	0.99	0.986	1.000	0.99	0.986	0.986				
PotentCap:	1133	xxxxx	xxxxx	1257	xxxxx	xxxxx	247	268	641	219	266	760				

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

Intersection #7 Glencoe/ORE 26 WB

Cycle (sec):	60			Critical Vol./Cap. (X):			0.456					
Loss Time (sec):	12 (Y+R = 4 sec)			Average Delay (sec/veh):			13.8					
Optimal Cycle:	36			Level Of Service:			B					

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Protected			Protected			Split Phase			Split Phase		
Rights:	Include			Include			Include			Ovl		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	1	0 1	0 0	0	0 2	0 1	0	0 0 0	0 0	1	1 0	0 1
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	35	175	0	0	425	55	0	0	0	370	3	145
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	39	193	0	0	468	61	0	0	0	407	3	160
Added Vol:	0	69	0	0	169	47	0	0	0	0	0	29
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	39	262	0	0	637	108	0	0	0	407	3	189
User 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
PHF Adj:	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
PHF Volume:	41	281	0	0	684	116	0	0	0	438	4	203
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	41	281	0	0	684	116	0	0	0	438	4	203
PCE 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
MLF 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
Final Vol.:	41	281	0	0	684	116	0	0	0	438	4	203
Saturation Flow Module:												
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Adjustment:	0.91	0.96	1.00	1.00	0.90	0.81	1.00	1.00	1.00	0.82	0.82	0.82
Lanes:	1.00	1.00	0.00	0.00	2.00	1.00	0.00	0.00	0.00	1.98	0.02	1.00
Final Sat.:	1736	1828	0	0	3437	1537	0	0	0	3082	25	1554
Capacity Analysis Module:												
Vol/Sat:	0.02	0.15	0.00	0.00	0.20	0.08	0.00	0.00	0.00	0.14	0.14	0.13
Crit Moves:	****				****					****		
Green/Cycle:	0.05	0.49	0.00	0.00	0.44	0.44	0.00	0.00	0.00	0.31	0.31	0.31
Volume/Cap:	0.46	0.31	0.00	0.00	0.46	0.17	0.00	0.00	0.00	0.46	0.46	0.42
Delay/Veh:	31.2	9.5	0.0	0.0	12.1	10.4	0.0	0.0	0.0	16.9	16.9	17.0
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
AdjDel/Veh:	31.2	9.5	0.0	0.0	12.1	10.4	0.0	0.0	0.0	16.9	16.9	17.0
HCM2kAvg:	1	3	0	0	5	1	0	0	0	4	4	3

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

Intersection #7 Glencoe/ORE 26 WB

Approach:	North Bound						South Bound						East Bound						West Bound					
Movement:	L	-	T	-	R		L	-	T	-	R		L	-	T	-	R		L	-	T	-	R	
HCM Ops Adjusted Lane Utilization Module:																								
Lanes:	1	0	1	0	0		0	0	2	0	1		0	0	0	0	0		1	1	0	0	1	
Lane Group:	L		T		xxxx		xxxx		T		R		xxxx		xxxx		xxxx		LT		LT		R	
#LnsInGrps:	1		1		0		0		2		1		0		0		0		2		2		1	
HCM Ops Input Saturation Adj Module:																								
Lane Width:	12		12		12		12		12		12		12		12		12		12		12		12	
CrosswalkWid			8						8						8						8			
% Hev Veh:			4						5						0						4			
Grade:			0%						0%						0%						0%			
Parking/Hr:			No						No						No						No			
Bus Stp/Hr:			0						0						0						0			
Area Type:	<	<	<	<	<	<	<	<	<	<	<	<	<	<	Other	>	>	>	>	>	>	>	>	>
Cnft Ped/Hr:			0						0						0						0			
ExclusiveRT:			Include						Include						Include						Include			
% RT Prtct:			0						0						0						0			
HCM Ops f(lt) Adj Case Module:																								
f(lt) Case:	1	xxxx		xxxx			xxxx	xxxx		xxxx			xxxx	xxxx		xxxx			2r		2r		xxxx	
HCM Ops Saturation Adj Module:																								
Ln Wid Adj:	1.00	1.00	xxxxx		xxxx	1.00		1.00		xxxx	xxxx	xxxxx		1.00	1.00		xxxx	xxxx	xxxxx		1.00	1.00		1.00
Hev Veh Adj:	0.96	0.96	xxxxx		xxxx	0.95		0.95		xxxx	xxxx	xxxxx		0.96	0.96		0.96	0.96	0.96		0.96	0.96		0.96
Grade Adj:	1.00	1.00	xxxxx		xxxx	1.00		1.00		xxxx	xxxx	xxxxx		1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
Parking Adj:	xxxx	1.00	xxxxx		xxxx	xxxx		1.00		xxxx	xxxx	xxxxx		xxxx	xxxx		xxxx	xxxx	xxxx		xxxx	xxxx		1.00
Bus Stp Adj:	xxxx	1.00	xxxxx		xxxx	xxxx		1.00		xxxx	xxxx	xxxxx		xxxx	xxxx		xxxx	xxxx	xxxx		xxxx	xxxx		1.00
Area Adj:	1.00	1.00	xxxxx		xxxx	1.00		1.00		xxxx	xxxx	xxxxx		1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
RT Adj:	xxxx	xxxx	xxxxx		xxxx	xxxx		0.85		xxxx	xxxx	xxxxx		xxxx	xxxx		xxxx	xxxx	xxxx		xxxx	xxxx		0.85
LT Adj:	0.95	xxxx	xxxxx		xxxx	xxxx		xxxxx		xxxx	xxxx	xxxxx		xxxx	xxxx		xxxx	xxxx	xxxxx		0.85	0.85		xxxxx
PedBike 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	1.00	1.00		1.00	1.00		1.00
HCM Sat Adj:	0.91	0.96	1.00		1.00	0.95		0.81		1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00		0.82	0.82		0.82
Usr Sat 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	1.00	1.00		1.00	1.00		1.00
MLF Sat Adj:	1.00	1.00	1.00		1.00	0.95		1.00		1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00		1.00	1.00		1.00
Fnl Sat Adj:	0.91	0.96	1.00		1.00	0.90		0.81		1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00		0.82	0.82		0.82
Delay Adjustment Factor Module:																								
Coordinated:	<	<	<	<	<	<	<	<	<	<	<	<	<	<	No	>	>	>	>	>	>	>	>	>
Signal Type:	<	<	<	<	<	<	<	<	<	<	<	<	<	<	Actuated	>	>	>	>	>	>	>	>	>
DelAdjFctr:	1.00	1.00	0.00		0.00	1.00		1.00		0.00	0.00	0.00		0.00	0.00		0.00	1.00	1.00		1.00	1.00		1.00

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

****

Intersection #7 Glencoe/ORE 26 WB

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.05	0.49	0.00	0.00	0.44	0.44	0.00	0.00	0.00	0.31	0.31	0.31
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	0.7	2.8	0.0	0.0	4.0	1.2	0.0	0.0	0.0	3.5	3.5	2.7
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00
Q2:	0.8	0.5	0.0	0.0	0.8	0.2	0.0	0.0	0.0	0.8	0.8	0.7
HCM2KQueue:	1.5	3.3	0.0	0.0	4.8	1.4	0.0	0.0	0.0	4.3	4.3	3.4
70th%Factor:	1.20	1.19	1.20	1.20	1.19	1.20	1.20	1.20	1.20	1.19	1.19	1.19
70th%HCM2kQ:	1.7	3.9	0.0	0.0	5.8	1.7	0.0	0.0	0.0	5.1	5.1	4.0
85th%Factor:	1.59	1.57	1.60	1.60	1.56	1.59	1.60	1.60	1.60	1.56	1.56	1.57
85th%HCM2kQ:	2.3	5.2	0.0	0.0	7.5	2.2	0.0	0.0	0.0	6.7	6.7	5.3
90th%Factor:	1.77	1.74	1.80	1.80	1.71	1.77	1.80	1.80	1.80	1.72	1.72	1.74
90th%HCM2kQ:	2.6	5.7	0.0	0.0	8.3	2.4	0.0	0.0	0.0	7.4	7.4	5.9
95th%Factor:	2.05	2.00	2.10	2.10	1.96	2.06	2.10	2.10	2.10	1.97	1.97	2.00
95th%HCM2kQ:	3.0	6.6	0.0	0.0	9.5	2.8	0.0	0.0	0.0	8.5	8.5	6.8
98th%Factor:	2.59	2.48	2.70	2.70	2.39	2.60	2.70	2.70	2.70	2.42	2.42	2.47
98th%HCM2kQ:	3.8	8.1	0.0	0.0	11.6	3.6	0.0	0.0	0.0	10.4	10.4	8.4

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

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Intersection #8 Glencoe/OR 26 EB

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Cycle (sec): 90 Critical Vol./Cap. (X): 0.465
Loss Time (sec): 12 (Y+R = 4 sec) Average Delay (sec/veh): 16.6
Optimal Cycle: 38 Level Of Service: B

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Approach:	North Bound					South Bound					East Bound					West Bound				
Movement:	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R	L	-	T	-	R
Control:	Protected					Protected					Split Phase					Split Phase				
Rights:	Ignore					Include					Ovl					Include				
Min. Green:	0	0	0			0	0	0			0	0	0			0	0	0		
Lanes:	0	0	2	0	1	1	0	2	0	0	0	1	0	0	1	0	0	0	0	0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.																				
Base Vol:	0	185	610	240	555	0	25	0	120		0	0	0							
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10		1.10	1.10	1.10							
Initial Bse:	0	204	671	264	611	0	28	0	132		0	0	0							
Added Vol:	0	43	0	86	84	0	26	0	0		0	0	0							
PasserByVol:	0	0	0	0	0	0	0	0	0		0	0	0							
Initial Fut:	0	247	671	350	695	0	53	0	132		0	0	0							
User Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00							
PHF Adj:	0.87	0.87	0.00	0.87	0.87	0.87	0.87	0.87	0.87		0.87	0.87	0.87							
PHF Volume:	0	283	0	402	798	0	61	0	152		0	0	0							
Reduct Vol:	0	0	0	0	0	0	0	0	0		0	0	0							
Reduced Vol:	0	283	0	402	798	0	61	0	152		0	0	0							
PCE Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00							
MLF Adj:	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00							
Final Vol.:	0	283	0	402	798	0	61	0	152		0	0	0							
Saturation Flow Module:																				
Sat/Lane:	1900	1900	1900	1900	1900	1900	1900	1900	1900		1900	1900	1900							
Adjustment:	1.00	0.97	1.00	0.92	0.97	1.00	0.92	1.00	0.83		1.00	1.00	1.00							
Lanes:	0.00	2.00	1.00	1.00	2.00	0.00	1.00	0.00	1.00		0.00	0.00	0.00							
Final Sat.:	0	3690	1900	1753	3690	0	1756	0	1568		0	0	0							
Capacity Analysis Module:																				
Vol/Sat:	0.00	0.08	0.00	0.23	0.22	0.00	0.04	0.00	0.10		0.00	0.00	0.00							
Crit Moves:		****		****					****											
Green/Cycle:	0.00	0.17	0.00	0.49	0.66	0.00	0.21	0.00	0.21		0.00	0.00	0.00							
Volume/Cap:	0.00	0.47	0.00	0.47	0.33	0.00	0.17	0.00	0.47		0.00	0.00	0.00							
Delay/Veh:	0.0	34.5	0.0	15.4	6.8	0.0	29.5	0.0	32.3		0.0	0.0	0.0							
User DelAdj:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00							
AdjDel/Veh:	0.0	34.5	0.0	15.4	6.8	0.0	29.5	0.0	32.3		0.0	0.0	0.0							
HCM2kAvg:	0	4	0	8	5	0	2	0	4		0	0	0							

