Appendix 2C Sample Methodology Memorandum

STATE OF OREGON

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File Code:

Date: [Current Date]

TO: **Project Manager and Reviewers**

FROM: **Transportation Analyst**
Senior Transportation Analyst

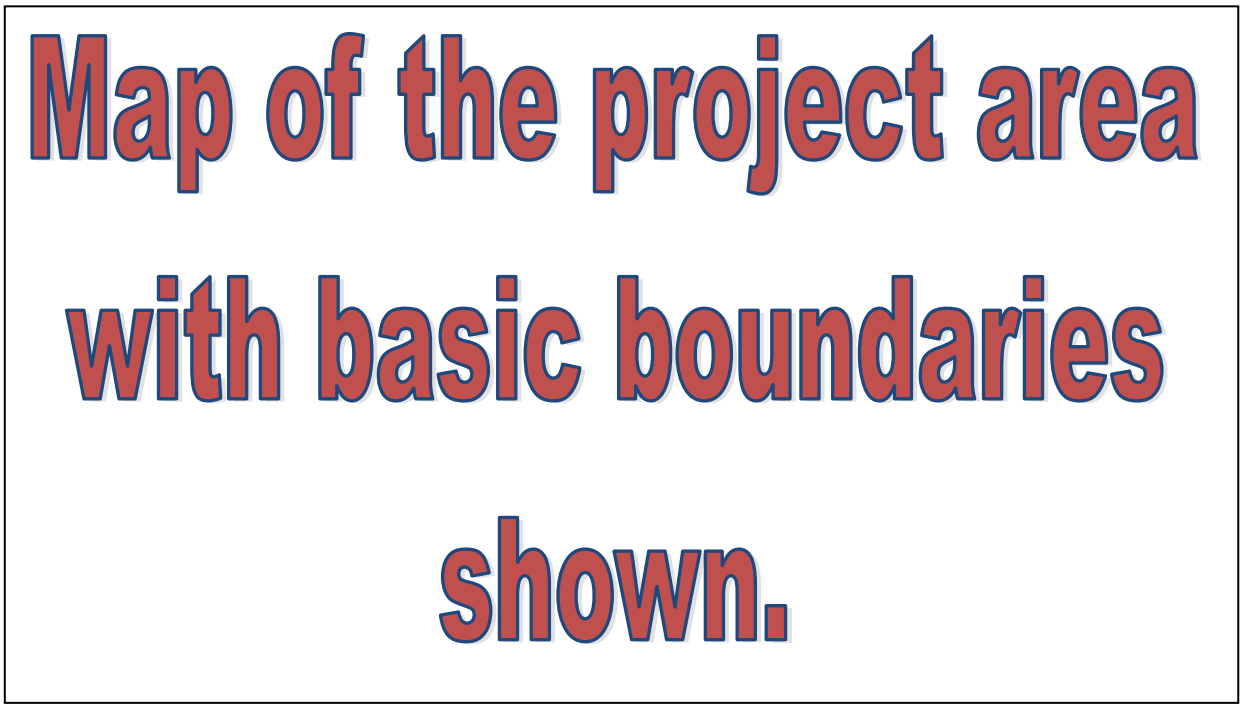
SUBJECT: **[Project Name] Methodology and Assumptions Memorandum**

[Provide introduction and purpose of memorandum. Provide reference to the Scope of Work.]
This memorandum documents the methodology and key assumptions to be used in generating the existing and future conditions analyses for the Project. The methodologies included in this memorandum will be used to analyze the transportation networks associated with this project. The Oregon Department of Transportation (ODOT) *Analysis Procedures Manual* (APM) will guide the methodologies and assumptions for this analysis.

Study Area

[Describe the extent of the study area. Provide a figure showing study area boundaries.]
The study area includes the city limits of River City as well as the nearby directly affected intersections on Main Street, Interstate, and Park Street. Figure 1 shows the study area extent.

Figure 1: Project Area



Study Intersections

[List study intersections in tabular form. Include how they will be evaluated.]
Existing intersections within the study area that are directly affected by the proposed changes to the project area will be analyzed according to the ODOT Analysis Procedure Manual (APM). Intersections will be evaluated for the operational, multimodal, and safety analysis using current methodologies detailed in the APM.

