



TECHNICAL MEMORANDUM

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Subject: State Route 1 Capacity Study Travel Demand Model Interim Validation Results

INTRODUCTION

Mendocino County is located in the northern coast in the state of California and is bordered by Humboldt and Trinity counties to the north, Tehama, Glenn, and Lake Counties to the east, Sonoma County to the south, and the Pacific Ocean to the west. The county contains 129 miles of coastline, which is traversed by the main thoroughfare State Route 1.

State Route 1 is the primary transportation route along the Mendocino County Coast and begins in the small town of Gualala, then passes through Fort Bragg, and exits the county near the community of Rockport. This technical memorandum provides an interim summary of the MCOG (Mendocino Council of Governments) TDF (Travel Demand Forecasting) model static validation to determine how well the 2020 model was able to match the estimated 2020 traffic counts.

TJKM will utilize the Mendocino County Council of Governments (MCOG) travel demand model, developed by Fehr and Peers in 2010 as the basis for the new State Route 1 Capacity Study model. Travel model accuracy is tested using the following comparison techniques:

- The percent error is calculated as the difference between the model volume and the actual count divided by the actual count.
- The Percent Root Mean Square Error (PRMSE) is the square root of the model volume minus the actual count squared divided by the number of counts. It is a measure similar to standard deviation in that it assesses the accuracy of the entire model.

MODEL OVERVIEW

The MCOG model is a three step model consisting of Trip Generation, Trip Distribution, and Trip Assignment. Due to automobile use being the dominant form of transportation in Mendocino County, the mode choice component was skipped.

The MCOG model covers all of Mendocino County, which includes the cities of Ukiah, Fort Bragg, Willits and Port Arena. **Figure 1** is map of the MCOG model coverage.

TRAFFIC COUNTS ESTIMATION

The 2009 roadway count data was used to estimate the 2020 traffic counts for the purpose of model validation. Growth rate was calculated by comparing the 2010 and 2020 land uses from the MCOG TDF model. The calculated growth rate was applied to the 2009 traffic counts to estimate 2020 count data.

TDF MODEL VALIDATION

The TDF model volume validation was done to be consistent with the California 2017 RTP guidelines. The aggregate Percent Root Mean Square Error (PRMSE) should be less than 40 percent for all links with counts.

Screenlines are groupings of roadway links that capture traffic flows in a particular direction. In addition to the PRMSE criteria, screenline volumes will be validated to follow the FHWA Validation Curve error tolerance as shown in **Figure 2**. The error tolerances for screenline based FHWA Calibration and Adjustment of System Planning Models are (for daily volumes):

- For 20,000 screenline volume, maximum percent error allowed is 45%
- For 40,000 screenline volume, maximum percent error allowed is 35%
- For 60,000 screenline volume, maximum percent error allowed is 30%
- For 80,000 screenline volume, maximum percent error allowed is 28%
- For 200,000 and above screenline volume, maximum percent error allowed is 20%.