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

Intersection #8 Glencoe/OR 26 EB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HCM Ops Adjusted Lane Utilization Module:												
Lanes:	0.0	2.0	1.0	1.0	2.0	0.0	0.1	1.0	1.0	0.0	0.0	0.0
Lane Group:	xxxx	T	R	L	T	xxxx	LT	LT	R	xxxx	xxxx	xxxx
#LnsInGrps:	0	2	1	1	2	0	1	1	1	0	0	0
HCM Ops Input Saturation Adj Module:												
Lane Width:	12	12	12	12	12	12	12	12	12	12	12	12
CrosswalkWid		8			8			8			8	
% Hev Veh:		3			3			3			0	
Grade:		0%			0%			0%			0%	
Parking/Hr:		No			No			No			No	
Bus Stp/Hr:		0			0			0			0	
Area Type:	< < < < < < < < < < < < < < < Other > > > > > > > > > > > > > > >											
Cnft Ped/Hr:		0			0			0			0	
ExclusiveRT:		Include			Include			Include			Include	
% RT Prtct:		0			0			0			0	
HCM Ops f(lt) Adj Case Module:												
f(lt) Case:	xxxx	xxxx	xxxx	1	xxxx	xxxx	4	xxxx	xxxx	xxxx	xxxx	xxxx
HCM Ops Saturation Adj Module:												
Ln Wid Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	xxxx	1.00	xxxx	xxxx	xxxxx
Hev Veh Adj:	xxxx	0.97	xxxxx	0.97	0.97	xxxxx	0.97	xxxx	0.97	xxxx	xxxx	xxxxx
Grade Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	xxxx	1.00	xxxx	xxxx	xxxxx
Parking Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Bus Stp Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Area Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	xxxx	1.00	xxxx	xxxx	xxxxx
RT Adj:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	0.85	xxxx	xxxx	xxxxx
LT Adj:	xxxx	xxxx	xxxxx	0.95	xxxx	xxxxx	0.95	xxxx	xxxxx	xxxx	xxxx	xxxxx
PedBike 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
HCM Sat Adj:	1.00	0.97	1.00	0.92	0.97	1.00	0.92	1.00	0.83	1.00	1.00	1.00
Usr Sat 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
MLF Sat 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
Fnl Sat Adj:	1.00	0.97	1.00	0.92	0.97	1.00	0.92	1.00	0.83	1.00	1.00	1.00
Delay Adjustment Factor Module:												
Coordinated:	< < < < < < < < < < < < < < < No > > > > > > > > > > > > > > >											
Signal Type:	< < < < < < < < < < < < < < Actuated > > > > > > > > > > > > > >											
DelAdjFctr:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

Intersection #8 Glencoe/OR 26 EB

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.00	0.17	0.00	0.49	0.66	0.00	0.21	0.00	0.21	0.00	0.00	0.00
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	0.0	3.2	0.0	7.0	4.3	0.0	1.3	0.0	3.3	0.0	0.0	0.0
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00
Q2:	0.0	0.8	0.0	0.9	0.5	0.0	0.2	0.0	0.8	0.0	0.0	0.0
HCM2KQueue:	0.0	4.0	0.0	7.8	4.8	0.0	1.5	0.0	4.2	0.0	0.0	0.0
70th%Factor:	1.20	1.19	1.20	1.18	1.19	1.20	1.20	1.20	1.19	1.20	1.20	1.20
70th%HCM2kQ:	0.0	4.8	0.0	9.2	5.7	0.0	1.8	0.0	5.0	0.0	0.0	0.0
85th%Factor:	1.60	1.56	1.60	1.53	1.56	1.60	1.59	1.60	1.56	1.60	1.60	1.60
85th%HCM2kQ:	0.0	6.3	0.0	12.0	7.5	0.0	2.4	0.0	6.5	0.0	0.0	0.0
90th%Factor:	1.80	1.73	1.80	1.67	1.71	1.80	1.77	1.80	1.72	1.80	1.80	1.80
90th%HCM2kQ:	0.0	7.0	0.0	13.1	8.3	0.0	2.7	0.0	7.2	0.0	0.0	0.0
95th%Factor:	2.10	1.98	2.10	1.89	1.96	2.10	2.05	2.10	1.98	2.10	2.10	2.10
95th%HCM2kQ:	0.0	8.0	0.0	14.8	9.5	0.0	3.1	0.0	8.2	0.0	0.0	0.0
98th%Factor:	2.70	2.43	2.70	2.25	2.39	2.70	2.59	2.70	2.43	2.70	2.70	2.70
98th%HCM2kQ:	0.0	9.8	0.0	17.6	11.5	0.0	4.0	0.0	10.1	0.0	0.0	0.0

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #9 Jackson School/West Union

Average Delay (sec/veh): 3.1 Worst Case Level Of Service: B[10.6]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	1 0	0	1 0	0	0	1! 0	0	0	1! 0	0	0	1! 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	5	4	4	25	1	20	3	80	5	2	60	10
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	6	4	4	28	1	22	3	88	6	2	66	11
Added Vol:	33	0	7	0	0	0	0	18	65	5	10	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	39	4	11	28	1	22	3	106	71	7	76	11
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	43	5	13	31	1	24	4	118	78	8	84	12
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	43	5	13	31	1	24	4	118	78	8	84	12
Critical Gap Module:												
Critical Gp:	7.2	6.6	6.3	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	284	277	157	280	310	91	97	xxxx	xxxxx	196	xxxx	xxxxx
Potent Cap.:	663	626	881	669	601	962	1491	xxxx	xxxxx	1359	xxxx	xxxxx
Move Cap.:	641	620	881	651	596	962	1491	xxxx	xxxxx	1359	xxxx	xxxxx
Volume/Cap:	0.07	0.01	0.01	0.05	0.00	0.03	0.00	xxxx	xxxx	0.01	xxxx	xxxx
Level Of Service Module:												
Queue:	0.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	11.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.4	xxxx	xxxxx	7.7	xxxx	xxxxx
LOS by Move:	B	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	xxxx	789	xxxx	756	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	xxxx	0.1	xxxxx	0.2	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	9.7	xxxxx	10.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	A	*	B	*	*	*	*	*	*	*
ApproachDel:	10.6			10.1			xxxxxx			xxxxxx		
ApproachLOS:	B			B			*			*		

Traffix 7.6.0115 (c) 2004 Dowling Assoc. Licensed to KITTELSON, PORTLAND

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #9 Jackson School/West Union

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	5%			4%			3%			5%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		
Time Period: 0.25 hour												

Traffix 7.6.0115 (c) 2004 Dowling Assoc. Licensed to KITTELSON, PORTLAND

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #10 NW West Union Road Access Dwy

Average Delay (sec/veh): 4.1 Worst Case Level Of Service: B[12.1]

Street Name:	East Expansion Access Dwy						NW West Union Rd					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	1 0 0	0 1		0 0	0 0		0 0	1 0		0 1	0 0	
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	0	0	0	0	0	0	0	88	0	0	85	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	0	0	0	0	0	0	0	97	0	0	94	0
Added Vol:	126	0	49	0	0	0	0	35	128	28	15	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	126	0	49	0	0	0	0	132	128	28	109	0
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	140	0	54	0	0	0	0	146	142	31	121	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	140	0	54	0	0	0	0	146	142	31	121	0
Critical Gap Module:												
Critical Gp:	6.4	xxxx	6.3	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	xxxx	3.3	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	400	xxxx	218	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	289	xxxx	xxxxx
Potent Cap.:	600	xxxx	815	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1256	xxxx	xxxxx
Move Cap.:	588	xxxx	815	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	1256	xxxx	xxxxx
Volume/Cap:	0.24	xxxx	0.07	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	0.02	xxxx	xxxx
Level Of Service Module:												
Queue:	0.9	xxxx	0.2	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.1	xxxx	xxxxx
Stopped Del:	13.0	xxxx	9.7	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.9	xxxx	xxxxx
LOS by Move:	B	*	A	*	*	*	*	*	*	A	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.1	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.9	xxxx	xxxxx
Shared LOS:	*	*	*	*	*	*	*	*	*	A	*	*
ApproachDel:	12.1			xxxxxx			xxxxxx			xxxxxx		
ApproachLOS:	B			*			*			*		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #10 NW West Union Road Access Dwy

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	5%			4%			3%			5%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		
Time Period: 0.25 hour												

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

****

Intersection #11 NW Jackson School Road Site Access Dwy

****

Average Delay (sec/veh): 4.8 Worst Case Level Of Service: A[9.1]

****

Street Name:	NW Jackson School Rd						East Expansion Site Access Dwy					
Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 1	0	0 0	0	0 0	1 0	1	0	0 0 1	0	0 0	0 0
Volume Module: >> Count Date: 26 Oct 2004 << 7:15 to 8:15 a.m.												
Base Vol:	0	13	0	0	8	0	0	0	0	0	0	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	0	14	0	0	9	0	0	0	0	0	0	0
Added Vol:	53	33	0	0	65	5	7	0	98	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	53	47	0	0	74	5	7	0	98	0	0	0
User 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
PHF 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
PHF Volume:	53	47	0	0	74	5	7	0	98	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	53	47	0	0	74	5	7	0	98	0	0	0
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx	6.4	xxxx	6.2	xxxxx	xxxx	xxxxx
FollowUpTim:	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx	3.5	xxxx	3.3	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	79	xxxx	xxxxx	xxxx	xxxx	xxxxx	230	xxxx	76	xxxx	xxxx	xxxxx
Potent Cap.:	1501	xxxx	xxxxx	xxxx	xxxx	xxxxx	756	xxxx	982	xxxx	xxxx	xxxxx
Move Cap.:	1501	xxxx	xxxxx	xxxx	xxxx	xxxxx	735	xxxx	982	xxxx	xxxx	xxxxx
Volume/Cap:	0.04	xxxx	xxxx	xxxx	xxxx	xxxx	0.01	xxxx	0.10	xxxx	xxxx	xxxx
Level Of Service Module:												
Queue:	0.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	0.3	xxxxx	xxxx	xxxxx
Stopped Del:	7.5	xxxx	xxxxx	xxxxx	xxxx	xxxxx	9.9	xxxx	9.1	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	*	*	*	A	*	A	*	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	0.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	7.5	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	A	*	*	*	*	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			xxxxxx			9.1			xxxxxx		
ApproachLOS:	*			*			A			*		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday AM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

****

Intersection #11 NW Jackson School Road Site Access Dwy

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	5%			4%			3%			5%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		
Time Period: 0.25 hour												

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Scenario Report

Scenario:	*Default Scenario*
Command:	Default Command
Volume:	Default Volume
Geometry:	Default Geometry
Impact Fee:	Default Impact Fee
Trip Generation:	Default Trip Generation
Trip Distribution:	Default Trip Distribution
Paths:	Default Paths
Routes:	Default Routes
Configuration:	Default Configuration

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Impact Analysis Report
Level Of Service

