

**APPENDIX C**  
**TRAFFIC METHODOLOGY**



# Murphy Road Corridor Study - Traffic Analysis Methodology Memorandum

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This technical memorandum outlines the process for conducting the Murphy Road Corridor Study traffic analysis. Based on the project schedule, an existing conditions memorandum is due in October 2006. Comments were received from City of Bend, Bend MPO and TPAU staff in October, 2006. This memorandum has been revised to reflect these comments.

## Data Collection and Existing Volumes

A total of 13 intersections will be analyzed in this project, based on discussions with the City. The complete list of intersections are identified below in Table 1 and on a study area map included as Figure 1.

TABLE 1  
Murphy Road Corridor Study Intersections

#	Main Street	Cross Street	Jurisdiction
1	SW Powers Road	US 97 (Bend Parkway S) SB Ramps	ODOT
2	SW Powers Road	US 97 (Bend Parkway N) NB Ramps	ODOT
3	SE Parrell Road	SW Powers Road	City of Bend
4	SE 15th Street	SE Ferguson Road / SE Sherwood Forest Drive	City of Bend
5	US 97	SW Ponderosa Drive / SE China Hat Road	ODOT
6	SE Knott Road	SE 15th Street / Tekampe Road	City of Bend
7	SW Brookwood Boulevard	SW Pinebrook Boulevard	City of Bend
8	SE 3rd St	SW Pinebrook Boulevard / Driveway	City of Bend
9	SE 3rd St	SE Murphy Road / Driveway	City of Bend
10	SE Murphy Road	SE Parrell Road	City of Bend
11	SE Murphy Road	SE Country Club Road	City of Bend
12	SE Murphy Road	SE Brosterhous Road	City of Bend
13*	SE Murphy Road	SE 15th Street	City of Bend

TABLE 1  
Murphy Road Corridor Study Intersections

#	Main Street	Cross Street	Jurisdiction
14*	SE Murphy Road	SE 27 <sup>th</sup> Street	City of Bend
15	SE 27 <sup>th</sup> Street	SE Ferguson Road	City of Bend

\* Intersections 13 and 14 (SE Murphy Rd & SE 15<sup>th</sup> Street, and SE Murphy Road and SE 27<sup>th</sup> Street) are potential future intersections. They will only be analyzed in future scenarios.

Full movement traffic counts for study intersections 1-13 were collected on Tuesday, August 29, 2006 for both the AM and PM peak hour periods. Based on recent intersection counts, intersections 1-11 were taken from 7:00 - 9:00 a.m. and 4:00 - 6:00 pm. Historical data on file for intersection 12 (Murphy Rd & Brosterhous Rd), suggested an earlier PM peak period therefore the count was collected at 7:00 - 9:00 a.m. and 3:00 - 6:00 pm. While traffic data was collected for both the AM and PM peak period, only a PM analysis will be conducted as traffic volumes were determined to be higher in the afternoon than the morning. The AM counts may be used at a later date for verifying potential design issues. Intersections 14 and 15 were collected on Tuesday, September 26, 2006 using the same methodology as previous intersections.

As the majority of intersection count data was collected on the same day it is expected there will be no volume data adjustments, such as seasonal adjustments, performed to the data. Any minor volume adjustments would be done to only provide consistent entering/exiting volumes between closely spaced intersections.

The traffic data collected (counts and field inventory) will be compared to the City's TRAFFIX file to ensure an accurate existing conditions analysis.

## Traffic Forecast Methodology

To determine future traffic conditions, the Bend Metropolitan Planning Organization (MPO) travel demand model will be used to produce traffic volume estimates. The decision to use this model was determined by a conference call with the Bend MPO, City of Bend and CH2M HILL staff on August 23rd, 2006. Key to this determination was that ODOT's Transportation Planning Analysis Unit (TPAU) has sufficiently developed the baseline future condition with additional build future scenarios that align with the proposed project conditions, to an extent that it can be used for project analysis. The four scenarios that will be used to provide future traffic volumes for this project are:

- 2030 No-Build - which includes a mixture of STIP, CIP and privately funded road improvement projects
- 2030 Murphy Crossing Scenario - 3 lane connection from Brookwood Road to 15th Street.

