



## MEMORANDUM

Date: August 26, 2019  
To: Bonnie Gow, *Washington State Department of Transportation*  
From: Kara Hall and Don Samdahl  
**Subject: West Plains Sub Area Land Use & Trip Generation Methodology**

*SE18-0645*

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This memorandum summarizes the approach for developing the 100% Build Out Land Use estimates and trip generation rates for the West Plains Area. An overview of the market based analysis completed as part of this effort and the methodology to be used for traffic forecasting is also summarized below.

### **100% Build Out Land Use & Trip Generation**

As estimate of land use information including square feet of development and corresponding number of employees and the number of potential dwelling units in the West Plains are based on current zoning was developed in order to establish an understanding of what could develop in the Urban Growth Area (UGA).

#### **Land Use**

Using the best available zoning information for the area, land use estimates for the 100% Build Out scenario were developed using a methodology consistent with the *2015 Land Quantity Analysis Result and Methodology* produced for the City of Spokane.

Beginning with zoning information for the City of Airway Heights, City of Spokane, and Spokane County, zoning information for the area was disaggregated to the Traffic Analysis Zone (TAZ) level. This produced land use by zoning code for each TAZ.

This data was then converted to acres, and two factors were applied. A market factor, consistent with documentation in the report developed for the City of Spokane, reduced the land expected to



develop over the planning horizon by 30 percent. A second factor applied a 20 percent reduction in available land to account for necessary infrastructure to support development. The result yielded an estimate of developable land by TAZ.

The analysis then used City of Airway Heights, Spokane County, and the City of Spokane guidelines for dwelling units per acre and allowable building coverage to develop estimates of square feet of expected development. Finally, factors for employees per thousand square feet developed for the *Industrial Land Use Study for Spokane County* (2010) were applied to the square footage estimates to determine the expected number of employees by land use for the 100% Build Out scenario for industrial uses. As this study did not provide estimates of employee per thousand square foot for other uses, factors consistent with the market based analysis were used for commercial employment. Estimates for the number of dwelling units and employees expected under the 100% Build Out scenario are summarized in **Attachment A**.

### **Trip Generation**

Expected PM peak hour vehicle trip generation estimates were developed for the 100% Build Out scenario using the number of employees expected and trip generation rates from the *Institute of Traffic Engineers (ITE) Trip Generation Manual, 10<sup>th</sup> Edition*. Trip rates per employee were used for retail, industrial, and commercial land uses, while trip rates per dwelling unit for single-family and multi-family home were used to determine expected trip generation for residential uses.

Trip generation estimates for several special generator land uses in the area were developed separately due to limited land use information and expected differences from standard ITE trip generation rates. Special generators are described in detail below.

### **Market-Based Analysis**

An independent market-based development forecast was completed to identify net new development estimates on vacant and under-utilized sites. Documentation for that assessment is provided in a separate memorandum; however, findings are summarized in **Attachment B**.

### **Special Generators**

There were several locations within the study area where Special Generator land use estimates were needed. These occurred in two situations: (1) locations where limited information was available regarding future land use plans, and (2) where the identified land uses were not expected to generate trips consistent with rates documented in the ITE Trip Generation Manual. These areas



and land uses were identified as Special Generators, for which land use estimates and trip generation rates were developed with a different methodology than the process described above.

Projects and areas identified as Special Generators in the West Plains Area included the following:

- Fairchild Air Force Base (FAFB)
- Kalispel Tribal Lands
- Spokane Tribal Lands
- Amazon Distribution Center
- Spokane International Airport

The methodology used to develop the number of employees and trip generation rates for each area/land use is documented below.

### **Fairchild Air Force Base**

Land use and trip generation estimates for FAFB were developed using the best available information provided by Air Force representatives on the Technical Advisory Committee. For future land use and employee estimates, an existing baseline was established using the 2016 Fiscal Statement for FAFB.

This statement provides information on the number of Active Duty, National Guard, and Reserve members stationed at FAFB. Information on the number of civilians and total personal were also provided. Based on the best available information, the analysis also identified 200 Active Duty Airmen who were recently stationed at FAFB, along with plans to add of 600 Active Duty Airmen in the future.

To ensure a conservative estimate of future growth, it was assumed that as additional Airmen were added the total personnel on base were also assumed to increase. As a result, ratios between Active Duty Airmen and all other personal groups were assumed to remain constant with future growth. To establish a current baseline, the 200 Active Duty Airmen were added to the 2016 personnel. All other personnel were increased proportionally. To develop projected numbers to be utilized in the trip generation analysis, an additional 600 Airmen were then added to the baseline numbers with respective growth across all base personnel. Current and project employment numbers for FAFB are summarized in **Attachment C**, FAFB Build Out Land Use.