The study intersections include these as a minimum:

- 1st St & Main St
- 2nd St & Main St
- 3rd St & Main St
- 4th St & Main St
- Park St & Main St
- Park St & A Ave
- Park St & B Ave

The future 2038 conditions will include all approved and funded changes to the project area.

Volume Development

2013 Base Year Volumes

[Indicate Base Year and list all traffic counts by location, date and type. Identify count sources. Note any issues or considerations.]

Traffic counts and related completed volumes at the study intersections were mostly gathered from the recent TSP for consistency. Due to current construction within the project area, all new counts could not be obtained. Counts at locations not included in the TSP will be adjusted to 2013 conditions according to the APM. Table 1 shows the traffic count information.

Table 1: Traffic Count Summary

TSP Counts- 2013 Volumes Available		
ODOT Intersections		
Intersection	**Count Date**	**Count Type**
1st St & Main St	7/4/2010	16 hr
2nd St & Main St	7/14/2010	24 hr
3rd St & Main St	9/17/2012	3 hr
4th St & Main St	9/17/2012	3 hr
Park St & Main St	9/17/2012	3 hr
Local Intersections		
Park St & A Ave	9/17/2012	3 hr
Park St & B Ave	11/14/2012	3 hr
Needed Counts		
ODOT Intersections		
Intersection	**Suggested Count Date**	**Suggested Count Type**
Interstate North Ramp and Park St	9/2014	24 hr
Interstate South Ramp and Park St	9/2014	24 hr
Local Intersections		
Park St & C Ave	9/2014	3 hr

Seasonal Adjustment Factor

[Provide a summary of seasonal adjustment process including a table of resulting factors. The seasonal adjustment process needs to illustrate the steps followed in selecting the adjustment factors.]

The volumes used from the 2013 TSP have already been adjusted. The counts that will be used in this analysis that are new will need to be adjusted to the 30th highest hour conditions (30HV). In order to remain consistent with the TSP volumes, the counts will be seasonally adjusted using the factors from the TSP. Where the counts were taken in a different month than the TSP counts, historical Seasonal Trends and Automatic Traffic Recorder (ATR) data will be used. The processes used for the seasonal adjustment factors are detailed below.

On-Site ATR Method

The on-site ATR method is employed when there is an ATR within the project area or near the project area. There are no ATRs within the project area; therefore the on-site ATR method is not possible for the new count locations.

ATR Characteristic Table

The ATR Characteristic Table is used when there is not an ATR available on-site to provide for the seasonal adjustment factor. It is a table that contains all of the ATRs and

some general characteristics that allow calculations using ATRs that are on roadways with similar characteristics. This method was used in average with the seasonal trend table during the TSP calculation of the seasonal adjustment factors. For the counts on Park St and the Interstate ramp terminals the characteristic method was averaged with the commuter trend (representing Park Street) to better represent the ramp traffic. For the new count locations seasonal adjustment factors from the TSP were used when possible.

ATR Seasonal Trend Table

The seasonal trend table is only to be used when there is not an ATR within, or near the project area and when there is not an ATR that is representative of the area. These seasonal factors will be used to adjust new counts taken during the same months as those counts taken for the TSP. The counts taken during different months will be adjusted appropriately using the 2013 Seasonal Trend Table. The seasonal trend table from 2013 with the used seasonal trends is shown in Table 2 and the resulting final seasonal adjustment factors are shown in Table 3.

Table 2: Seasonal Trends

2013 Seasonal Trend Table			
Trend	**1-Aug**	**15-Aug**	**Peak**
Commuter	0.9484	0.9424	0.9424

Table 3: Final Seasonal Adjustment Factors

Main St		
Month	**Factor**	**Source**
July	1.01	2013 TSP
September	1.03	2013 TSP
November	1.10	2013 TSP
Local Network		
Month	**Factor**	**Source**
July	1.01	2013 TSP
August	0.9424	Seasonal Trend Table
September	1.02	2013 TSP
November	1.07	2013 TSP
Interstate		
Month	**Factor**	**Source**
September	1.10	2013 TSP
Interstate Ramps		
Month	**Factor**	**Source**
September	1.06	2013 TSP

Historical Growth Adjustment

[Provide explanation of any historical growth factors used to adjust counts to Base Year.] All of the extra non-TSP counts also need to be adjusted to the 2013 base year of the project. The adjustment process utilizes the Future Volume Tables (FVT) which are updated annually. Although an R-squared of 0.75 is preferred, an R-squared value of 0.5 or higher is acceptable. If the R-square value is unacceptable then location with similar

characteristics and within a nearby location should be substituted. In areas covered by a Travel Demand Model the R-squared value is replaced by the word "MODEL." In this case the growth rate is determined by the model, future year divided by base year.