Figure 1 – MCOG Model Map

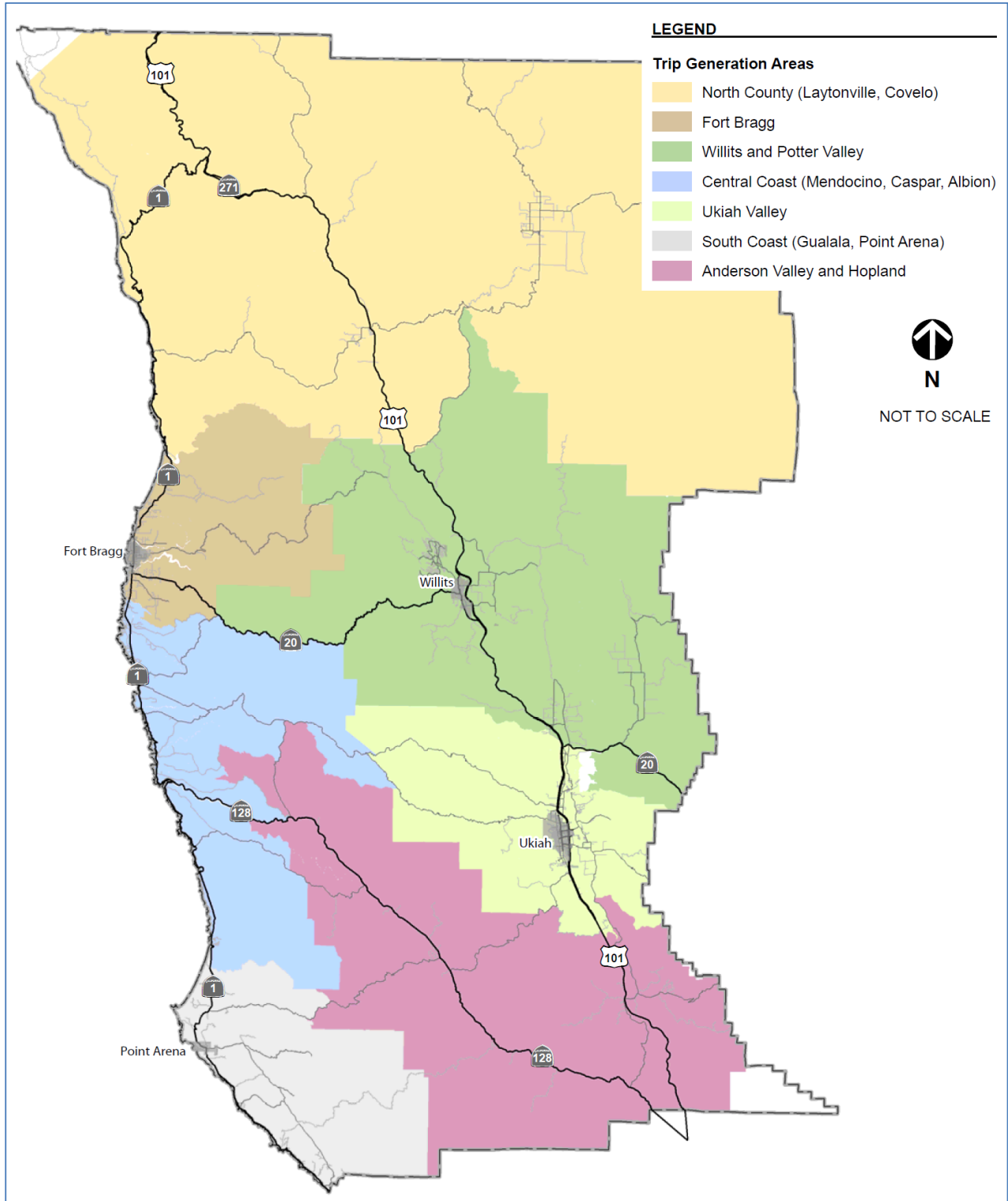
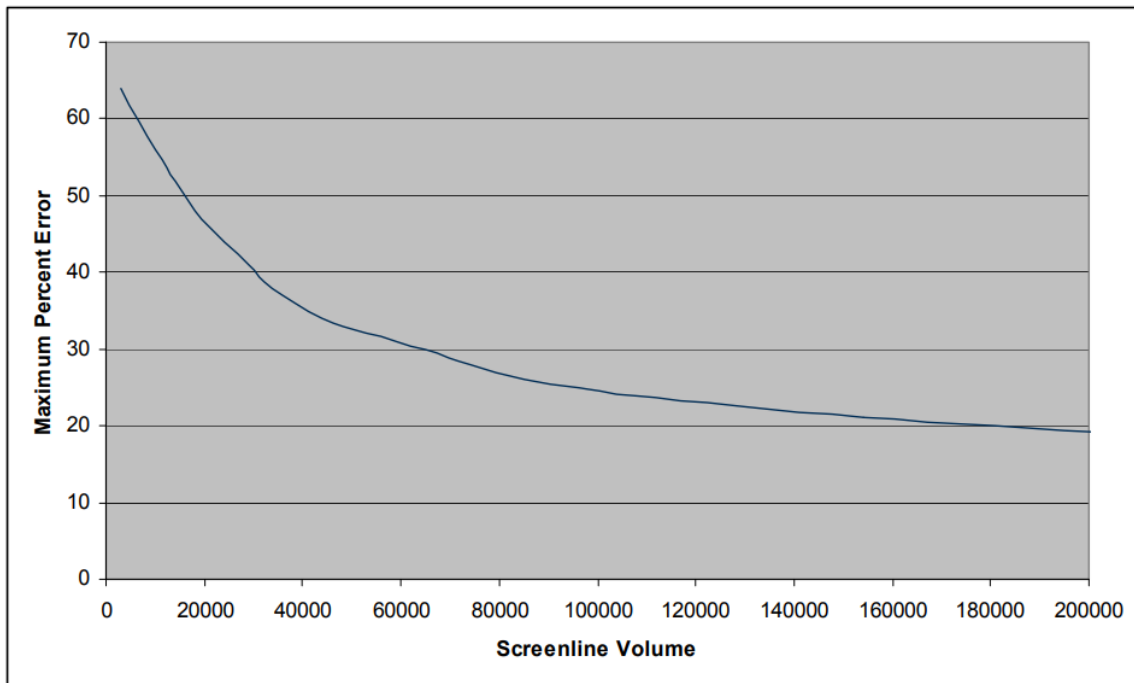