These first two scenarios described above are forecasts that have been already modeled by TPAU as part of the on-going planning efforts of the City and Bend MPO. The follow two scenarios are project-specific conditions that will be addressed.

- 2030 Murphy Crossing Scenario Modification A- 3 lane connection from Brookwood Road to 15th Street with 5 lane section from 3rd to 15th Street. (The modeling request will be communicated by Bend MPO staff to TPAU staff.)
- 2030 Murphy Crossing Scenario Modification B - 5 lane section from 3rd to 15th Street with a 3 lane connection from 15th Street to 27th Street. (The modeling request will be communicated by Bend MPO staff to TPAU staff for modeling.)

These future 2030 forecasts are built upon the Bend MPO Existing 2003 calibrated model. This existing model will be used to generate the volume growth between the 2003 and future 2030 demand models. The post-processing of turning movement volumes will follow the guidelines in National Cooperative Highway Research Program (NCHRP) 255 to ensure a valid post-processing technique. The basic forecasting post-process will be to take the traffic growth between the model's calibrated existing (2003) year and the future 2030 forecast conditions and apply that growth to the existing PM peak hour traffic volumes to establish future 2030 traffic volumes. Because of the large study area, the level of detail used to forecast growth will be determined from link volumes. As part of the model effort, detailed select link information will be requested to ensure the appropriate trip assignments.

Two sensitivity analyses will be conducted as part of Task 5 Future Conditions.

a) To ensure that known future developments are included and captured within the model's assumed land use growth. This will consist of comparing the land use (household and employment estimates) associated with the model's traffic analysis zones (TAZs) against the expected land use proposed by these developments.

b) To gauge travel pattern shifts of extending Murphy Road to 27th Street the traffic forecasts will be reviewed to understand how influential this connector has on traffic patterns in the study area. No detailed traffic analysis will be conducted with this scenario.

## Future Baseline Projects

Two future scenarios - the 2030 No-Build and a 2030 Murphy Crossing Scenario - will be analyzed, following discussion with the Bend MPO and the City of Bend. The baseline projects included in these two scenarios are discussed in-detail in Attachment 1 (page 7). The list of projects assumed for the 2030 No-Build condition includes the:

- Cooley Road/US 97 Intersection project
- Empire Avenue connection to 27<sup>th</sup> Street/Butler Market Road
- Deschutes Market Road/US 97 Interchange
- US 97 access management projects

The Murphy Crossing scenario assumes the same committed/no-build projects, projects in the 2020 TSP and extending Murphy Road west across US 97 to Brookwood Boulevard and east to 15th Street. While this scenario includes a different set of future projects as it includes the TSP project list, based on discussions with the City and Bend MPO these projects are expected to not alter the traffic patterns within the project area.

## Traffic Analysis Software and Input Assumptions

Synchro software, version 6, will be used for the intersection analysis. The reported results will be LOS and V/C ratios from the Highway Capacity Manual (HCM) report. The assumptions are listed in Table 2 below.

TABLE 2  
Synchro Operations Parameters/Assumptions

Arterial Intersection Parameters	Condition	
	Existing (2005)	Design Year (2030) No-Build and Build Alternatives
Peak Hour Factor	From traffic count.	- 0.85 for collector streets - 0.90 for minor arterials - 0.95 for major arterials such as US 97 Note: If the existing traffic count has higher PHFs then continue using the existing PHFs.
Conflicting Bikes and Pedestrian per Hour	From traffic count, if not provided, assume 10 peds/bikes per approach	Same as existing
Area Type	"Other" Area	Same as existing
Ideal Saturation Flow Rate per Lane (for all movements)	1800	Same as existing
Lane Width	From As-built or field visit; otherwise 12 feet	Same as existing
Percent Heavy Vehicles	From traffic count, otherwise 2%	Same as existing
Percent Grade	From As-builts, otherwise 0%	Same as existing
Parking Maneuvers per Hour	If on-street parking allowed, assume some maneuvers (approx. 1 maneuver per stall)	Same as existing
Bus Blockages	From field visit, otherwise assume 0.	Same as existing
Intersection signal phasing and coordination	From field visit and signal timing plans	Optimize phase and cycle length, phase sequence and offset (if signals are coordinated)
Intersection signal timing optimization limits	N/A	60 to 120 seconds depending on the number of phases <sup>1</sup>
Minimum Green time	From signal timing plans	For existing signals, same as existing. If additional signal warranted, 10 seconds if no pedestrian time is required
Yellow and all-red time	From signal timing plans	For existing signals, same as existing. If additional signal warranted, (Y) = 4 seconds and (R) = 1 second
Right Turn on Red	From field visit.	From existing conditions, if additional signal, then "allow".
Vehicle Queues	For City intersections: 95th Percentile queue. For ODOT intersections: V/C < 0.70, use 95 <sup>th</sup> Percentile results from Synchro reports For V/C > 0.70, use SimTraffic report (the average of at least 5 runs of 1 hour length with 15-min peak divided out) <sup>1</sup>	Same as existing
Level of service goals for US 97	US 97 (#4) is categorized as a Freight	<b>No-Build:</b> Apply Existing Conditions