Intersection	Base LOS	Base Del/ Veh	Base V/ C	Future LOS	Future Del/ Veh	Future V/ C	Change in
# 1 313/North	A	9.2	0.000	C	17.3	0.000	+ 8.108 D/V
# 2 309/North	A	9.7	0.000	C	17.0	0.000	+ 7.298 D/V
# 3 Glencoe/North	B	10.7	0.000	C	22.5	0.000	+11.811 D/V
# 4 Glencoe/West Union	B	11.3	0.528	F	75.3	1.235	+ 0.706 V/C
# 5 Glencoe/Pacific	C	15.8	0.000	E	38.7	0.000	+22.916 D/V
# 6 Glencoe/Highland	D	29.8	0.000	F	260.5	0.000	+230.647 D/V
# 7 Glencoe/ORE 26 WB	B	17.1	0.572	B	18.4	0.650	+ 1.318 D/V
# 8 Glencoe/OR 26 EB	B	10.1	0.407	B	13.2	0.542	+ 3.030 D/V
# 9 Jackson School/West Union	B	10.5	0.000	B	11.8	0.000	+ 1.239 D/V
# 10	A	0.0	0.000	B	12.3	0.000	+12.312 D/V
# 11	A	0.0	0.000	A	9.1	0.000	+ 9.109 D/V

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

****
Intersection #1 313/North
****
Average Delay (sec/veh): 5.9 Worst Case Level Of Service: C[17.3]
****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			1 0 0 1 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	2	0	2	0	0	0	0	70	2	5	65	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	2	0	2	0	0	0	0	77	2	6	72	0
Added Vol:	0	9	0	195	8	7	12	0	0	0	0	280
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	2	9	2	195	8	7	12	77	2	6	72	280
User 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
PHF Adj:	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
PHF Volume:	3	11	3	247	10	9	15	97	3	7	91	354
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	3	11	3	247	10	9	15	97	3	7	91	354
Critical Gap Module:												
Critical Gp:	7.1	6.5	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	420	588	99	418	412	268	445	xxxx	xxxxx	100	xxxx	xxxxx
Potent Cap.:	543	421	957	545	530	771	1115	xxxx	xxxxx	1492	xxxx	xxxxx
Move Cap.:	522	413	957	525	520	771	1115	xxxx	xxxxx	1492	xxxx	xxxxx
Volume/Cap:	0.01	0.03	0.00	0.47	0.02	0.01	0.01	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	2.5	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	17.8	xxxx	xxxxx	8.3	xxxx	xxxxx	7.4	xxxx	xxxxx
LOS by Move:	*	*	*	C	*	*	A	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	474	xxxxx	xxxx	xxxx	613	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.1	xxxxx	xxxxx	xxxx	0.1	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	12.9	xxxxx	xxxxx	xxxx	11.1	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	B	*	*	*	B	*	*	*	*	*	*
ApproachDel:		12.9			17.3			xxxxxx			xxxxxx	
ApproachLOS:		B			C			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

****
Intersection #1 313/North
****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	2%			2%			2%			2%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
LaneWidth:	12 feet			12 feet			12 feet			12 feet		

Pedestrian Walk Speed: 4.00 feet/sec
Time Period: 0.25 hour

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 309/North

Average Delay (sec/veh): 0.8 Worst Case Level Of Service: C[17.0]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	0	0	1! 0	0	0	1! 0	0	0	1! 0	0	0	1! 0
Volume Module:												
Base Vol:	2	2	2	5	2	5	5	65	5	2	65	5
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	2	2	2	6	2	6	6	72	6	2	72	6
Added Vol:	11	0	0	0	0	0	0	185	10	0	268	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	13	2	2	6	2	6	6	257	16	2	340	6
User 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
PHF Adj:	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
PHF Volume:	17	3	3	7	3	7	7	329	20	3	435	7
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	17	3	3	7	3	7	7	329	20	3	435	7
Critical Gap Module:												
Critical Gp:	7.1	6.5	6.2	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	802	801	339	800	807	439	442	xxxx	xxxxx	349	xxxx	xxxxx
Potent Cap.:	304	320	708	305	317	622	1118	xxxx	xxxxx	1210	xxxx	xxxxx
Move Cap.:	297	317	708	300	315	622	1118	xxxx	xxxxx	1210	xxxx	xxxxx
Volume/Cap:	0.06	0.01	0.00	0.02	0.01	0.01	0.01	xxxx	xxxx	0.00	xxxx	xxxx
Level Of Service Module:												
Queue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	8.2	xxxx	xxxxx	8.0	xxxx	xxxxx
LOS by Move:	*	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	323	xxxxx	xxxx	386	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	0.2	xxxxx	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	17.0	xxxxx	xxxxx	14.7	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	C	*	*	B	*	*	*	*	*	*	*
ApproachDel:		17.0			14.7			xxxxxx			xxxxxx	
ApproachLOS:		C			B			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #2 309/North

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	0%			0%			2%			2%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		

Time Period: 0.25 hour

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #3 Glencoe/North

Average Delay (sec/veh): 7.6 Worst Case Level Of Service: C[22.5]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0			0 0 1! 0 0		
Volume Module:												
Base Vol:	65	95	2	2	50	10	10	2	55	2	2	2
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	72	105	2	2	55	11	11	2	61	2	2	2
Added Vol:	265	5	0	0	4	4	4	0	182	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	337	110	2	2	59	15	15	2	242	2	2	2
User 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
PHF Adj:	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
PHF Volume:	351	114	2	2	61	16	16	2	253	2	2	2
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	351	114	2	2	61	16	16	2	253	2	2	2
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.1	6.5	6.2	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	77	xxxx	xxxxx	116	xxxx	xxxxx	892	891	69	1018	898	115
Potent Cap.:	1522	xxxx	xxxxx	1448	xxxx	xxxxx	263	282	994	216	279	937
Move Cap.:	1522	xxxx	xxxxx	1448	xxxx	xxxxx	202	201	994	124	199	937
Volume/Cap:	0.23	xxxx	xxxx	0.00	xxxx	xxxx	0.08	0.01	0.25	0.02	0.01	0.00
Level Of Service Module:												
Queue:	0.9	xxxx	xxxxx	0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Stopped Del:	8.1	xxxx	xxxxx	7.5	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	A	*	*	*	*	*	*	*	*
Movement:	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT	LT	LTR	RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	789	xxxxx	xxxx	212	xxxxx
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	1.5	xxxxx	xxxxx	0.1	xxxxx
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	11.9	xxxxx	xxxxx	22.5	xxxxx
Shared LOS:	*	*	*	*	*	*	*	B	*	*	C	*
ApproachDel:	xxxxxx			xxxxxx			11.9			22.5		
ApproachLOS:	*			*			B			C		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #3 Glencoe/North

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	2%			6%			2%			2%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
LaneWidth:	12 feet			12 feet			12 feet			12 feet		

Pedestrian Walk Speed: 4.00 feet/sec
Time Period: 0.25 hour

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM 4-Way Stop Method (Future Volume Alternative)

Intersection #4 Glencoe/West Union

Cycle (sec): 100 Critical Vol./Cap. (X): 1.235
Loss Time (sec): 0 (Y+R = 4 sec) Average Delay (sec/veh): 75.3
Optimal Cycle: 0 Level Of Service: F

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Min. Green:	0	0	0	0	0	0	0	0	0	0	0	0
Lanes:	0	0	1! 0	0	0	1! 0	0	0	1! 0	0	0	1! 0
Volume Module:												
Base Vol:	95	155	50	15	110	2	15	30	75	80	30	20
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	105	171	55	17	121	2	17	33	83	88	33	22
Added Vol:	0	210	69	39	140	7	6	23	0	59	24	53
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	105	381	124	56	261	9	23	56	83	147	57	75
User 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
PHF Adj:	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
PHF Volume:	117	428	139	62	293	10	25	63	93	165	64	84
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Reduced Vol:	117	428	139	62	293	10	25	63	93	165	64	84
PCE 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
MLF 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
Final Vol.:	117	428	139	62	293	10	25	63	93	165	64	84
Saturation Flow Module:												
Adjustment:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lanes:	0.17	0.63	0.20	0.17	0.80	0.03	0.14	0.35	0.51	0.53	0.20	0.27
Final Sat.:	95	346	113	86	403	14	62	153	226	251	97	128
Capacity Analysis Module:												
Vol/Sat:	1.23	1.23	1.23	0.73	0.73	0.73	0.41	0.41	0.41	0.66	0.66	0.66
Crit Moves:		****			****			****			****	
Delay/Veh:	142.2	142	142.2	25.3	25.3	25.3	15.1	15.1	15.1	22.3	22.3	22.3
Delay 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
AdjDel/Veh:	142.2	142	142.2	25.3	25.3	25.3	15.1	15.1	15.1	22.3	22.3	22.3
LOS by Move:	F	F	F	D	D	D	C	C	C	C	C	C
ApproachDel:	142.2			25.3			15.1			22.3		
Delay Adj:	1.00			1.00			1.00			1.00		
ApprAdjDel:	142.2			25.3			15.1			22.3		
LOS by Appr:	F			D			C			C		

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM 4-Way Stop Method
Base Volume Alternative

Intersection #4 Glencoe/West Union

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Time Period: 0.25 hour												
HevVeh:	3%			3%			4%			7%		
Alpha Value: 0.01												
GroupType:	1			1			1			1		
P[C1]:	0.46			0.29			0.28			0.30		
P[C2]:	0.14			0.30			0.09			0.08		
P[C3]:	0.27			0.17			0.38			0.40		
P[C4]:	0.12			0.21			0.21			0.20		
P[C5]:	0.01			0.03			0.03			0.02		
Padj[C1]:	0.011			0.014			0.016			0.016		
Padj[C2]:	0.004			0.004			0.008			0.008		
Padj[C3]:	-0.007			-0.003			-0.009			-0.009		
Padj[C4]:	-0.007			-0.012			-0.013			-0.012		
Padj[C5]:	-0.001			-0.003			-0.003			-0.002		
Lane:	L1			L1			L1			L1		
LaneType:	LEFTTHRURITE			LEFTTHRURITE			LEFTTHRURITE			LEFTTHRURITE		
HeadwayAdj:	0.014			0.065			-0.282			0.150		
Volume:	371			157			148			161		
Capacity:	702			638			633			595		
DegOfUtil:	0.51			0.23			0.21			0.25		
DepHeadway:	4.95			5.28			5.18			5.57		
ServiceTime:	3.0			3.3			3.2			3.6		
Delay:	13.0			9.8			9.6			10.4		

Approach:	North Bound	South Bound	East Bound	West Bound
ApproachDel:	13.0	9.8	9.6	10.4
Delay Adj:	1.00	1.00	1.00	1.00
ApprAdjDel:	13.0	9.8	9.6	10.4
LOS by Appr:	B	A	A	B
OverallDel:		11.3		
OverallLOS:		B		