Figure 2 – FHWA Validation Error Curve



Source: Calibration and Adjustment of System Planning Models, FHWA, 2010

Screenlines in the region were set up in the MCOG TDF model and 2020 model traffic volumes were compared against the 2020 traffic counts for Daily, AM, and PM peak hour configurations. The results are summarized in **Tables 1-3** below. **Figures 3-6** show the screenlines used in the validation.

Table 1: Screenline Validation (Daily)

ID	Screenline Name	2020 Counts	2020 Model Volumes	Percent Error	FHWA Criteria	Meets Criteria	PRMSE
1	Ukiah Gateways	80,570	76,669	-5%	28%	YES	8%
2	Ukiah Downtown	79,381	59,118	-26%	28%	YES	26%
3	Willits Gateways	39,370	29,629	-25%	35%	YES	27%
4	Fort Bragg Gateways	31,091	32,355	4%	40%	YES	41%
5	Fort Bragg East/West	10,887	6,474	-41%	55%	YES	40%
6	Coast to Valley	5,742	7,758	35%	60%	YES	14%
7	Model Gateways	19,969	25,273	27%	45%	YES	37%
Grand Total		267,010	237,276	-11%	20%	YES	33%

Table 2: Screenline Validation (AM Peak Hour)

ID	Screenline Name	2020 Counts	2020 Model Volumes	Percent Error	PRMSE
1	Ukiah Gateways	5,421	5488	1%	0.1
2	Ukiah Downtown	4,546	3611	-21%	0.13
3	Willits Gateways	2,650	2430	-8%	0.05

<i>ID</i>	<i>Screenline Name</i>	<i>2020 Counts</i>	<i>2020 Model Volumes</i>	<i>Percent Error</i>	<i>PRMSE</i>
4	Fort Bragg Gateways	2,468	2315	-6%	0.12
5	Fort Bragg East/West	1,263	472	-63%	0.13
6	Coast to Valley	309	545	76%	0.11
7	Model Gateways	1,158	1328	15%	0.06
Grand Total		17,814	16,189	-9%	11%

Table 3: Screenline Validation (PM Peak Hour)

<i>ID</i>	<i>Screenline Name</i>	<i>2020 Counts</i>	<i>2020 Model Volumes</i>	<i>Percent Error</i>	<i>PRMSE</i>
1	Ukiah Gateways	6,229	6695	7%	0.09
2	Ukiah Downtown	5,596	6517	16%	0.19
3	Willits Gateways	3,057	2554	-16%	0.11
4	Fort Bragg Gateways	2,775	2955	6%	0.15
5	Fort Bragg East/West	1,012	651	-36%	0.07
6	Coast to Valley	387	592	53%	0.13
7	Model Gateways	1,598	1843	15%	0.08
Grand Total		20,652	21,807	6%	14%

