

SCOPE OF WORK

SUBMITTED TO: Kristine Cai, Fresno COG via Email

SUBMITTED BY: Nagendra Dhakar, Mark Bradley, Hannah Carson RSG

CLIENT: _____

DATE SUBMITTED: November 23, 2022

RSG PROJECT #: _____ **TASK ORDER #:** _____

CLIENT PROJECT #: _____ **VERSION #:** 4

PROJECT TITLE: Fresno AB Model Update 2019

The project will update the Fresno AB model to reflect 2019 base year conditions. The model update will include the following tasks.

TASK 1: Project Management

RSG team will hold bi-weekly conference calls with FresnoCOG to discuss progress in the previous period and issues that may be encountered. RSG will prepare monthly invoices and progress reports.

Deliverables:

- Meeting notes
- Monthly invoices and progress reports

TASK 2: Update Model Inputs

This task will update AB model inputs for the 2019 base year. We will update the following inputs:

1. **Networks.** The Fresno AB model uses three networks: highway, transit, and bike. The current highway and transit networks represent 2017 details with all future year projects coded. FresnoCOG will review the networks and update as necessary to include 2019 and future year details. FresnoCOG will compare the bike network with the latest regional bike map and/or open street map (CyclOSM¹) and update as necessary to prepare it for the 2019 conditions. RSG will provide support in reviewing and coding network details.
2. **MAZ Land Use Data.** The model requires the following land-use information for each MAZ: number of households, employment in 9 DaySim categories,

¹ <https://www.cyclosm.org/#map=15/36.8425/-119.7958/cyclosm>

enrollment in 3 categories, off-street parking capacity and cost (daily and hourly). The first three datasets (households, employment, and enrollment) are already available for 2019, however, FresnoCOG will review and validate them with other data sources. For parking data, FresnoCOG will look for freely available data sources and convert the data into format required in the model. RSG will provide support in reviewing and advising in preparing data in model input formats.

3. **Synthetic Population.** PopulationSim generates synthetic population files that are input to the DaySim model. The population files include a household file and a person file. The following are primary inputs to the PopulationSim process: seed data, household controls, and non-institutional group quarters (GQ) controls. FresnoCOG will provide total households and total non-institutional GQs by MAZ. FresnoCOG will update the PopulationSim process to use 2015-2019 PUMS as seed data and 5-year 2015-2019 ACS for marginal distributions. FresnoCOG will run the updated PopulationSim and generate synthetic population files in DaySim format. RSG will provide guidance to FresnoCOG in working with PopulationSim and review output population files.
4. **Workers IXI Fractions.** DaySim requires the share of county workers working outside the county (IX) and share of employment occupied by outside county workers (XI) for each TAZ. RSG will use the 2019 LODES data to develop these fractions in the format required in DaySim.
5. **Park and Ride.** DaySim expects an input file listing park ride locations with the zone id, parking capacity, and cost. FresnoCOG will prepare this input file in the required format. RSG will provide guidance.
6. **External Auto Demand.** The external auto demand are fixed matrices input to the model. Presently, they are developed using the California Statewide Model. RSG will assist FresnoCOG in developing these input matrices from passive big data. FresnoCOG will purchase passive big data. RSG will provide guidance and support to FresnoCOG in processing the big data to convert into matrix trip tables required in the model system.
7. **External Truck Demand.** The external truck demand are fixed matrices input to the model. The present AB model system uses truck matrices from 2007 and 2040 as inputs, which are then used internally to interpolate demand for the scenario year. RSG will assist FresnoCOG to create the external truck demand from the passive dataset. FresnoCOG will purchase passive big data. For future scenarios, the external truck demand will be based on the base year external truck demand and the demand growth calculated from the California Statewide Model. The growth seen in the Statewide Model will be subjected to reasonable checks and adjusted to land use assumptions as necessary.



RSG will update the AB model with the updated inputs and run the model to verify successful completion. RSG will review results for higher level demand and assignment summaries. If issues are discovered, FresnoCOG will review and update model inputs.

Deliverables:

- Updated model inputs
- Updated model setup on GitHub

TASK 3: Model Enhancements

RSG will add the following enhancement to the Fresno AB model:

1. **Telecommute model.** We recently implemented and estimated a telecommute model for SACOG. We will transfer the estimated parameters from SACOG and implement the telecommute model in the Fresno AB model system.
2. **New Modes (TNC).** We will update the DaySim model to include transportation network companies (e.g., Uber, Lyft) as a new transportation mode. We will also make changes to the trip building step to include vehicle demand from the new mode. If desired, we will update the assignment step to add a new class for the new mode.
3. **Update Cube Software.** RSG will assist FresnoCOG in updating the Fresno AB model system to be compatible with the latest version of Cube Software. FresnoCOG will test the model with the new software and RSG will provide support in this effort including helping reach out to Bentley support if needed.
4. **Other Enhancements.** RSG will make other enhancements to the Fresno AB model system. The updates will include the following:
 - a. Update SB375 VMT calculations - SB 375 includes both passenger cars and light duty trucks. The SB 375 VMT should include II, IX & XI trips made by both residents and non-residents. The IXXI VMT should only include VMT within our county boundary. In summary, SB375 VMT should include:
 - i. Resident trips (DaySim) – II trips made by residents
 - ii. External auto trips (IX, XI) – trips by Fresno residents and outside residents
 - iii. External truck trips (IX, XI) – only light duty
 - iv. Internal truck trips (II) – only light duty
 - b. Align VMT summaries from two different spreadsheets - *_Roadway_SummaryCombined.xlsx and 1_Inputs_Support\Validation\hwy_validation_vmt_11112018_final.xlsx
 - c. Update the model to run in one click from the Cube catalog

- d. Clean up the setup to keep only relevant inputs and catalog keys
- e. Automate Daysim input keys. E.g., the keys for the parcel and the PopSim inputs (household and person) files so that those input files can be made year specific.
- f. Add DaySim summaries to the model flow

Deliverables:

- Updated model setup on GitHub

TASK 4: Model Calibration

RSG will calibrate the model using household travel survey and Census data. The model calibration will be performed in conjunction with the model validation (described in the next task).