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #5 Glencoe/Pacific

Average Delay (sec/veh): 2.5 Worst Case Level Of Service: E[38.7]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Uncontrolled				Uncontrolled				Stop Sign				Stop Sign			
Rights:	Include				Include				Include				Include			
Lanes:	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0	0	0	1!	0 0
Volume Module:																
Base Vol:	35	295	2		2	275	5		2	2	35		5	2	5	
Growth Adj:	1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10	
Initial Bse:	39	325	2		2	303	6		2	2	39		6	2	6	
Added Vol:	0	260	0		0	181	18		18	0	0		0	0	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	39	585	2		2	484	24		20	2	39		6	2	6	
User 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	
PHF Adj:	0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94		0.94	0.94	0.94	
PHF Volume:	41	622	2		2	514	25		21	2	41		6	2	6	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Final Vol.:	41	622	2		2	514	25		21	2	41		6	2	6	
Critical Gap Module:																
Critical Gp:	4.1	xxxx	xxxxx		4.1	xxxx	xxxxx		7.1	6.5	6.2		7.1	6.5	6.2	
FollowUpTim:	2.2	xxxx	xxxxx		2.2	xxxx	xxxxx		3.5	4.0	3.3		3.5	4.0	3.3	
Capacity Module:																
Cnflict Vol:	539	xxxx	xxxxx		738	xxxx	xxxxx		1467	1464	527		1488	1477	737	
Potent Cap.:	1029	xxxx	xxxxx		734	xxxx	xxxxx		89	109	551		87	107	354	
Move Cap.:	1029	xxxx	xxxxx		734	xxxx	xxxxx		84	104	551		76	102	354	
Volume/Cap:	0.04	xxxx	xxxx		0.00	xxxx	xxxx		0.26	0.02	0.07		0.08	0.02	0.02	
Level Of Service Module:																
Queue:	0.1	xxxx	xxxxx		0.0	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx			
Stopped Del:	8.6	xxxx	xxxxx		9.9	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx			
LOS by Move:	A	*	*		A	*	*	*	*	*	*	*	*			
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		xxxx	183	xxxxx		xxxx	121	xxxxx	
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	1.5	xxxxx		xxxxx	0.4	xxxxx	
Shrd StpDel:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	35.1	xxxxx		xxxxx	38.7	xxxxx	
Shared LOS:	*	*	*		*	*	*		*	E	*		*	E	*	
ApproachDel:	xxxxxx				xxxxxx				35.1				38.7			
ApproachLOS:	*				*				E				E			

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #5 Glencoe/Pacific

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
HevVeh:	2%				2%				2%				2%			
Grade:	0%				0%				0%				0%			
Peds/Hour:	0				0				0				0			
Pedestrian Walk Speed: 4.00 feet/sec																
LaneWidth:	12 feet				12 feet				12 feet				12 feet			
Time Period: 0.25 hour																
Upstream Signals:																
Link Index:	#11															
Dist(miles):	0.125															
Speed (mph):	40.00															
SignalIndex:	#7															
Cycle Time:	60 secs															
InitVolume:	0	237														
Saturation:	0	1828														
ArrivalType:	0	3														
G/C:	0.00	0.40														
*** Computation 1: Time for Queue to Clear at Each Upstream Intersection																
P:	0.000	0.396														
gq1:	0.00	4.69														
gq2:	0.00	0.70														
gq:	0.00	5.38														
*** Computation 2: Time Intersection Blocked Because of Upstream Platoons																
alpha:	0.550															
beta:	0.645															
ta (secs):	11.250															
F:	0.200															
f:	1.000	1.000														
vcmax:	0	1279														
vcg:	0	254														
vcmin:	1000	1000														
tp:	0.0	3.2														
p:	0.054															
*** Computation 3: Platoon Event Periods																
pdom/psubo:	0.054/0.000/Unconstrained															
*** Computation 4: Conflicting Flows During Each Unblocked Period																
InitCnflVol:	328	xxxxx	xxxxx	348	xxxxx	xxxxx	762	759	325	779	761	346				
UpstreamAdj:	1.00	x.xxx	x.xxx	0.95	x.xxx	x.xxx	0.95	0.946	1.000	0.95	0.946	0.946				
ConflictVol:	328	xxxxx	xxxxx	367	xxxxx	xxxxx	805	802	325	824	804	366				
*** Computation 5: Capactiy for Subject Movement During Unblocked Period																
InitPotCap:	1232	xxxxx	xxxxx	1191	xxxxx	xxxxx	301	317	716	292	316	679				
UpstreamAdj:	1.00	x.xxx	x.xxx	0.95	x.xxx	x.xxx	0.95	0.946	1.000	0.95	0.946	0.946				
PotentCap:	1232	xxxxx	xxxxx	1127	xxxxx	xxxxx	284	300	716	276	299	642				

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

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Intersection #6 Glencoe/Highland

****

Average Delay (sec/veh): 21.7 Worst Case Level Of Service: F[260.5]

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Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	1 0	0	1 0	1 0	0	1 0	0 1	0	0 1	1 0	0	1 0
Volume Module:												
Base Vol:	75	300	10	15	260	20	20	2	95	55	2	30
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	83	330	11	17	286	22	22	2	105	61	2	33
Added Vol:	0	256	0	0	176	5	4	0	0	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	83	586	11	17	462	27	26	2	105	61	2	33
User 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
PHF Adj:	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
PHF Volume:	88	623	12	18	491	29	28	2	111	64	2	35
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	88	623	12	18	491	29	28	2	111	64	2	35
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	4.2	xxxx	xxxxx	7.2	6.6	6.3	7.1	6.5	6.2
FollowUpTim:	2.2	xxxx	xxxxx	2.3	xxxx	xxxxx	3.5	4.0	3.3	3.5	4.0	3.3
Capacity Module:												
Cnflict Vol:	520	xxxx	xxxxx	751	xxxx	xxxxx	1614	1598	506	1659	1609	744
Potent Cap.:	1036	xxxx	xxxxx	711	xxxx	xxxxx	70	88	561	65	88	348
Move Cap.:	1036	xxxx	xxxxx	711	xxxx	xxxxx	56	79	561	47	78	348
Volume/Cap:	0.08	xxxx	xxxx	0.02	xxxx	xxxx	0.49	0.03	0.20	1.38	0.03	0.10
Level Of Service Module:												
Queue:	0.3	xxxx	xxxxx	0.1	xxxx	xxxxx	xxxxx	xxxx	0.7	6.1	xxxx	xxxxx
Stopped Del:	8.8	xxxx	xxxxx	10.2	xxxx	xxxxx	xxxxx	xxxx	13.0	400.7	xxxx	xxxxx
LOS by Move:	A	*	*	B	*	*	*	*	B	F	*	*
Movement:	LT -	LTR	- RT	LT -	LTR	- RT	LT -	LTR	- RT	LT -	LTR	- RT
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	57	xxxx	xxxxx	xxxx	xxxx	286
SharedQueue:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	2.1	xxxx	xxxxx	xxxxx	xxxx	0.4
Shrd StpDel:	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	122.5	xxxx	xxxxx	xxxxx	xxxx	19.5
Shared LOS:	*	*	*	*	*	*	F	*	*	*	*	C
ApproachDel:	xxxxxx			xxxxxx			36.3			260.5		
ApproachLOS:	*			*			E			F		

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

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Intersection #6 Glencoe/Highland

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Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	4%			6%			5%			4%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
Pedestrian Walk Speed: 4.00 feet/sec												
LaneWidth:	12 feet			12 feet			12 feet			12 feet		
Time Period: 0.25 hour												
Upstream Signals:												
Link Index:	#11											
Dist(miles):	0.125											
Speed (mph):	40.00											
SignalIndex:	#7											
Cycle Time:	60 secs											
InitVolume:	0	237										
Saturation:	0	1828										
ArrivalType:	0	3										
G/C:	0.00	0.40										
*** Computation 1: Time for Queue to Clear at Each Upstream Intersection												
P:	0.000	0.396										
gq1:	0.00	4.69										
gq2:	0.00	0.70										
gq:	0.00	5.38										
*** Computation 2: Time Intersection Blocked Because of Upstream Platoons												
alpha:	0.550											
beta:	0.645											
ta (secs):	11.250											
F:	0.200											
f:	1.000	1.000										
vcmax:	0	1279										
vcg:	0	254										
vcmin:	1000	1000										
tp:	0.0	3.2										
p:	0.054											
*** Computation 3: Platoon Event Periods												
pdom/psubo:	0.054/0.000/Unconstrained											
*** Computation 4: Conflicting Flows During Each Unblocked Period												
InitCnflVol:	328	xxxxx	xxxxx	363	xxxxx	xxxxx	902	889	316	940	895	357
UpstreamAdj:	1.00	x.xxx	x.xxx	0.95	x.xxx	x.xxx	0.95	0.946	1.000	0.95	0.946	0.946
ConflictVol:	328	xxxxx	xxxxx	383	xxxxx	xxxxx	954	940	316	994	946	377
*** Computation 5: Capactiy for Subject Movement During Unblocked Period												
InitPotCap:	1221	xxxxx	xxxxx	1153	xxxxx	xxxxx	236	261	718	222	259	665
UpstreamAdj:	1.00	x.xxx	x.xxx	0.95	x.xxx	x.xxx	0.95	0.946	1.000	0.95	0.946	0.946
PotentCap:	1221	xxxxx	xxxxx	1091	xxxxx	xxxxx	223	247	718	210	245	629