Figure 3 – Model Screenlines

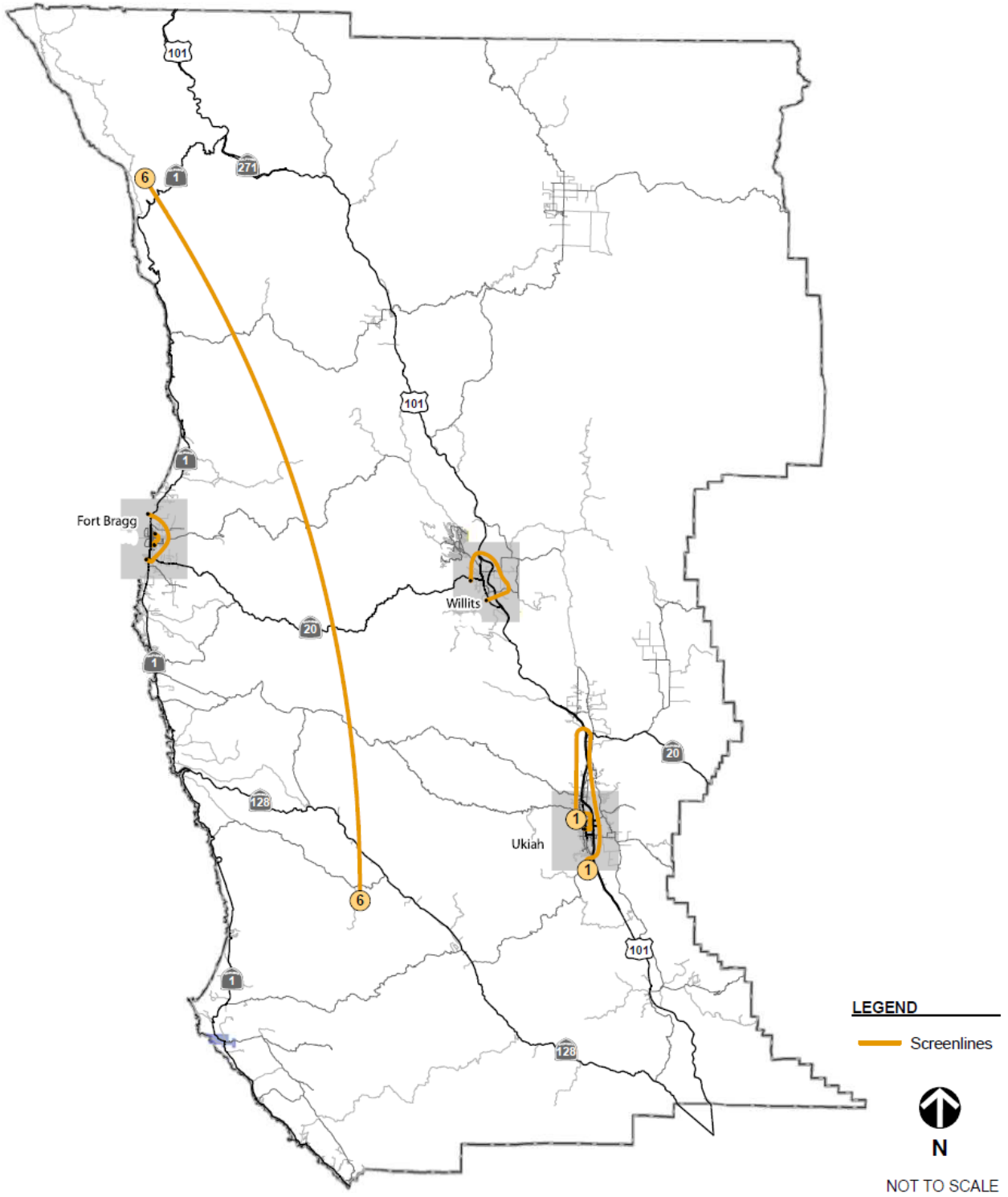


Figure 4 – Model Screenlines (Fort Bragg)