Trip generation for FAFB was developed using data collected at the main gate for the Air Force Base. Using the established baseline numbers for personnel and traffic counts collected at US 2 and



Mitchell Street, a trip rate per person was developed. The trip rate was found to be 0.10 trips per employee during the PM peak hour.

### **Kalispel Tribal Lands**

Limited information was available regarding future development plans for the Kalispel Tribal Lands. However, expected trip generation information for the area was provided by the Kalispel Development Company.

Using the expected trip generation for the area and the trips per employee for retail land uses from the ITE Trip Generation Manual, an equivalent number of retail employees needed to match the expected trip rate was calculated. This information is summarized in **Attachment D**.

### **Spokane Tribal Lands**

Information for the Spokane Tribal Land in the study area is documented in the *West Plains Development Trip, Traffic Impact Analysis (April 28, 2011)*. Proposed land uses and expected trip generation in the study area are summarized in the document.

As most of the proposed land uses would be considered retail uses, employee estimates for this area were developed consistent with methodology for the Kalispel Tribal Lands documented above.

The ITE Trip Generation rate for trip per employee was used to determine the number of equivalent retail employees needed to match the expected trip generation rate. Information for this Special Generator is summarized in **Attachment D**.

### **Amazon Distribution Center**

Information for the Amazon Distribution Center is documented in the *Project Rose Traffic Impact Analysis (May, 2018)*. Per the document, the proposed distribution center will provide 2,560,000 square feet of warehousing and distribution. As noted in the traffic impact analysis for this project, Amazon Distribution Centers tend to generate a much higher trip rate than typical warehousing uses. A trip generation study for similar fulfillment centers was completed as part of the Traffic Impact Analysis, which resulted in an expected trip generation for the Project Rose site of 1.25 trips/1,000 square feet (KSF) or 0.90 trips per employee.

The typical trip generation rate per employee for industrial uses is 0.49 trips per employee. In order to account for the higher trip generation expected from this site, the number of employees



expected for this site was factored up. **Attachment D** summarizes the expected trip generation and model inputs for Project Rose.

### **Spokane International Airport**

Two factors are expected to contribute to growth in the area controlled by Spokane International Airport. The first is continued growth in operations at Spokane International Airport, including the future addition of a third runway. The second factor is growth in development on land around the airport, which is expected to be developed by a mix of commercial and industrial uses. Land available for development was considered as described in the 100% Build Out scenario above; however, growth associated with airport operations was considered separately and is described below.

The best available metric to estimate growth associated with airport operations was determined to be the number of enplanements. The number of enplanements in 2015 was used to establish a baseline along with employment data. Using the number of enplanements and the number of employees, determined using On the Map Census data, a baseline number of employees per enplanement was established. Using the number of employees per enplanement and the forecasts for 2030 enplanements from the Spokane International Airport Master Plan a future number of employees was calculated. Calculations for the airport land use are summarized in **Attachment E**.

### **Traffic Forecasting Approach**

This section describes how the results of the land use analysis and trip generation calculations described above are planned to be incorporated by WSDOT into the regional travel demand model for the West Planes area. Model scenarios developed for this project will include:

- Base Year (2019)
- Future Year (Market Based Land Use)
- Future Year (100% Build Out Land Use)

In order to validate trip generation from the land uses in the 2040 travel demand model, the following five dynamic tests will be performed to determine trip generation rates assumed in the model TAZ identified within the study area:

- Add 100 single family dwelling units
- Add 100 multifamily dwelling units



- Add 100 non-CDB retail employees
- Add 100 office employees
- Add 100 industrial employees

The PM peak hour trips generated before adding the test land uses will then be compared to the PM peak hour trips generated after adding the test land uses to verify the trip rates assumed in the travel demand model for each land use type. These rates will be compared to trip generation rates found in the current Institute of Transportation Engineers (ITE) manual and summarized as part of the effort described above.

Through this process a proposed multiplier will be identified for each of the land use types. This multiplier will then be applied to the appropriate land use types for each TAZ in the study area. Through an iterative process, the trips generated with the proposed multiplier will be compared to the expected generation. This process will need to be iterated until it is determined that the trips generated from the travel demand model and the expected trip generation rates are within an acceptable threshold (approximately +/- 10%).