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-----------------------------------------------------------------------------
              Kittelson & Associates, Inc. -- Project #6953
              North Plains Residential -- City of Bend, Oregon
         Year 2015 Total Traffic Conditions, Weekday PM Peak Hour
-----------------------------------------------------------------------------
                   Level Of Service Computation Report
         2000 HCM Operations Method (Future Volume Alternative)
*****************************************************************************
Intersection #7 Glencoe/ORE 26 WB
*****************************************************************************
Cycle (sec):         60             Critical Vol./Cap. (X):        0.650
Loss Time (sec):     12 (Y+R =  4 sec) Average Delay (sec/veh):     18.4
Optimal Cycle:       47             Level Of Service:                  B
*****************************************************************************
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
Control:        Protected        Protected       Split Phase      Split Phase
Rights:          Include          Include          Include            Ovl
Min. Green:    0    0    0     0    0    0     0    0    0     0    0    0
Lanes:        1  0  1  0  0   0  0  2  0  1   0  0  0  0  0   1  1  0  0  1
------------|---------------||---------------||---------------||---------------|
Volume Module:
Base Vol:     155  215    0     0  330   80     0    0    0   585    2  230
Growth Adj:  1.10 1.10 1.10  1.10 1.10 1.10  1.10 1.10 1.10  1.10 1.10 1.10
Initial Bse:  171  237    0     0  363   88     0    0    0   644    2  253
Added Vol:      0  157    0     0  129   47     0    0    0     0    0   99
PasserByVol:    0    0    0     0    0    0     0    0    0     0    0    0
Initial Fut:  171  394    0     0  492  135     0    0    0   644    2  352
User 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
PHF Adj:     0.90 0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90  0.90 0.90 0.90
PHF Volume:   189  437    0     0  547  150     0    0    0   715    2  391
Reduct Vol:     0    0    0     0    0    0     0    0    0     0    0    0
Reduced Vol:  189  437    0     0  547  150     0    0    0   715    2  391
PCE 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
MLF 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
Final Vol.:   189  437    0     0  547  150     0    0    0   715    2  391
------------|---------------||---------------||---------------||---------------|
Saturation Flow Module:
Sat/Lane:    1900 1900 1900  1900 1900 1900  1900 1900 1900  1900 1900 1900
Adjustment:  0.91 0.96 1.00  1.00 0.90 0.81  1.00 1.00 1.00  0.82 0.82 0.82
Lanes:       1.00 1.00 0.00  0.00 2.00 1.00  0.00 0.00 0.00  1.99 0.01 1.00
Final Sat.:  1736 1828    0     0 3437 1537     0    0    0  3097   11 1554
------------|---------------||---------------||---------------||---------------|
Capacity Analysis Module:
Vol/Sat:     0.11 0.24 0.00  0.00 0.16 0.10  0.00 0.00 0.00  0.23 0.23 0.25
Crit Moves:  ****                  ****                                   ****
Green/Cycle: 0.17 0.41 0.00  0.00 0.24 0.24  0.00 0.00 0.00  0.39 0.39 0.39
Volume/Cap:  0.65 0.58 0.00  0.00 0.65 0.40  0.00 0.00 0.00  0.60 0.60 0.65
Delay/Veh:   28.4 14.7  0.0   0.0 22.2 19.7   0.0  0.0  0.0  15.5 15.5 17.6
User DelAdj: 1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00  1.00 1.00 1.00
AdjDel/Veh:  28.4 14.7  0.0   0.0 22.2 19.7   0.0  0.0  0.0  15.5 15.5 17.6
HCM2kAvg:       5    7    0     0    6    3     0    0    0     7    7    7
*****************************************************************************
```

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-----------------------------------------------------------------------------
              Kittelson & Associates, Inc. -- Project #6953
              North Plains Residential -- City of Bend, Oregon
         Year 2015 Total Traffic Conditions, Weekday PM Peak Hour
-----------------------------------------------------------------------------
               Level Of Service Detailed Computation Report
                       2000 HCM Operations Method
                       Future Volume Alternative
*****************************************************************************
Intersection #7 Glencoe/ORE 26 WB
*****************************************************************************
Approach:      North Bound      South Bound      East Bound       West Bound
Movement:     L  -  T  -  R    L  -  T  -  R    L  -  T  -  R    L  -  T  -  R
------------|---------------||---------------||---------------||---------------|
HCM Ops Adjusted Lane Utilization Module:
Lanes:        1  0  1  0  0   0  0  2  0  1   0  0  0  0  0   1  1  0  0  1
Lane Group:     L    T xxxx  xxxx    T    R  xxxx xxxx xxxx    LT   LT    R
#LnsInGrps:     1    1    0     0    2    1     0    0    0     2    2    1
------------|---------------||---------------||---------------||---------------|
HCM Ops Input Saturation Adj Module:
Lane Width:    12   12   12    12   12   12    12   12   12    12   12   12
CrosswalkWid        8                8                8                8
% Hev Veh:          4                5                0                4
Grade:             0%               0%               0%               0%
Parking/Hr:        No               No               No               No
Bus Stp/Hr:         0                0                0                0
Area Type:    < < < < < < < < < < < < < < Other > > > > > > > > > > > > > > >
Cnft Ped/Hr:        0                0                0                0
ExclusiveRT:   Include          Include          Include          Include
% RT Prtct:         0                0                0                0
------------|---------------||---------------||---------------||---------------|
HCM Ops f(lt) Adj Case Module:
f(lt) Case:     1 xxxx xxxx  xxxx xxxx xxxx  xxxx xxxx xxxx    2r   2r xxxx
------------|---------------||---------------||---------------||---------------|
HCM Ops Saturation Adj Module:
Ln Wid Adj:  1.00 1.00 xxxxx  xxxx 1.00 1.00  xxxx xxxx xxxxx 1.00 1.00 1.00
Hev Veh Adj: 0.96 0.96 xxxxx  xxxx 0.95 0.95  xxxx xxxx xxxxx 0.96 0.96 0.96
Grade Adj:   1.00 1.00 xxxxx  xxxx 1.00 1.00  xxxx xxxx xxxxx 1.00 1.00 1.00
Parking Adj: xxxx 1.00 xxxxx  xxxx xxxx 1.00  xxxx xxxx xxxxx xxxx xxxx 1.00
Bus Stp Adj: xxxx 1.00 xxxxx  xxxx xxxx 1.00  xxxx xxxx xxxxx xxxx xxxx 1.00
Area Adj:    1.00 1.00 xxxxx  xxxx 1.00 1.00  xxxx xxxx xxxxx 1.00 1.00 1.00
RT Adj:      xxxx xxxx xxxxx  xxxx xxxx 0.85  xxxx xxxx xxxxx xxxx xxxx 0.85
LT Adj:      0.95 xxxx xxxxx  xxxx xxxx xxxxx xxxx xxxx xxxxx 0.85 0.85 xxxxx
PedBike 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
HCM Sat Adj: 0.91 0.96 1.00  1.00 0.95 0.81  1.00 1.00 1.00  0.82 0.82 0.82
Usr Sat 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
MLF Sat Adj: 1.00 1.00 1.00  1.00 0.95 1.00  1.00 1.00 1.00  1.00 1.00 1.00
Fnl Sat Adj: 0.91 0.96 1.00  1.00 0.90 0.81  1.00 1.00 1.00  0.82 0.82 0.82
------------|---------------||---------------||---------------||---------------|
Delay Adjustment Factor Module:
Coordinated: < < < < < < < < < < < < < < No  > > > > > > > > > > > > > > > >
Signal Type: < < < < < < < < < < < <   Actuated    > > > > > > > > > > > > >
DelAdjFctr:  1.00 1.00 0.00  0.00 1.00 1.00  0.00 0.00 0.00  1.00 1.00 1.00
*****************************************************************************
```

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K/14PRINT

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

****

Intersection #7 Glencoe/ORE 26 WB

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.17	0.41	0.00	0.00	0.24	0.24	0.00	0.00	0.00	0.39	0.39	0.39
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	3.1	5.6	0.0	0.0	4.1	2.1	0.0	0.0	0.0	5.6	5.6	5.3
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00	1.00
Q2:	1.7	1.3	0.0	0.0	1.7	0.6	0.0	0.0	0.0	1.4	1.4	1.7
HCM2kQueue:	4.8	7.0	0.0	0.0	5.8	2.7	0.0	0.0	0.0	7.0	7.0	7.1
70th%Factor:	1.19	1.18	1.20	1.20	1.19	1.19	1.20	1.20	1.20	1.18	1.18	1.18
70th%HCM2kQ:	5.7	8.2	0.0	0.0	6.9	3.3	0.0	0.0	0.0	8.3	8.3	8.4
85th%Factor:	1.56	1.54	1.60	1.60	1.55	1.57	1.60	1.60	1.60	1.54	1.54	1.54
85th%HCM2kQ:	7.4	10.7	0.0	0.0	9.0	4.3	0.0	0.0	0.0	10.8	10.8	10.9
90th%Factor:	1.72	1.68	1.80	1.80	1.70	1.75	1.80	1.80	1.80	1.68	1.68	1.68
90th%HCM2kQ:	8.2	11.7	0.0	0.0	9.8	4.8	0.0	0.0	0.0	11.8	11.8	11.9
95th%Factor:	1.96	1.91	2.10	2.10	1.93	2.02	2.10	2.10	2.10	1.91	1.91	1.90
95th%HCM2kQ:	9.3	13.3	0.0	0.0	11.2	5.5	0.0	0.0	0.0	13.4	13.4	13.5
98th%Factor:	2.39	2.29	2.70	2.70	2.34	2.51	2.70	2.70	2.70	2.28	2.28	2.28
98th%HCM2kQ:	11.4	15.9	0.0	0.0	13.6	6.9	0.0	0.0	0.0	16.0	16.0	16.1

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Operations Method (Future Volume Alternative)

****

Intersection #8 Glencoe/OR 26 EB

****

Cycle (sec): 90 Critical Vol./Cap. (X): 0.542
Loss Time (sec): 12 (Y+R = 4 sec) Average Delay (sec/veh): 13.2
Optimal Cycle: 43 Level Of Service: B

****

Approach:	North Bound						South Bound						East Bound						West Bound					
Movement:	L	-	T	-	R		L	-	T	-	R		L	-	T	-	R		L	-	T	-	R	
Control:	Protected						Protected						Split Phase						Split Phase					
Rights:	Ignore						Include						Include						Include					
Min. Green:	0		0		0		0		0		0		0		0		0		0		0		0	
Lanes:	0	0	1	0	1		1	0	2	0	0		0	1	0	0	1		0	0	0	0	0	
Volume Module:																								
Base Vol:	0	350	340		145	770	0		20	2	45		0		0		0							
Growth Adj:	1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10		1.10		1.10							
Initial Bse:	0	385	374		160	847	0		22	2	50		0		0		0							
Added Vol:	0	96	0		62	68	0		61	0	0		0		0		0							
PasserByVol:	0	0	0		0	0	0		0	0	0		0		0		0							
Initial Fut:	0	481	374		222	915	0		83	2	50		0		0		0							
User Adj:	1.00	1.00	0.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00		1.00		1.00							
PHF Adj:	0.94	0.94	0.00		0.94	0.94	0.94		0.94	0.94	0.94		0.94		0.94		0.94							
PHF Volume:	0	512	0		236	973	0		88	2	53		0		0		0							
Reduct Vol:	0	0	0		0	0	0		0	0	0		0		0		0							
Reduced Vol:	0	512	0		236	973	0		88	2	53		0		0		0							
PCE Adj:	1.00	1.00	0.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00		1.00		1.00							
MLF Adj:	1.00	1.00	0.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00		1.00		1.00							
Final Vol.:	0	512	0		236	973	0		88	2	53		0		0		0							
Saturation Flow Module:																								
Sat/Lane:	1900	1900	1900		1900	1900	1900		1900	1900	1900		1900		1900		1900							
Adjustment:	1.00	0.97	1.00		0.92	0.92	1.00		0.83	0.83	0.83		1.00		1.00		1.00							
Lanes:	0.00	1.00	1.00		1.00	2.00	0.00		0.97	0.03	1.00		0.00		0.00		0.00							
Final Sat.:	0	1845	1900		1753	3505	0		1528	40	1568		0		0		0							
Capacity Analysis Module:																								
Vol/Sat:	0.00	0.28	0.00		0.13	0.28	0.00		0.06	0.06	0.03		0.00		0.00		0.00							
Crit Moves:		****			****				****															
Green/Cycle:	0.00	0.51	0.00		0.25	0.76	0.00		0.11	0.11	0.11		0.00		0.00		0.00							
Volume/Cap:	0.00	0.54	0.00		0.54	0.37	0.00		0.54	0.54	0.31		0.00		0.00		0.00							
Delay/Veh:	0.0	15.5	0.0		30.8	3.7	0.0		41.7	41.7	38.2		0.0		0.0		0.0							
User DelAdj:	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00		1.00		1.00		1.00							
AdjDel/Veh:	0.0	15.5	0.0		30.8	3.7	0.0		41.7	41.7	38.2		0.0		0.0		0.0							
HCM2kAvg:	0	10	0		7	5	0		4	4	2		0		0		0							

****

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Operations Method
Future Volume Alternative