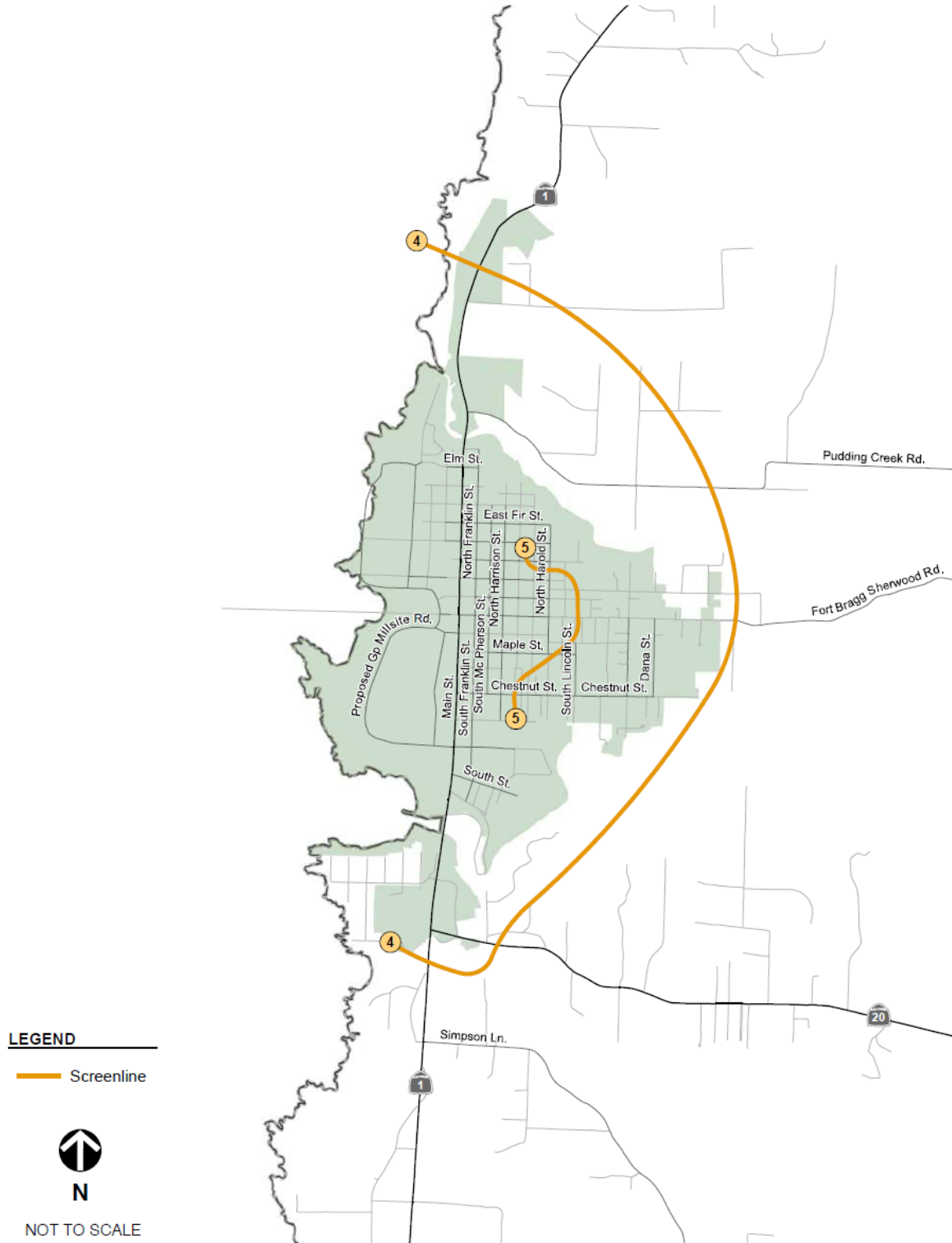


Figure 5 – Model Screenlines (Willits)