TABLE 2  
Synchro Operations Parameters/Assumptions

Arterial Intersection Parameters	Condition	
	Existing (2005)	Design Year (2030) No-Build and Build Alternatives
intersections. <sup>2</sup>	Route on a Statewide Highway (NHS) inside the Urban Growth Boundary in the MPO <b>Posted speed &gt;= 45 mph:</b> Major Road V/C threshold = 0.80 Side-street V/C threshold is 0.90	V/C Thresholds <b>Build Alternatives:</b> <b>Posted speed &gt;= 45 mph:</b> Major Road V/C threshold = 0.75 Side-street V/C threshold is 0.85
Level of service goals for City jurisdiction intersections. <sup>3</sup>	Two-Way Stop Control – average delay for critical lane group less than or equal to 50 seconds. All-way stop control – average delay for the intersection less than or equal to 80 seconds. Roundabout – volume to capacity ratio for the intersection less than or equal to 1.0. Signalized intersection – the volume to capacity ratio for the intersection less than or equal to 1.0.	Same as existing

1- The simulation will be for one hour with the peak 15-minutes in the first 15 minutes. The results from this simulation will be applied to signalized and unsignalized intersections. Instructions provided by TPAU.

2- Existing and No-Build V/C thresholds from the Oregon Highway Plan (OHP) Adopted 2005 Amendments, Build V/C thresholds from the Highway Design Manual, Table 10-1.

3- City of Bend Development Code; Chapter 4.7.400 (B) - Operations Standards

# Attachment 1

COMMITTED/NO-BUILD PROJECT LIST



### Road Improvement Projects Constructed or Under Construction

Map #	Sponsor	Road	From	To	Improvement
1	City	27th Street	Forum Shopping Center	Neff Road	Widen to 4 thru lanes plus center turn lane
2	City	15th Street	US20/Greenwood	Bear Creek Road	New 2 lane connection
3	City	Empire Avenue	Lower Meadow Drive	High Desert Lane	New 2 lane connection
4	City	Hunnell Road	Robal Rd	Cooley Rd	Full connection

### Road Improvement Projects Funded in STIP or CIP

Map #	Sponsor	Road	From	To	Improvement
5	City/ODOT	Cooley Road	US97		At-grade improvement (graphic attached)
6	City	Empire Avenue	Purcell	Butler Mkt/27th St	New 2 lane connection w/center turn lane
8	ODOT	US97	Parkway	China Hat Road	Install median barrier (Right-in/Right-Out access)

### Privately Funded Road Improvements Included in Approved Developments

Map #	Sponsor	Road	From	To	Improvement
9	Private	Skyline Ranch Rd	Skyliner Road	Century Drive	New 2 lane road
10	Private	American Lane	Carmen Loop	Brosterhous	Realign and modernize. Remove sharp turn at N end of Foxborough subdivision.
11	Private	Metolius Drive	Skyliner Ranch Road	existing Metolius Dr	May not be in model network
12	Private	New E-W Collector	Mt Washington	Shevlin Park Rd	New 2 lane road
13	Private	New N-S Collector	New Road (#12 above)	Galveston	New 2 lane road

### Traffic Signal Projects Funded in STIP or CIP

Map #	Sponsor	Road	From	To	Improvement
19	City	Empire Avenue	Boyd Acres Rd		Signal
20	ODOT	Reed Market Road	US97		Traffic signal at NB off-ramp termini