****

Intersection #8 Glencoe/OR 26 EB

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HCM Ops Adjusted Lane Utilization Module:												
Lanes:	0 0	1 0	1	1 0	2 0	0	0 1	0 0	1	0 0	0 0	0
Lane Group:	xxxx	T	R	L	T	xxxx	LT	LT	R	xxxx	xxxx	xxxx
#LnsInGrps:	0	1	1	1	2	0	1	1	1	0	0	0
HCM Ops Input Saturation Adj Module:												
Lane Width:	12	12	12	12	12	12	12	12	12	12	12	12
CrosswalkWid		8			8			8			8	
% Hev Veh:		3			3			3			0	
Grade:		0%			0%			0%			0%	
Parking/Hr:		No			No			No			No	
Bus Stp/Hr:		0			0			0			0	
Area Type:	< < < < < < < < < < < < < < < < < < Other > > > > > > > > > > > > > > > > > >											
Cnft Ped/Hr:		0			0			0			0	
ExclusiveRT:		Include			Include			Include			Include	
% RT Prtct:		0			0			0			0	
HCM Ops f(lt) Adj Case Module:												
f(lt) Case:	xxxx	xxxx	xxxx	1	xxxx	xxxx	2r	2r	xxxx	xxxx	xxxx	xxxx
HCM Ops Saturation Adj Module:												
Ln Wid Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	1.00	1.00	xxxx	xxxx	xxxxx
Hev Veh Adj:	xxxx	0.97	xxxxx	0.97	0.97	xxxxx	0.97	0.97	0.97	xxxx	xxxx	xxxxx
Grade Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	1.00	1.00	xxxx	xxxx	xxxxx
Parking Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Bus Stp Adj:	xxxx	xxxx	xxxxx	xxxx	1.00	xxxxx	xxxx	xxxx	1.00	xxxx	xxxx	xxxxx
Area Adj:	xxxx	1.00	xxxxx	1.00	1.00	xxxxx	1.00	1.00	1.00	xxxx	xxxx	xxxxx
RT Adj:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	0.85	xxxx	xxxx	xxxxx
LT Adj:	xxxx	xxxx	xxxxx	0.95	xxxx	xxxxx	0.85	0.85	xxxxx	xxxx	xxxx	xxxxx
PedBike 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
HCM Sat Adj:	1.00	0.97	1.00	0.92	0.97	1.00	0.83	0.83	0.83	1.00	1.00	1.00
Usr Sat 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
MLF Sat Adj:	1.00	1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fnl Sat Adj:	1.00	0.97	1.00	0.92	0.92	1.00	0.83	0.83	0.83	1.00	1.00	1.00
Delay Adjustment Factor Module:												
Coordinated:	< < < < < < < < < < < < < < < < < < No > > > > > > > > > > > > > > > > > >											
Signal Type:	< < < < < < < < < < < < < < < < < < Actuated > > > > > > > > > > > > > > > > > >											
DelAdjFctr:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report (HCM2000 Queue Method)
2000 HCM Operations Method
Future Volume Alternative

****

Intersection #8 Glencoe/OR 26 EB

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Green/Cycle:	0.00	0.51	0.00	0.25	0.76	0.00	0.11	0.11	0.11	0.00	0.00	0.00
ArrivalType:		3			3			3			3	
ProgFactor:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Q1:	0.0	8.6	0.0	5.4	4.0	0.0	2.5	2.5	1.2	0.0	0.0	0.0
UpstreamVC:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
UpstreamAdj:	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EarlyArrAdj:	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	0.00	0.00	0.00
Q2:	0.0	1.2	0.0	1.1	0.6	0.0	1.1	1.1	0.4	0.0	0.0	0.0
HCM2kQueue:	0.0	9.8	0.0	6.5	4.6	0.0	3.6	3.6	1.7	0.0	0.0	0.0
70th%Factor:	1.20	1.18	1.20	1.18	1.19	1.20	1.19	1.19	1.20	1.20	1.20	1.20
70th%HCM2kQ:	0.0	11.5	0.0	7.7	5.5	0.0	4.3	4.3	2.0	0.0	0.0	0.0
85th%Factor:	1.60	1.52	1.60	1.54	1.56	1.60	1.57	1.57	1.58	1.60	1.60	1.60
85th%HCM2kQ:	0.0	14.9	0.0	10.1	7.2	0.0	5.6	5.6	2.6	0.0	0.0	0.0
90th%Factor:	1.80	1.65	1.80	1.69	1.72	1.80	1.73	1.73	1.77	1.80	1.80	1.80
90th%HCM2kQ:	0.0	16.1	0.0	11.0	7.9	0.0	6.3	6.3	2.9	0.0	0.0	0.0
95th%Factor:	2.10	1.85	2.10	1.92	1.96	2.10	1.99	1.99	2.05	2.10	2.10	2.10
95th%HCM2kQ:	0.0	18.1	0.0	12.5	9.1	0.0	7.2	7.2	3.4	0.0	0.0	0.0
98th%Factor:	2.70	2.17	2.70	2.31	2.40	2.70	2.46	2.46	2.58	2.70	2.70	2.70
98th%HCM2kQ:	0.0	21.3	0.0	15.0	11.1	0.0	8.9	8.9	4.3	0.0	0.0	0.0

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

****

Intersection #9 Jackson School/West Union

****

Average Delay (sec/veh): 4.2 Worst Case Level Of Service: B[11.8]

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Stop Sign			Stop Sign			Uncontrolled			Uncontrolled		
Rights:	Include			Include			Include			Include		
Lanes:	1	0	0 1 0	0	0	1! 0 0	0	0	1! 0 0	0	0	1! 0 0
Volume Module:												
Base Vol:	10	25	5	10	5	5	10	80	2	5	85	5
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	11	28	6	11	6	6	11	88	2	6	94	6
Added Vol:	75	0	5	0	0	0	0	15	53	6	21	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	86	28	11	11	6	6	11	103	55	12	115	6
User 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
PHF Adj:	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
PHF Volume:	95	30	12	12	6	6	12	113	61	13	126	6
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	95	30	12	12	6	6	12	113	61	13	126	6
Critical Gap Module:												
Critical Gp:	7.2	6.6	6.3	7.1	6.5	6.2	4.1	xxxx	xxxxx	4.1	xxxx	xxxxx
FollowUpTim:	3.5	4.0	3.3	3.5	4.0	3.3	2.2	xxxx	xxxxx	2.2	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	328	325	144	343	352	129	132	xxxx	xxxxx	174	xxxx	xxxxx
Potent Cap.:	620	588	896	608	569	916	1447	xxxx	xxxxx	1385	xxxx	xxxxx
Move Cap.:	602	578	896	568	559	916	1447	xxxx	xxxxx	1385	xxxx	xxxxx
Volume/Cap:	0.16	0.05	0.01	0.02	0.01	0.01	0.01	xxxx	xxxx	0.01	xxxx	xxxx
Level Of Service Module:												
Queue:	0.6	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	xxxxx	0.0	xxxx	xxxxx
Stopped Del:	12.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx	7.5	xxxx	xxxxx	7.6	xxxx	xxxxx
LOS by Move:	B	*	*	*	*	*	A	*	*	A	*	*
Movement:	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT	LT -	LTR -	RT
Shared Cap.:	xxxx	xxxx	641	xxxx	625	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	xxxxx	xxxx	0.2	xxxxx	0.1	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	xxxxx	xxxx	11.0	xxxxx	11.0	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	*	*	B	*	B	*	*	*	*	*	*	*
ApproachDel:		11.8			11.0			xxxxxx			xxxxxx	
ApproachLOS:		B			B			*			*	

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

****

Intersection #9 Jackson School/West Union

****

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	5%			4%			3%			5%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
LaneWidth:	12 feet			12 feet			12 feet			12 feet		

Pedestrian Walk Speed: 4.00 feet/sec
Time Period: 0.25 hour

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #10

Average Delay (sec/veh): 3.3 Worst Case Level Of Service: B[12.3]

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
Control:	Stop Sign				Stop Sign				Uncontrolled				Uncontrolled			
Rights:	Include				Include				Include				Include			
Lanes:	1	0	0	0 1	0	0	0	0 0	0	0	0	1 0	0	1	0	0 0
Volume Module:																
Base Vol:	0	0	0		0	0	0		0	92	0		0	100	0	
Growth Adj:	1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10		1.10	1.10	1.10	
Initial Bse:	0	0	0		0	0	0		0	101	0		0	110	0	
Added Vol:	88	0	33		0	0	0		0	35	95		47	49	0	
PasserByVol:	0	0	0		0	0	0		0	0	0		0	0	0	
Initial Fut:	88	0	33		0	0	0		0	136	95		47	159	0	
User 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	
PHF Adj:	0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90		0.90	0.90	0.90	
PHF Volume:	98	0	37		0	0	0		0	151	106		52	177	0	
Reduct Vol:	0	0	0		0	0	0		0	0	0		0	0	0	
Final Vol.:	98	0	37		0	0	0		0	151	106		52	177	0	
Critical Gap Module:																
Critical Gp:	6.4	xxxx			6.2	xxxxx	xxxx		xxxxx	xxxxx	xxxx		4.1	xxxx	xxxxx	
FollowUpTim:	3.5	xxxx			3.3	xxxxx	xxxx		xxxxx	xxxxx	xxxx		2.2	xxxx	xxxxx	
Capacity Module:																
Cnflict Vol:	485	xxxx			204	xxxx	xxxx		xxxxx	xxxx	xxxx		257	xxxx	xxxxx	
Potent Cap.:	545	xxxx			842	xxxx	xxxx		xxxxx	xxxx	xxxx		1291	xxxx	xxxxx	
Move Cap.:	527	xxxx			842	xxxx	xxxx		xxxxx	xxxx	xxxx		1291	xxxx	xxxxx	
Volume/Cap:	0.19	xxxx			0.04	xxxx	xxxx		xxxx	xxxx	xxxx		0.04	xxxx	xxxx	
Level Of Service Module:																
Queue:	0.7	xxxx			0.1	xxxxx	xxxx		xxxxx	xxxxx	xxxx		0.1	xxxx	xxxxx	
Stopped Del:	13.4	xxxx			9.5	xxxxx	xxxx		xxxxx	xxxxx	xxxx		7.9	xxxx	xxxxx	
LOS by Move:	B	*			A	*	*		*	*	*		A	*	*	
Movement:	LT - LTR - RT				LT - LTR - RT				LT - LTR - RT				LT - LTR - RT			
Shared Cap.:	xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx		xxxx	xxxx	xxxxx	
SharedQueue:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		0.1	xxxx	xxxxx	
Shrd StpDel:	xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		xxxxx	xxxx	xxxxx		7.9	xxxx	xxxxx	
Shared LOS:	*	*	*		*	*	*		*	*	*		A	*	*	
ApproachDel:	12.3				xxxxxx				xxxxxx				xxxxxx			
ApproachLOS:	B				*				*				*			

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #10

Approach:	North Bound				South Bound				East Bound				West Bound			
Movement:	L	-	T	- R	L	-	T	- R	L	-	T	- R	L	-	T	- R
HevVeh:	0%				0%				3%				5%			
Grade:	0%				0%				0%				0%			
Peds/Hour:	0				0				0				0			
Pedestrian Walk Speed: 4.00 feet/sec																
LaneWidth:	12 feet				12 feet				12 feet				12 feet			

Time Period: 0.25 hour

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Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #11

Average Delay (sec/veh): 3.8 Worst Case Level Of Service: A[9.1]