2038 Future Year Volumes

[Provide explanation of how Future Year volumes will be calculated. Identify the horizon year.]
Future volume data will be calculated using the Model travel demand model version 3.1 (or 4.1 if deemed ready at time of application). The 2038 volumes calculated using the model will be post-processed according to the APM and used for the future analysis of the study area. The volumes will be post-processed on the link level and then turning movements will be created using select-links and turning movement count proportions (if applicable).

Traffic Analysis

Intersection Operational Standards

[Identify all applicable operational targets and standards for all jurisdictions in the study area.]
The study area falls within the Model boundaries and the state jurisdiction operational standards used will be guided by Table 6 of the 1999 Oregon Highway Plan (OHP). The Volume-to-Capacity (v/c) ratio is used as a standard measure of intersection operations. The HDM and OHP provide different targets that are used for different purposes. The OHP mobility targets assist in the planning phase and help determine future system deficiencies. The HDM are used to develop a 20 year design life option that addresses said future deficiencies. Each roadway classification will be compared to its appropriate standard from the OHP and HDM.

Table 4: V/C Ratio Targets & LOS Standards

Roadway	Standard/Target				
	LOS	HDM	OHP	City	County
Main Street	--	0.85	0.95	--	--
Interstate Mainline	--	0.75	0.85	--	--
Interstate Interchange Ramp Terminals	--	0.75	0.85	--	--
Park Street	--	--	--	0.90	--
Local Streets	LOS D	--	--	--	--

Screening Level Analysis

[Identify the overall analysis process to be used to evaluate alternatives.]
A specified number of different model land-use and network scenarios may be screened in order to identify those alternatives that are best suited for the Rivendell area. The different alternatives will be compared with the baseline 2038 future year no-build

scenario as well as with each other. Using screen-lines and volumes at key locations, percent change and demand-to-capacity ratio will be used as screening measures. A table will be provided in the screening memorandum that contains a summary of the findings and recommendations will be made based on those findings. The findings in the screening level analysis will help determine which alternatives will be moved forward into the detailed analysis.

Analysis Parameters

[Identify in tabular form the major analysis parameters and assumptions used.]
Parameters for traffic analysis will be gathered using varying sources and methodologies. The 2013 TSP will be used as a main source, when possible, for consistency and simplicity. Data needed that is not available in the TSP will be gathered via pre-construction historical aerial photos as well as site visits when possible. Table 5 lists some of the possible sources that will be used on specific parameters.

Table 5: Analysis Parameters

Parameter	Description	Source
Intersection/Roadway Geometry	# of lanes, lane configuration, signal phasing, cross-sectional information	TSP, aerial photos, field measurements
Operational Data	posted speeds, intersection control, parking, transit, rail crossings	TSP, Oregon digital video log, straight line charts, GIS data, aerial photos, local knowledge
Peak Hour Factor	PHF	TSP, calculated
Traffic Volumes	AADT, DHV	TSP, calculated from new counts
Signal Timing Data	Phasing, coordination, clearance timing	TSP, ODOT Region, City
Traffic Operations	v/c, LOS	Calculated using 2010 HCM
Queuing	95th percentile	SIDRA 6.1[1]

Operational Analysis

[Identify chosen analytical software and version and how being used. Indicate major changes from default values for both Base Year and Future Years. Include microsimulation details including data approach, calibration thresholds, tolerances and mention of the Vissim Protocol or the APM Simulation chapter as appropriate.]

Both existing and future conditions will be analyzed using Sidra Intersection v 6.1 analysis software. Sidra is a lane-based deterministic software and does not involve simulation. Queues determined by Sidra will be 95th percentile queues and volume to capacity (v/c) ratios calculated are only the highest v/c for the intersection. Therefore critical v/c for signalized intersections will

[1] If micro-simulation is necessary it will be completed in SimTraffic Version 8 following the simulation guidelines in the APM.

need to be calculated by hand using the Highway Capacity Manual (2010 HCM) process. Sidra changes from default for analysis can be found in Table 6.