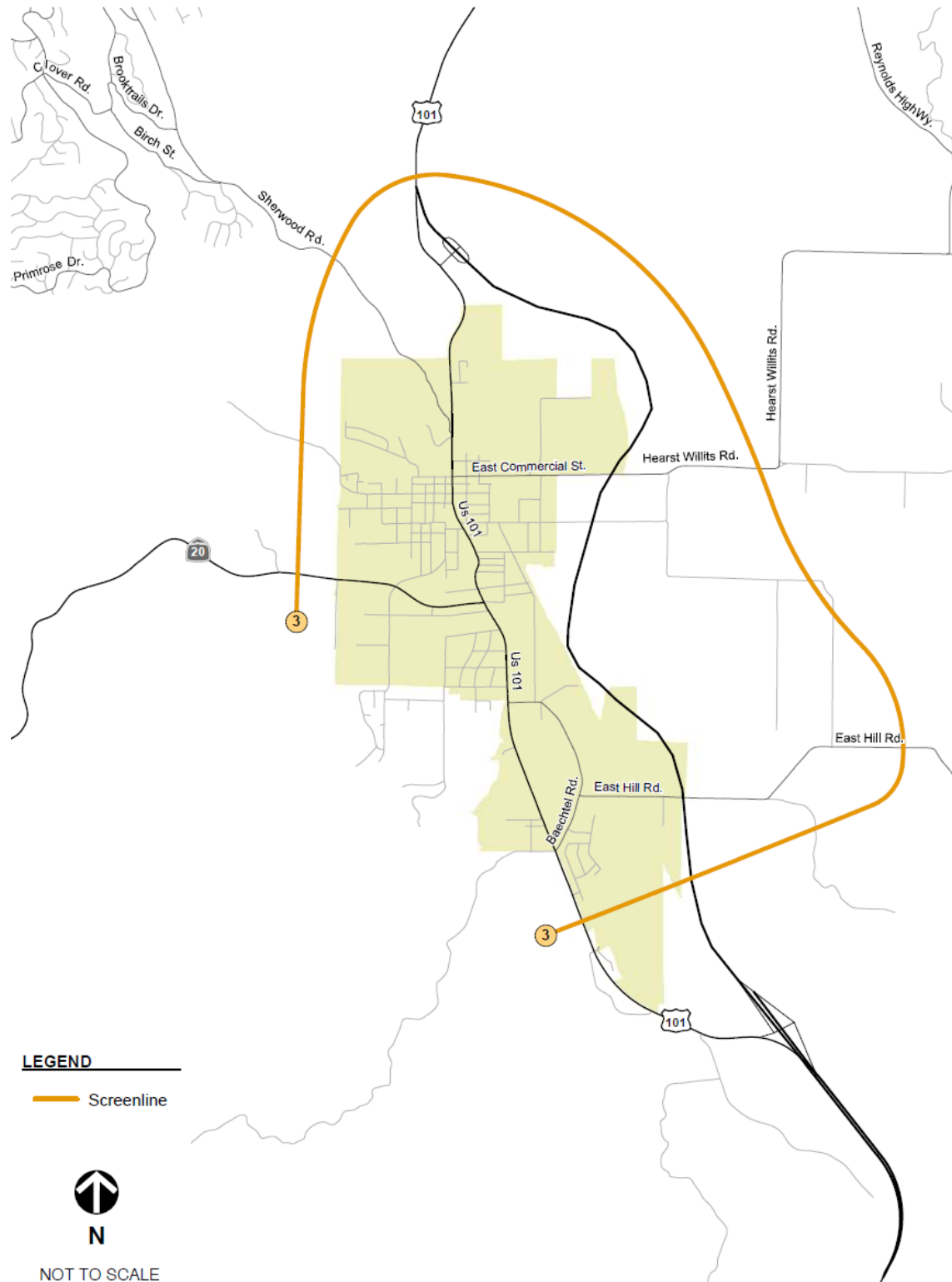