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
Control:	Uncontrolled			Uncontrolled			Stop Sign			Stop Sign		
Rights:	Include			Include			Include			Include		
Lanes:	0 1	0	0 0	0	0 0	1 0	1	0	0 0 1	0	0 0	0 0
Volume Module:												
Base Vol:	0	40	0	0	12	0	0	0	0	0	0	0
Growth Adj:	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Initial Bse:	0	44	0	0	13	0	0	0	0	0	0	0
Added Vol:	96	75	0	0	53	6	5	0	65	0	0	0
PasserByVol:	0	0	0	0	0	0	0	0	0	0	0	0
Initial Fut:	96	119	0	0	66	6	5	0	65	0	0	0
User 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
PHF Adj:	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
PHF Volume:	107	132	0	0	74	7	6	0	72	0	0	0
Reduct Vol:	0	0	0	0	0	0	0	0	0	0	0	0
Final Vol.:	107	132	0	0	74	7	6	0	72	0	0	0
Critical Gap Module:												
Critical Gp:	4.1	xxxx	xxxxx	xxxxx	xxxx	xxxxx	6.4	xxxx	6.2	xxxxx	xxxx	xxxxx
FollowUpTim:	2.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx	3.5	xxxx	3.3	xxxxx	xxxx	xxxxx
Capacity Module:												
Cnflict Vol:	80	xxxx	xxxxx	xxxx	xxxx	xxxxx	422	xxxx	77	xxxx	xxxx	xxxxx
Potent Cap.:	1499	xxxx	xxxxx	xxxx	xxxx	xxxxx	592	xxxx	990	xxxx	xxxx	xxxxx
Move Cap.:	1499	xxxx	xxxxx	xxxx	xxxx	xxxxx	558	xxxx	990	xxxx	xxxx	xxxxx
Volume/Cap:	0.07	xxxx	xxxx	xxxx	xxxx	xxxx	0.01	xxxx	0.07	xxxx	xxxx	xxxx
Level Of Service Module:												
Queue:	0.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx	0.0	xxxx	0.2	xxxxx	xxxx	xxxxx
Stopped Del:	7.6	xxxx	xxxxx	xxxxx	xxxx	xxxxx	11.5	xxxx	8.9	xxxxx	xxxx	xxxxx
LOS by Move:	A	*	*	*	*	*	B	*	A	*	*	*
Movement:	LT - LTR - RT			LT - LTR - RT			LT - LTR - RT			LT - LTR - RT		
Shared Cap.:	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx	xxxx	xxxx	xxxxx
SharedQueue:	0.2	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shrd StpDel:	7.6	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx	xxxxx	xxxx	xxxxx
Shared LOS:	A	*	*	*	*	*	*	*	*	*	*	*
ApproachDel:	xxxxxx			xxxxxx			9.1			xxxxxx		
ApproachLOS:	*			*			A			*		

Kittelson & Associates, Inc. -- Project #6953
North Plains Residential -- City of Bend, Oregon
Year 2015 Total Traffic Conditions, Weekday PM Peak Hour

Level Of Service Detailed Computation Report
2000 HCM Unsignalized Method
Base Volume Alternative

Intersection #11

Approach:	North Bound			South Bound			East Bound			West Bound		
Movement:	L	T	R	L	T	R	L	T	R	L	T	R
HevVeh:	5%			4%			0%			0%		
Grade:	0%			0%			0%			0%		
Peds/Hour:	0			0			0			0		
LaneWidth:	12 feet			12 feet			12 feet			12 feet		

Pedestrian Walk Speed: 4.00 feet/sec
Time Period: 0.25 hour

Weekday PM Analysis

Intersection Summary

akcelik & associates
aaTraffic SIDRA

Polygon North Plains -- Glencoe/West Union Road

Performance Measure	Vehicles	Persons
Demand Flow	1549 veh/h	1859 pers/h
Degree of Saturation	0.509	
Capacity (Total)	4590 veh/h	
95% Back of Queue (ft)	113 ft	
95% Back of Queue (veh)	4.4 veh	
Stop-line Delay (Total)	0.84 veh-h/h	1.01 pers-h/h
Stop-line Delay (Average)	2.0 s/veh	2.0 s/pers
Level of Service	LOS A	
Level of Service (Worst Movement)	LOS A	
Total Effective Stops	1655 veh/h	1986 pers/h
Effective Stop Rate	1.07 per veh	1.07 per pers
Travel Distance (Total)	631.4 veh-mi/h	757.6 pers-mi/h
Travel Distance (Average)	2152 ft	2152 ft
Travel Time (Total)	21.6 veh-h/h	25.9 pers-h/h
Travel Time (Average)	50.2 secs	50.2 secs
Travel Speed	29.2 mph	29.2 mph
Operating Cost (Total)	261 $/h	261 $/h
Fuel Consumption (Total)	28.4 ga/h	
Carbon Dioxide (Total)	269.0 kg/h	
Hydrocarbons (Total)	0.416 kg/h	
Carbon Monoxide (Total)	18.91 kg/h	
NOX (Total)	0.602 kg/h	

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Produced by aaSIDRA 2.0.0.205

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Akcelik & Associates Pty Ltd - aaSIDRA 2.0.0.205

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Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1

aaTraffic SIDRA US Highway Capacity Manual (2000) Version

RUN INFORMATION

* Basic Parameters:
  Intersection Type: Roundabout
  Driving on the right-hand side of the road
  Input data specified in US units
  Default Values File No. 11
  Peak flow period (for performance): 15 minutes
  Unit time (for volumes): 60 minutes (Total Flow Period)
  Delay definition: Stop Line delay
  Geometric delay not included
  HCM Delay and Queue Models option selected
  Level of Service based on: Delay (HCM method)
  Queue definition: Back of queue, 95th Percentile

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1
Roundabout

Table S.0 - TRAFFIC FLOW DATA

Mov No.	Left LV	Left HV	Through LV	Through HV	Right LV	Right HV	Flow Scale	Peak Flow Factor
VEHICLES Demand flows in veh/hour as used by the program								
West: West Approach								
12	159	7	61	3	81	3	1.00	0.89
South: South Approach								
32	114	4	415	13	135	4	1.00	0.89
East: East Approach								
22	24	2	59	4	87	7	1.00	0.89
North: North Approach								
42	61	2	284	9	10	1	1.00	0.89

Based on unit time = 60 minutes.
Flow Scale and Peak Hour Factor effects included in flow values.

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1

Table R.0 - ROUNDABOUT BASIC PARAMETERS

Cent Island Diam (ft)	Circ Width (ft)	Insc Diam. (ft)	No.of Circ. Lanes	No.of Entry Lanes	Av.Ent Lane Width (ft)	Circulating/Exiting Stream Flow (veh/h)	%HV	Adjust. Flow (pcu/h)	%Exit Incl.	Cap. Constr. Effect
West: West Approach										
100	30	160	1	1	13.00	382	3.3	382	0	N
South: South Approach										
100	30	160	1	1	13.00	292	3.8	292	0	N
East: East Approach										
100	30	160	1	1	13.00	711	3.2	711	0	N
North: North Approach										
100	30	160	1	1	13.00	207	4.7	207	0	N

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1
Roundabout

Table R.5 - ROUNDABOUT CAPACITY & LEVEL OF SERVICE - aaSIDRA & HCM MODELS

Mov No.	Dem Flow (veh/h)	aaSIDRA Cap. (veh/h)	aaSIDRA Deg. Satn x	aaSIDRA Av. Delay (sec)	aaSIDRA LOS	HCM 2000 Lower Cap. (veh/h)	HCM 2000 Lower Deg. Satn x	HCM 2000 Lower Av. Delay (sec)	HCM 2000 Lower LOS	HCM 2000 Upper Cap. (veh/h)	HCM 2000 Upper Deg. Satn x	HCM 2000 Upper Av. Delay (sec)	HCM 2000 Upper LOS
West: West Approach													
12 LTR	314	1089	0.288	2.1	A	836	0.376	2.7	B	1025	0.306	2.1	A
		1089	0.288	2.1	A	836	0.376	2.7	B	1025	0.306	2.1	A
South: South Approach													
32 LTR	685	1345	0.509	1.7	A	904	0.758	5.6	B	1101	0.622	2.7	A
		1345	0.509	1.7	A	904	0.758	5.6	B	1101	0.622	2.7	A
East: East Approach													
22 LTR	183	769	0.238	4.7	A	613	0.299	6.0	B	771	0.237	5.0	A
		769	0.238	4.7	A	613	0.299	6.0	B	771	0.237	5.0	A
North: North Approach													
42 LTR	367	1387	0.265	0.9	A	972	0.378	1.3	A	1176	0.312	1.0	A
		1387	0.265	0.9	A	972	0.378	1.3	A	1176	0.312	1.0	A
ALL VEHICLES:		4590	0.509	2.0	A	3325	0.758	4.0	A	4073	0.622	2.4	A

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1

Roundabout

Table R.6 - ROUNDABOUT ALTERNATIVE CAPACITY MODELS

Mov No.	Dem Flow (veh /h)	aaSIDRA Cap. (veh /h)	aaSIDRA Deg. Satn x	NAASRA 1986 Cap. (veh /h)	NAASRA 1986 % Diff from aaSIDRA	Ger. Linear Cap. (veh /h)	Ger. Linear % Diff from aaSIDRA	Ger. GapAcc Cap. (veh /h)	Ger. GapAcc % Diff from aaSIDRA
West: West Approach									
12 LTR	314	1089	0.288	1273	16.9	935	-14.1	913	-16.2
		1089	0.288	1273	16.9	935	-14.1	913	-16.2
South: South Approach									
32 LTR	685	1345	0.509	1389	3.3	1002	-25.5	989	-26.5
		1345	0.509	1389	3.3	1002	-25.5	989	-26.5
East: East Approach									
22 LTR	183	769	0.238	869	13.0	677	-12.0	639	-16.9
		769	0.238	869	13.0	677	-12.0	639	-16.9
North: North Approach									
42 LTR	367	1387	0.265	1502	8.3	1064	-23.3	1062	-23.4
		1387	0.265	1502	8.3	1064	-23.3	1062	-23.4
ALL VEHICLES:	4590	0.509	5033	9.7	3678	-19.9	3603	-21.5	

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1
Roundabout

Table S.3 - INTERSECTION PARAMETERS

Intersection Level of Service	=	A
Worst movement Level of Service	=	A
Average intersection delay (s)	=	2.0
Largest average movement delay (s)	=	4.7
Largest back of queue, 95% (ft)	=	113
Performance Index	=	31.30
Degree of saturation (highest)	=	0.509
Practical Spare Capacity (lowest)	=	67 %
Total vehicle capacity, all lanes (veh/h)	=	4590
Total vehicle flow (veh/h)	=	1549
Total person flow (pers/h)	=	1859
Total vehicle delay (veh-h/h)	=	0.84
Total person delay (pers-h/h)	=	1.01
Total effective vehicle stops (veh/h)	=	1655
Total effective person stops (pers/h)	=	1986
Total vehicle travel (veh-mi/h)	=	631.4
Total cost ($/h)	=	260.94
Total fuel (ga/h)	=	28.4
Total CO2 (kg/h)	=	268.95

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953

Intersection ID: 1
Roundabout

Table S.5 - MOVEMENT PERFORMANCE

Mov No.	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue 95% Back (vehs)	Longest Queue 95% Back (ft)	Perf. Index	Aver. Speed (mph)
West: West Approach									
12 LTR	0.19	0.22	2.1	0.52	1.27	2.1	54	6.80	45.1
South: South Approach									
32 LTR	0.32	0.39	1.7	0.51	1.01	4.4	113	13.55	47.4
East: East Approach									
22 LTR	0.24	0.29	4.7	0.68	1.41	1.7	44	4.32	45.8
North: North Approach									
42 LTR	0.09	0.11	0.9	0.36	0.83	1.9	48	6.63	48.7

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1
Roundabout

Table S.6 - INTERSECTION PERFORMANCE

Total Flow (veh/h)	Deg. Satn x	Total Delay (veh-h/h)	Total Delay (pers-h/h)	Aver. Delay (sec)	Prop. Queued	Eff. Stop Rate	Longest Queue (ft)	Perf. Index	Aver. Speed (mph)
West: West Approach									
314	0.288	0.19	0.22	2.1	0.523	1.27	54	6.80	28.0
South: South Approach									
685	0.509	0.32	0.39	1.7	0.519	1.01	113	13.55	29.5
East: East Approach									
183	0.238	0.24	0.29	4.7	0.685	1.41	44	4.32	28.5
North: North Approach									
367	0.265	0.09	0.11	0.9	0.367	0.83	48	6.63	30.2
INTERSECTION (persons):									
1859	0.509		1.01	2.0	0.504	1.07		31.30	47.0

Queue values in this table are 95% back of queue (feet).