**A. Western Plains Sub-Area Full Buildout**

Jurisdiction	TAZ	Zoning	Total Acreage	Acreage after Market Factor & Non Buildable Lands (50%)	Allowed Building Coverage (%)	Max Density (du/acre)	Total DU	Building Area (KSF)	Total SF (Current)	Employee/ KSF	Total Employees (Allowed)
Spokane County	459	Rural Traditional	289	145	-	0.1	14	-	-	-	-
Spokane County	460	Rural Traditional	614	307	-	0.1	30	-	-	-	-
Spokane County	463	Rural Traditional	387	194	-	0.1	19	-	-	-	-
Spokane County	544	Rural Traditional	249	124	-	0.1	12	-	-	-	-
Spokane County	546	Rural Traditional	79	39	-	0.1	3	-	-	-	-
Spokane County	547	Rural Traditional	67	33	-	0.1	3	-	-	-	-
Spokane County	549	Rural Traditional	87	43	-	0.1	4	-	-	-	-
Spokane County	556	Rural Traditional	687	344	-	0.1	34	-	-	-	-
Spokane City	460	Light Industrial	584	292	50%	-	-	6,359	-	1.23	7,821
Spokane City	546	Light Industrial	29	14	50%	-	-	312	-	1.23	384
Spokane City	547	Light Industrial	226	113	50%	-	-	2,463	-	1.23	3,029
Spokane City	550	Light Industrial	891	445	50%	-	-	9,701	-	1.23	11,933
Spokane City	551	Light Industrial	132	66	50%	-	-	1,433	-	1.23	1,762
Spokane City	552	Light Industrial	67	34	50%	-	-	730	-	1.23	898
Spokane City	556	Light Industrial	315	158	50%	-	-	3,435	-	1.23	4,225
Spokane County	460	Light Industrial	396	198	50%	-	-	4,309	-	1.23	5,300
Spokane County	463	Light Industrial	8	4	50%	-	-	89	-	1.23	109
Spokane County	551	Light Industrial	472	236	50%	-	-	5,145	-	1.23	6,328
Spokane County	552	Light Industrial	66	33	50%	-	-	721	-	1.23	887
Spokane County	553	Light Industrial	313	156	50%	-	-	3,405	-	1.23	4,188
Spokane County	556	Light Industrial	1280	640	50%	-	-	13,943	-	1.23	17,150
Spokane County	558	Light Industrial	327	163	50%	-	-	3,559	-	1.23	4,377
Spokane County	559	Light Industrial	844	422	50%	-	-	9,186	-	1.23	11,299
Airway Heights	459	C-1. Light Commercial	22	11	60%	-	-	286	-	1.23	352
Airway Heights	464	C-1. Light Commercial	29	15	60%	-	-	382	-	2	764
Airway Heights	459	C-2. General Commercial	56	28	60%	-	-	728	-	2	1,456
Airway Heights	462	C-2. General Commercial	139	70	60%	-	-	1,818	-	2	3,636
Airway Heights	464	C-2. General Commercial	306	153	60%	-	-	3,996	-	2	7,991
Airway Heights	459	I-1. Light Industrial	37	18	60%	-	-	480	-	1.23	590
Airway Heights	461	I-1. Light Industrial	335	167	60%	-	-	4,378	-	1.23	5,384
Airway Heights	464	I-1. Light Industrial	142	71	60%	-	-	1,858	-	1.23	2,285
Airway Heights	459	I-2. Heavy Industrial	81	40	60%	-	-	1,057	-	1.23	1,300
Airway Heights	460	I-2. Heavy Industrial	29	15	60%	-	-	383	-	1.23	471
Airway Heights	461	I-2. Heavy Industrial	85	42	60%	-	-	1,106	-	1.23	1,360
Airway Heights	464	I-2. Heavy Industrial	679	340	60%	-	-	8,878	-	1.23	10,919
Airway Heights	459	R-1. Single-Family Residential	253	127	-	5	632	-	-	-	-
Airway Heights	546	R-1. Single-Family Residential	40	20	-	5	99	-	-	-	-
Spokane County	552	Low Density Residential	133	67	-	6	399	-	-	-	-
Spokane County	553	Low Density Residential	535	268	-	6	1606	-	-	-	-
Spokane County	558	Low Density Residential	625	312	-	6	1874	-	-	-	-
Spokane County	559	Low Density Residential	145	73	-	6	435	-	-	-	-
Spokane County	579	Low Density Residential	85	42	-	6	254	-	-	-	-
Airway Heights	459	RM. Manufactured Housing	59	29	-	7	206	-	-	-	-
Airway Heights	464	RM. Manufactured Housing	35	17	-	7	120	-	-	-	-
Airway Heights	459	R-2. Duplex Residential	35	18	-	10	176	-	-	-	-
Airway Heights	546	R-2. Duplex Residential	6	3	-	10	28	-	-	-	-
Spokane City	553	Residential 4-10	2	1	-	10	10	-	-	-	-
Spokane City	559	Residential 4-10	6	3	-	10	29	-	-	-	-
Spokane County	552	High Density Residential	5	2	-	15	34	-	-	-	-
Spokane County	558	High Density Residential	17	8	-	15	125	-	-	-	-
Spokane County	559	High Density Residential	2	1	-	15	12	-	-	-	-
Spokane County	552	Medium Density Residential	5	3	-	15	40	-	-	-	-
Spokane County	553	Medium Density Residential	8	4	-	15	57	-	-	-	-
Spokane County	558	Medium Density Residential	7	3	-	15	49	-	-	-	-
Airway Heights	459	R-3. Multi-Family Residential	74	37	-	20	739	-	-	-	-
Airway Heights	546	R-3. Multi-Family Residential	21	11	-	20	214	-	-	-	-
Spokane City	550	Residential 15-30	1	0	-	30	7	-	-	-	-
Airway Heights	459		4	2	-	-	-	-	-	-	-
Spokane County	460	Air Force Base	1212	606	-	-	-	-	-	-	-
Spokane County	544	Air Force Base	900	450	-	-	641	-	-	-	-
Spokane County	549	Air Force Base	2079	1040	-	-	-	-	-	-	-
Spokane County	556	Air Force Base	0	0	-	-	-	-	-	-	-