Table 6: Changes from Default

Sidra Program Assumptions	Change from Default
Performance Measure	Degree of Saturation
Basic Saturation Flow Rate	1750 vph
Capacity Model	US HCM 2010
Walking Speed	3.5 ft/sec
Crossing Speed	3.5 ft/sec
Growth Rate	From MPO model
Signal Analysis	Actuated
Max Cycle Length	120 Sec
Yellow and all red (unless timing plan available)	Table 7-20 in APM (Round to nearest whole second)
Priority Inputs	Review for yielding to pedestrians.

Existing Conditions (2013)

Existing conditions will be gathered from the 2013 TSP when possible, and will be supplemented by field visits (when location is not affected by construction) or by historical aerial photos and documents. Table 7 shows some existing condition information and where the information originates.

Table 7: Existing Conditions

Intersection Parameters	Existing Conditions
Peak Hour Factor	Traffic Counts/2013 TSP
Saturation Flow Rate	1750 vph
Lane Width	12 ft, and field observations
Percent Heavy Vehicles	Traffic Counts/2013 TSP
Signal Phasing and Timing	ODOT/City
Minimum Green	Timing Plans
Yellow/All Red	Timing Plans
95th Percentile queue	Sidra Output

Future Conditions (2038)

Alternatives that are chosen from the screening level analysis will be analyzed and compared to the future no-build scenarios. The future no-build scenario will include any state and local transportation improvements that are financially constrained. In the case that the 2038 scenario has deficiencies, analysis to approximate the year it occurs will be completed. For all unsignalized intersections with v/c ratios meeting or exceeding mobility targets, average daily traffic-based Preliminary Signal Warrants (PSW) will be completed to determine if any control improvements are recommended. Two-way stop, four-way stop, right/left turn channelization, signals, and roundabouts will be explored based on analysis results and the PSWs. Table 8 shows some of the assumptions that will be made for future conditions.

Table 8: Future Conditions

Intersection Parameters	Future Conditions
Peak Hour Factor	Traffic Counts/2013 TSP
Saturation Flow Rate	1750 vph
Lane Width	Designated by alternative
Percent Heavy Vehicles	Traffic Counts/2013 TSP
Signal Phasing and Timing	APM Defaults
Minimum Green	APM Defaults
Yellow/All Red	APM Defaults
95th Percentile queue	Sidra Output

Crash Analysis

[Provide explanation on how safety analysis will be performed including screening for Base, Future and Alternatives Analyses.]

Five years of crash data (2009-2013) will be reviewed and analyzed for potential crash patterns. An overall assessment of crash types, severities, and trends will be completed. For intersections within the 2013 TSP crashes analysis will be summarized from those findings. The last three years of the Safety Priority Index System (SPIS) will be analyzed to determine if any Top 5% or 10% sites exist within the project area.

Intersection crash rates will be compared to the published intersection 90th percentile crash rates and the HSM Critical Crash Rate using the statewide external reference population mean crash rate (APM Table 4-1). Comparing to the statewide external reference population is necessary because there are not enough intersections within the study area to create a proper reference population. Interstate segment crash rates will be compared to Table II in the Crash Rate Table. Average Daily Traffic volumes developed for traffic analysis will be used in the crash analysis calculations. All locations exceeding the 90th percentile crash rate, the Table II rate, flagged by the HSM method, or Top 5% or 10% SPIS Site will be flagged as a potential safety issue. These "issues" will be mapped on a figure and crash patterns/causes will be identified and described.

Qualitative MMLOS

[Provide explanation of how multimodal analysis will be performed for the Base, Future and Alternatives Analyses.]

This multimodal assessment methodology is a qualitative version of the 2010 HCM Multimodal Level of Service (MMLOS) method. It uses roadway characteristics to provide subjective ratings such as excellent, good, fair or poor for each of the pedestrian, bicycle, and transit modes. The MMLOS that was calculated for the 2013 TSP will be used when possible for simplicity and consistency. Roadway characteristics will be gathered from the existing TSP and from historical aerials to reconstruct 2013, pre-construction conditions. A table for the project area and intersections will be provided with a summary of the qualitative ratings in the current and future memorandums. Comparison of the final alternatives will also be completed using the qualitative MMLOS.

If you have any questions, please call the analyst at xxx-xxx-xxxx or email at analyst@ODOT.STATE.OR.US

cc: Interested Parties