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1
Roundabout

Table S.10 - MOVEMENT CAPACITY AND PERFORMANCE SUMMARY

Mov No.	Mov Typ	Dem Flow (veh /h)	Total Cap. (veh /h)	Lane Util (%)	Deg. Satn x	Aver. Delay (sec)	Eff. Stop Rate	95% Back of Queue (veh)	Perf. Index

West: West Approach									
12 LTR	314	1089	100	0.288	2.1	1.27	2.1	6.80	
South: South Approach									
32 LTR	685	1345	100	0.509*	1.7	1.01	4.4	13.55	
East: East Approach									
22 LTR	183	769	100	0.238	4.7	1.41	1.7	4.32	
North: North Approach									
42 LTR	367	1387	100	0.265	0.9	0.83	1.9	6.63	

* Maximum degree of saturation

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1
Roundabout

Table S.14 - SUMMARY OF INPUT AND OUTPUT DATA

Lane No.	Demand Flow (veh/h) L	T	R	Tot	%HV	Adj. Basic Satf.	Eff Grn (secs) 1st	2nd	Deg Sat x	Aver. Delay (sec)	Longest Queue (ft)	Shrt Lane (ft)
West: West Approach												
1 LTR	166	64	84	314	4				0.288	2.1	54	
	166	64	84	314	4				0.288	2.1	54	
South: South Approach												
1 LTR	118	428	139	685	3				0.509	1.7	113	
	118	428	139	685	3				0.509	1.7	113	
East: East Approach												
1 LTR	26	63	94	183	7				0.238	4.7	44	
	26	63	94	183	7				0.238	4.7	44	
North: North Approach												
1 LTR	63	293	11	367	3				0.265	0.9	48	
	63	293	11	367	3				0.265	0.9	48	

ALL VEHICLES	Total Flow	% HV	Max X	Aver. Delay	Max Queue
	1549	4	0.509	2.0	113

Total flow period = 60 minutes. Peak flow period = 15 minutes.

Queue values in this table are 95% back of queue (feet).

Note: Basic Saturation Flows are not adjusted at roundabouts or sign-controlled intersections and apply only to continuous lanes.

Polygon North Plains -- Glencoe/West Union Road
Weekday PM Peak Hour, Project #: 6953
Intersection ID: 1
Roundabout

Table S.15 - CAPACITY AND LEVEL OF SERVICE

Mov No.	Mov Typ	Total Flow (veh /h)	Total Cap. (veh /h)	Deg. of Satn (v/c)	Aver. Delay (sec)	LOS
West: West Approach						
12 LTR		314	1089	0.288	2.1	A
		314	1089	0.288	2.1	A
South: South Approach						
32 LTR		685	1345	0.509*	1.7	A
		685	1345	0.509	1.7	A
East: East Approach						
22 LTR		183	769	0.238	4.7	A
		183	769	0.238	4.7	A
North: North Approach						
42 LTR		367	1387	0.265	0.9	A
		367	1387	0.265	0.9	A
ALL VEHICLES:		1549	4590	0.509	2.0	A

Level of Service calculations are based on
average control delay including geometric delay (HCM criteria),
independent of the current delay definition used.
For the criteria, refer to the "Level of Service" topic in the
aaSIDRA Output Guide or the Output section of the on-line help.
* Maximum v/c ratio, or critical green periods

--- End of aaSIDRA Output ---

Appendix F

Signal Warrant Analyses

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

Project #: 6953
Project Name: Polygon North Plains
Analyst: JWB
Date: 2/10/2005
File: H:\projfile\6953\excel\[SigWarrant.xls]Data Input

Intersection: NW West Union Rd/NW Glencoe Rd
Scenario: Year 2015 Total Traffic Conditions

Warrant Summary

Warrant	Name	Analyzed?	Met?
#1	Eight-Hour Vehicular Volume	Yes	No
#2	Four-Hour Vehicular volume	Yes	No
#3	Peak Hour	Yes	No
#4	Pedestrian Volume	No	-
#5	School Crossing	No	-
#6	Coordinated Signal System	No	-
#7	Crash Experience	No	-
#8	Roadway Network	No	-

Raw Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	NB	SB	EB	WB
5:00 PM	6:00 PM	486	317	79	204
2nd	Highest Hour	467	304	76	196
3rd	Highest Hour	457	298	74	192
4th	Highest Hour	389	254	63	163
5th	Highest Hour	369	241	60	155
6th	Highest Hour	330	216	54	139
7th	Highest Hour	306	200	50	129
8th	Highest Hour	292	190	47	122
9th	Highest Hour	233	152	38	98
10th	Highest Hour	219	143	36	92
11th	Highest Hour	219	143	36	92
12th	Highest Hour	209	136	34	88
13th	Highest Hour	190	124	31	80
14th	Highest Hour	175	114	28	73
15th	Highest Hour	175	114	28	73
16th	Highest Hour	170	111	28	71
17th	Highest Hour	97	63	16	41
18th	Highest Hour	53	35	9	22
19th	Highest Hour	49	32	8	20
20th	Highest Hour	19	13	3	8
21st	Highest Hour	15	10	2	6
22nd	Highest Hour	15	10	2	6
23rd	Highest Hour	10	6	2	4
24th	Highest Hour	10	6	2	4

Input Parameters

Volume Adjustment Factor =	1.0
North-South Approach =	Major
East-West Approach =	Minor
Major Street Thru Lanes =	1
Minor Street Thru Lanes =	1
Speed > 40 mph?	No
Population < 10,000?	No
Warrant Factor	100%
Peak Hour or Daily Count?	Peak Hour
Major Street: 4th-Highest Hour / Peak Hour	80%
Major Street: 8th-Highest Hour / Peak Hour	60%
Minor Street: 4th-Highest Hour / Peak Hour	80%
Minor Street: 8th-Highest Hour / Peak Hour	60%

Analysis Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	NB	SB	EB	WB
5:00 PM	6:00 PM	486	317	79	204
2nd	Highest Hour	467	304	76	196
3rd	Highest Hour	457	298	74	192
4th	Highest Hour	389	254	63	163
5th	Highest Hour	369	241	60	155
6th	Highest Hour	330	216	54	139
7th	Highest Hour	306	200	50	129
8th	Highest Hour	292	190	47	122
9th	Highest Hour	233	152	38	98
10th	Highest Hour	219	143	36	92
11th	Highest Hour	219	143	36	92
12th	Highest Hour	209	136	34	88
13th	Highest Hour	190	124	31	80
14th	Highest Hour	175	114	28	73
15th	Highest Hour	175	114	28	73
16th	Highest Hour	170	111	28	71
17th	Highest Hour	97	63	16	41
18th	Highest Hour	53	35	9	22
19th	Highest Hour	49	32	8	20
20th	Highest Hour	19	13	3	8
21st	Highest Hour	15	10	2	6
22nd	Highest Hour	15	10	2	6
23rd	Highest Hour	10	6	2	4
24th	Highest Hour	10	6	2	4

Warrant Summary

KITTELSON & ASSOCIATES, INC.
610 SW Alder, Suite 700
Portland, Oregon 97205
(503) 228-5230
Fax: (503) 273-8169

Project #:	6953
Project Name:	Polygon North Plains
Analyst:	JWB
Date:	2/10/2005
File:	H:\projfile\6953\excel\[GlencoePacific.xls]Data Input
Intersection:	NW Glencoe Road/NW Pacific Avenue
Scenario:	Year 2015 Total Traffic Conditions

Warrant Summary

Warrant	Name	Analyzed?	Met?
#1	Eight-Hour Vehicular Volume	Yes	No
#2	Four-Hour Vehicular volume	Yes	No
#3	Peak Hour	Yes	No
#4	Pedestrian Volume	No	-
#5	School Crossing	No	-
#6	Coordinated Signal System	No	-
#7	Crash Experience	No	-
#8	Roadway Network	No	-

Raw Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	NB	SB	EB	WB
5:00 PM	6:00 PM	669	479	28	63
2nd	Highest Hour	642	460	27	60
3rd	Highest Hour	629	450	26	59
4th	Highest Hour	535	383	22	50
5th	Highest Hour	508	364	21	48
6th	Highest Hour	455	326	19	43
7th	Highest Hour	421	302	18	40
8th	Highest Hour	401	287	17	38
9th	Highest Hour	321	230	13	30
10th	Highest Hour	301	216	13	28
11th	Highest Hour	301	216	13	28
12th	Highest Hour	288	206	12	27
13th	Highest Hour	261	187	11	25
14th	Highest Hour	241	172	10	23
15th	Highest Hour	241	172	10	23
16th	Highest Hour	234	168	10	22
17th	Highest Hour	134	96	6	13
18th	Highest Hour	74	53	3	7
19th	Highest Hour	67	48	3	6
20th	Highest Hour	27	19	1	3
21st	Highest Hour	20	14	1	2
22nd	Highest Hour	20	14	1	2
23rd	Highest Hour	13	10	1	1
24th	Highest Hour	13	10	1	1

Input Parameters

Volume Adjustment Factor =	1.0
North-South Approach =	Major
East-West Approach =	Minor
Major Street Thru Lanes =	1
Minor Street Thru Lanes =	1
Speed > 40 mph?	No
Population < 10,000?	No
Warrant Factor	100%
Peak Hour or Daily Count?	Peak Hour
Major Street: 4th-Highest Hour / Peak Hour	80%
Major Street: 8th-Highest Hour / Peak Hour	60%
Minor Street: 4th-Highest Hour / Peak Hour	80%
Minor Street: 8th-Highest Hour / Peak Hour	60%

Analysis Traffic Volumes

Hour		Major Street		Minor Street	
Begin	End	NB	SB	EB	WB
5:00 PM	6:00 PM	669	479	28	63
2nd	Highest Hour	642	460	27	60
3rd	Highest Hour	629	450	26	59
4th	Highest Hour	535	383	22	50
5th	Highest Hour	508	364	21	48
6th	Highest Hour	455	326	19	43
7th	Highest Hour	421	302	18	40
8th	Highest Hour	401	287	17	38
9th	Highest Hour	321	230	13	30
10th	Highest Hour	301	216	13	28
11th	Highest Hour	301	216	13	28
12th	Highest Hour	288	206	12	27
13th	Highest Hour	261	187	11	25
14th	Highest Hour	241	172	10	23
15th	Highest Hour	241	172	10	23
16th	Highest Hour	234	168	10	22
17th	Highest Hour	134	96	6	13
18th	Highest Hour	74	53	3	7
19th	Highest Hour	67	48	3	6
20th	Highest Hour	27	19	1	3
21st	Highest Hour	20	14	1	2
22nd	Highest Hour	20	14	1	2
23rd	Highest Hour	13	10	1	1
24th	Highest Hour	13	10	1	1

Warrant Summary

City of North Plains
31360 NW Commercial Street
North Plains, OR 97133
503-647-5555

UNITED STATES POSTAL SERVICE

9262

97301

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635 Capitol Street NE, Ste 150
Salem, Oregon 97301-2540