**A. Western Plains Sub-Area Full Buildout**

Jurisdiction	TAZ	Zoning	Total Acreage	Acreage after Market Factor & Non Buildable Lands (50%)	Allowed Building Coverage (%)	Max Density (du/acre)	Total DU	Building Area (KSF)	Total SF (Current)	Employee/ KSF	Total Employees (Allowed)
Spokane City	550	Airport	1058	529	-	-	-	-	-	-	-
Spokane City	551	Airport	1864	932	-	-	-	-	-	-	-
Spokane City	552	Airport	16	8	-	-	-	-	-	-	-
Spokane County	556	General Commercial	93	46	55%	-	-	1,111	-	2	2,223
Spokane County	547	General Commercial	21	11	55%	-	-	256	-	2	511
Spokane County	550	General Commercial	9	5	55%	-	-	108	-	2	216
Spokane City	550	General Commercial	1	1	55%	-	-	14	-	2	27
Spokane County	461	Kalispel Airway Heights 252	139	69	-	-	-	-	-	-	-
Spokane County	460	Mineral Lands	198	99	-	-	-	-	-	-	-
Spokane City	550	General Commercial	6	3	55%	-	-	73	-	2	147
Airway Heights	459	Open Space	23	11	-	-	-	-	-	-	-
Airway Heights	461	Open Space	70	35	-	-	-	-	-	-	-
Airway Heights	464	Open Space	2	1	-	-	-	-	-	-	-
Airway Heights	459	Public	9	5	-	-	-	-	-	-	-
Airway Heights	460	Public	5	2	-	-	-	-	-	-	-
Airway Heights	462	Public	154	77	-	-	-	-	-	-	-
Airway Heights	464	Public	82	41	-	-	-	-	-	-	-
Spokane County	460	Regional Commercial	38	19	100%	-	-	819	-	2	1,637
Spokane County	551	Regional Commercial	70	35	100%	-	-	1,527	-	2	3,055
Spokane County	552	Regional Commercial	92	46	100%	-	-	2,009	-	2	4,018
Spokane County	553	Regional Commercial	100	50	100%	-	-	2,176	-	2	4,351
Spokane County	556	Regional Commercial	49	25	100%	-	-	1,075	-	2	2,150
Spokane County	559	Regional Commercial	14	7	100%	-	-	306	-	2	612
Spokane County	463	Spokane Tribe West Plains Development	145	72	-	-	-	-	-	-	-
Spokane County	460	SpokaneAIR	562	281	-	-	-	-	-	-	-
Airway Heights	461	Tribal	44	22	-	-	-	-	-	-	-
Airway Heights	462	Tribal	116	58	-	-	-	-	-	-	-
<b>Total</b>							<b>7,905</b>	-	-	-	<b>135,145</b>

Notes:

- As Buildout information is not available for Tribal Uses, employment and dwelling units is not considered in Buildout but will be considered in Trip Generation based on information provided.
- Estimates for Spokane International Airport and Fairchild Air Force Base have been developed separately and are documented in summary tables and methodology documentation.
- Employment Per KSF ratios for Industrial and Retail uses are based on factors developed as part of the Industrial Land Use Study for Spokane County.
- Market Factor Adjustment based on most recent available information for Spokane County.