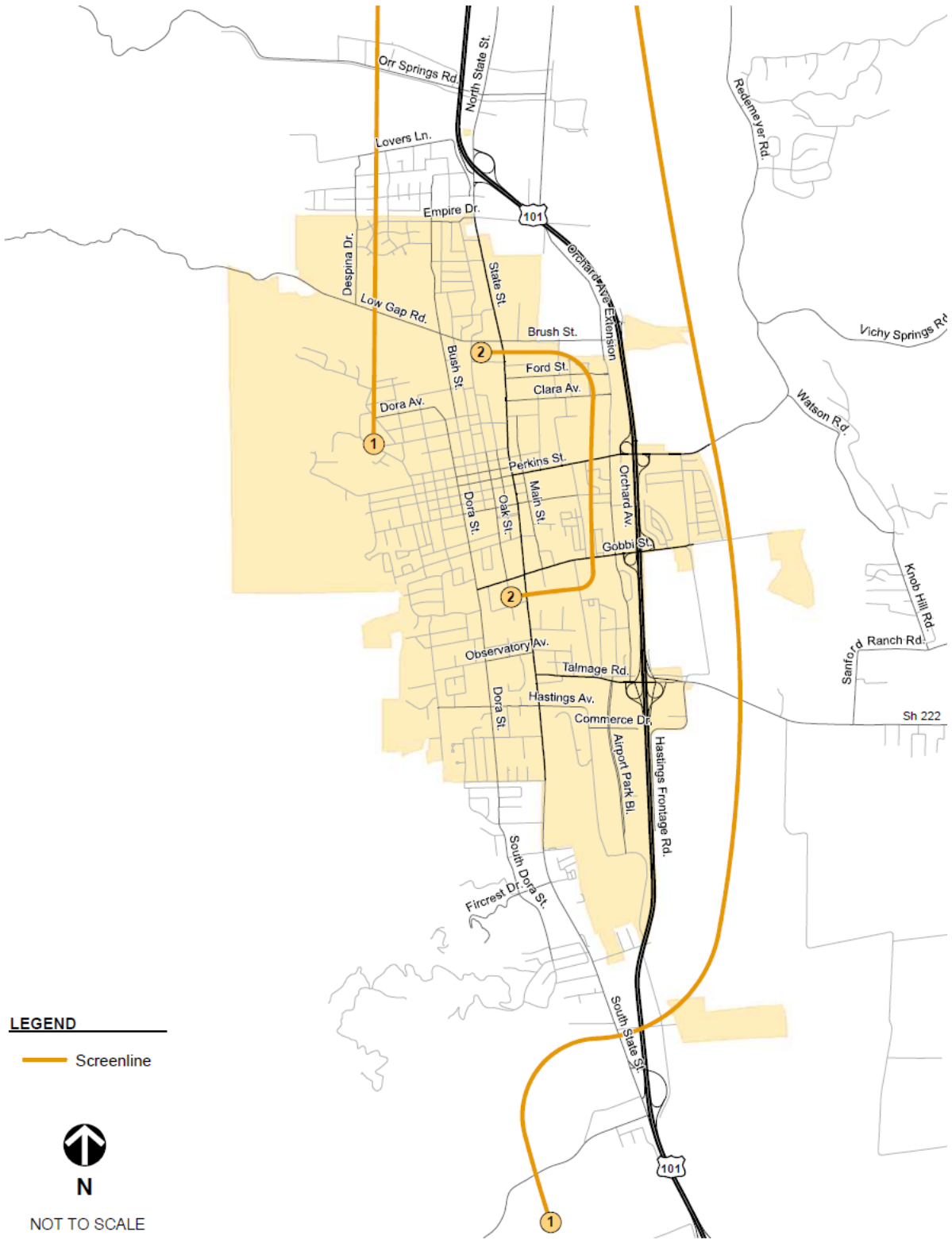