RSG will use the 2017 NHTS for DaySim demand calibration. The NHTS included 609 households in Fresno County. Of these, 189 households were collected on weekends, leaving only 420 households (weekday travel) for model calibration. We propose utilizing the data from the entire SJV for the model calibration. This would increase our weekday sample size from 420 households to 1,727 households. Given that the Fresno AB model does not have zone system outside the Fresno County, we will use the entire SJV data for calibrating patterns where zone systems are not required (e.g., number of tours, number of trips, mode choice, time of day) and use Fresno County specific data for tour and trip length calibrations that would need the zone system.

The 2017 NHTS data is already weighted, however, it was not weighted for Fresno County population excluding the weekend sample, so RSG will re-weight the Fresno County data using 2019 demographics data from Fresno COG and ACS. We will also re-weight the valley-wide data using controls calculated from 2019 ACS PUMS. At the time of re-weighting, we will process the data and convert into DaySim format to prepare for model calibration and ensure that the weighted Fresno County NHTS records used for calibration are consistent with the synthetic population used as model input.

We will also utilize other observed sources, such as big passive data, commute flow patterns from LEHD Origin-Destination Employment Statistics (LODES), and auto ownership from ACS. In absence of a transit on-board survey, we will use the 2019 observed transit boardings to infer transit travel for mode choice targets.

Deliverables:

- Processed 2017 NHTS data for 8 SJV counties in DaySim format
- Final calibration summaries
- Updated setup on GitHub



TASK 5: Model Validation

RSG will use the observed traffic counts and transit boardings to validate model assignment flows. FresnoCOG will assemble observed traffic counts and join them to the model network. The counts will include the following segments: autos, trucks, screenlines, and external stations. FresnoCOG will obtain regional 2019 VMT from the HPMS. FresnoCOG will obtain transit ridership by route from transit operating agencies and convert into the format required for transit validation. RSG will provide guidance in developing validation datasets and support in review.

RSG will use these datasets to validate the model assignment flows and make necessary adjustments to improve validation results. FresnoCOG will support RSG in the model validation by reviewing network attributes, land use data, and observed validation data.

Deliverables:

- Traffic counts
- Transit boardings
- Final validation summaries
- Updated setup on GitHub

TASK 6: Model Documentation

RSG will prepare a project report describing model updates and other tasks performed under this task order. RSG will also update the GitHub wiki with up-to-date documentation.

Deliverables:

- Project report
- Updated GitHub wiki

Table 2, Table 3, and Table 3 provide project staff rates, estimated budget, and schedule respectively. The total budget is at \$111,257.

TABLE 1: PROJECT STAFF RATES

STAFF	TITLE	LOADED HOURLY RATE
Nagendra Dhakar	Project Manager	\$189.86
Mark Bradley	Technical Advisor	\$363.78
Hannah Carson	Analyst	\$137.09

TABLE 2: PROJECT BUDGET

		RSG			Total Hours	Total Cost
Task	Task Descri	Hourly Rate	Nagendra Dhakar (Project Manager)	Mark Bradley (Technical Advisor)		
			\$ 189.86	\$ 363.78	\$ 137.09	
1	Project Management		24	4	34	62 \$ 10,673
	Conference calls (upto 20)		20	4	20	44 \$ 7,994
	Other project management		4		14	18 \$ 2,679
2	Update Model Inputs		26	0	76	102 \$ 15,355
	Networks		2		4	6 \$ 928
	MAZ land use data		4		12	16 \$ 2,405
	Synthetic population		4		12	16 \$ 2,405
	Workers ixii fractions		2		12	14 \$ 2,025
	Park and ride		2		0	2 \$ 380
	External auto demand		4		10	14 \$ 2,130
	External truck demand		4		10	14 \$ 2,130
	Run model with updated inputs		4		16	20 \$ 2,953
3	Model Enhancements		24	0	100	124 \$ 18,266
	Telecommute model		2		12	14 \$ 2,025
	New modes (TNC)		4		20	24 \$ 3,501
	Update Cube Software		2		8	10 \$ 1,476
	Other, as needed		16		60	76 \$ 11,263
4	Model Calibration		32	66	96	194 \$ 43,246
	Develop survey data (2017 NHTS)		8	60	14	82 \$ 25,265
	Develop other observed data (e.g., lodes, census, big data)		8	2	22	32 \$ 5,262
	Calibrate		16	4	60	80 \$ 12,718
5	Model Validation		21	0	88	109 \$ 16,051
	Develop observed traffic counts		4		24	28 \$ 4,050
	Develop transit boardings		1		4	5 \$ 738
	Validate		16		60	76 \$ 11,263
6	Model Documentation		12	2	34	48 \$ 7,667
	Project report		8	2	24	34 \$ 5,537
	Update wiki		4		10	14 \$ 2,130
TOTAL	Model Update 2019		139	72	428	639 \$ 111,257

TABLE 3: PROJECT SCHEDULE

Task	Task Description	Start	End	2022	2023								
				Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	Project Management	Nov-22	Oct-23										
2	Update Model Inputs	Nov-22	Feb-23										
3	Model Enhancements	Nov-22	Feb-23										
4	Model Calibration	Jan-23	May-23										
5	Model Validation	Apr-23	Jul-23										
6	Model Documentation	Jul-23	Aug-23										