### B. Market Analysis Land Use

TAZ No	Commercial	Hotel	Industrial	Mini	Office	Housing Units	Retail
				Storage			
459						1,098	25,744
460							
461	150,000						
462			18,021			500	107,027
463	120,000	100,000					120,000
464			475,060		21,105	143	105,851
546						249	
547				372,515		78	120,160
549							
550			325,838	64,040	249,207		247,706
551		63,824	3,560,215	38,021			407,460
552		104,361	301,295				96,115
553			177,829		12,000	718	146,362
556							295,206
558			545,380			8	
559			201,979			2,293	
579						77	
<b>Total Dev't.</b>	<b>270,000</b>	<b>268,185</b>	<b>5,605,617</b>	<b>474,576</b>	<b>282,312</b>	<b>5,164</b>	<b>1,671,631</b>
Sq. ft./emp	450	1,000	1,200	30,000	350		600
<b>Employees</b>	600	268	4,671	16	807		2,786
Household size						2.62	
<b>People</b>						13,530	

<b>C. FAFB Build Out Land Use</b>				
<b>2016 Fiscal Statement</b>		<b>Ratios</b>	<b>Current</b>	<b>Projected</b>
Active Duty	2828	-	3028	3628
Washington Air National Guard	947	0.33	1014	1215
Army Nation Guard/Army Reserve	685	0.24	733	879
<b>Total Military</b>	<b>4,460</b>	<b>1.58</b>	<b>4,775</b>	<b>5,722</b>
General Schedule	611	0.22	654	784
Federal Wage System	94	0.03	101	121
Defense Commisary Agency	58	0.02	62	74
Non-Appropriated Fund Civilians	221	0.08	237	284
Contract Civilians	363	0.13	389	466
AAFES Civilians	103	0.04	110	132
Branch Banks/Credit Union Civilians	10	0.00	11	13
Other Civilian Vendors	15	0.01	16	19
<b>Total Civilians</b>	<b>1,475</b>	<b>0.52</b>	<b>1,579</b>	<b>1,892</b>
<b>Total Dependants</b>	<b>5,935</b>	<b>2.10</b>	<b>6,355</b>	<b>7,614</b>
<b>Total Personal</b>	<b>11,870</b>	<b>4.20</b>	<b>12,709</b>	<b>15,228</b>

Current Estimates = 2016 Economic Impact Statement + 200 Airmen added recently.  
Projected Estimates = Current + 600 Airmen planned to be added.

**D. Special Generators Build Out**

Tribe	Trips Expected	Trips/Employee (Retail)	Retail Employees Needed	TAZ	Notes		
Spokane Tribe	3834	1.62	2367	463	Trip Generation Source: West Plains Development Spokane Trip, Traffic Impact Analysis (April 28, 2011). For travel demand modeling purposes, it is assumed all land use would be represented using retail and factored to meet expected trips.		
Kalispel Tribe	1700	1.62	1049	461/462	Trip Generation Source: Kalispel Development Company. For travel demand modeling purposes, it is assumed all land use would be represented using retail and factored to meet expected trips. All employees will be added to TAZ 462.		
Planned Development							
Project	Trips Expected	Trips/Employee (ITE Rate)	Employees	TAZ	Trips/Employee	Employee Factor	Employees for Travel Demand Model
Amazon Distribution Center <sup>1</sup>	2069	0.49	2288	551	0.90	1.85	4222

<sup>1</sup> Trips Expected and Number of Employees from Project Rose TIA (May, 2018).

### E. Spokane International Airport Operations Projected Growth

2015 Census Data		Enplanements		
Employment Sector	Jobs	2015 Enplanements	2030 Enplanements	2030 Projected Employees
Manufacturing	6	3.30E-06	-	10
Retail Trade	31	1.70E-05	-	53
Transportation and Warehousing	431	2.37E-04	-	739
Information	14	7.69E-06	-	24
Real Estate Rental and Leasing	96	5.27E-05	-	165
Professional Scientific and Technical Ser	20	1.10E-05	-	34
Admin & Support	78	4.29E-05	-	134
Educational Services	66	3.63E-05	-	113
Accommodation and Food Services	165	9.07E-05	-	283
<b>Total</b>	<b>907</b>	<b>1,820,148</b>	<b>3,119,876</b>	<b>1,555</b>