Figure 6 – Model Screenlines (Ukiah)



Further, **Tables 4-6** summarize the results by facility type, viz., Freeway, Urban and Rural Arterial, Collector and Local roads for the Daily, AM and PM peak hour configurations.

Table 4: Validation by Facility Type (Daily)

<i>Facility Type</i>	<i>2020 Counts</i>	<i>2020 Model Volumes</i>	<i>Percent Error</i>	<i>PRMSE</i>
Freeway	40,663	40,342	-1%	8%
Urban Arterial	238,200	197,545	-17%	26%
Major Collector	298,129	223,946	-25%	27%
Minor Collector	212,547	139,826	-34%	41%
Rural Arterial	252,218	296,114	17%	40%
Rural Collector	15,664	14,360	-8%	14%
Local	82,661	61,930	-25%	37%
Grand Total	1,140,081	974,063	-15%	33%

Table 5: Validation by Facility Type (AM Peak Hour)

<i>Facility Type</i>	<i>2020 Counts</i>	<i>2020 Model Volumes</i>	<i>Percent Error</i>	<i>PRMSE</i>
Freeway	2,441	2,969	22%	12%
Urban Arterial	15,359	14,577	-5%	9%
Major Collector	21,201	17,167	-19%	8%
Minor Collector	17,612	10,035	-43%	13%
Rural Arterial	15,624	20,090	29%	12%
Rural Collector	1,019	1,450	42%	8%
Local	6,855	4,945	-28%	14%
Grand Total	80,111	71,233	-11%	11%

Table 6: Validation by Facility Type (PM Peak Hour)

<i>Facility Type</i>	<i>2020 Counts</i>	<i>2020 Model Volumes</i>	<i>Percent Error</i>	<i>PRMSE</i>
Freeway	3,143	3,542	13%	10%
Urban Arterial	39,417	36,632	-7%	16%
Major Collector	24,697	23,556	-5%	7%
Minor Collector	17,481	13,810	-21%	11%
Rural Arterial	38,194	39,565	4%	11%
Rural Collector	1,181	1,262	7%	5%
Local	7,442	6,009	-19%	12%
Grand Total	131,555	124,376	-5%	12%

SUMMARY AND NEXT STEPS

Here's a summary of the screenline and facility type validation results based on the tables provided in this memo:

Screenline Validation Results

- Daily Validation: The model met FHWA criteria across all screenlines. The percent errors varied, with some screenlines showing close matches (e.g., Ukiah Gateways at 5% error) and others having larger discrepancies (e.g., Fort Bragg East/West at 41%). Overall, the percent error was 11% with a PRMSE of 33%.
- AM Peak Hour: The model had varied performance, with most screenlines meeting the criteria. Ukiah Gateways showed a 1% error, while Coast to Valley had a high 76% error. The overall percent error was 9%, with a PRMSE of 11%.
- PM Peak Hour: The model generally performed well, with a 6% overall percent error and 14% PRMSE. Coast to Valley again showed a high percent error (53%), while Ukiah Gateways had a 7% error.

Facility Type Validation Results

- Daily Validation: The model's accuracy varied by facility type:
 - Freeways showed a small error of 1%.
 - Urban arterials had a larger discrepancy, with a 17% error.
 - Rural arterials showed a positive error of 17%, while rural collectors had an 8% error.
 - Local roads showed a significant 25% error.
 - The overall percent error was 15%, with a PRMSE of 33%.
- AM Peak Hour:
 - Freeways showed a 22% error, indicating some overestimation.
 - Urban arterials performed better with a 5% error.
 - Rural collectors had the highest error at 42%.
 - The overall error was 11%, with a PRMSE of 11%.
- PM Peak Hour:
 - Freeways had a 13% error.
 - Urban arterials showed a 7% error.
 - Minor collectors had a more significant 21% error.
 - The overall error was 5%, with a PRMSE of 12%.

In summary, the validation results showed that while the model generally met FHWA criteria and PRMSE is less than 40%, there was scope of improvement with certain screenlines and facility types that warrant further model refinement. TJKM plans to proceed with further revisions to the TDF model to improve model performance against the traffic counts.