The Alameda County Transportation Commission (Alameda CTC) maintains and updates a countywide travel demand model in compliance with Congestion Management Program (CMP) legislation. The CMP legislation requires every CMA, in consultation with the regional transportation planning agency (the Metropolitan Transportation Commission (MTC) in the Bay Area), cities, and the county, to develop a uniform database on traffic impacts for use in a countywide travel demand model. Further, the legislation mandates the countywide model to be consistent with the assumptions of the regional travel demand model developed by MTC including the most current land use and socioeconomic database adopted for regional transportation planning.

The Alameda Countywide model has its origin in the MTC BAYCAST-90 regional trip-based model and has been regularly updated at minimum every four years following each update of the MTC Regional Transportation Plan.

The current version of the model incorporates the Plan Bay Area 2040[1] transportation investments and land use and includes 2010 as base year and 2020 and 2040 as two future years. The land use distribution is reviewed by the local jurisdictions and modified within certain limitations to maintain overall regional consistency. The Alameda Countywide model produces forecasts that are generally consistent with the travel demand forecasts that MTC has produced for Plan Bay Area 2040 for the Plan horizon year of 2040 and meets the regional model consistency requirements.

Model Calibration and Validation

Calibration of the current Alameda Countywide model was originally from year 2000 travel behavior survey data and then updated as required to achieve a 2010 validation. The model was validated to year 2010 screenline volumes for the AM and PM peak hours, peak periods and daily, and to year 2010 observed transit boardings. Daily transit boardings were validated for the year 2010 at the system level for major regional transit operators (Caltrain, BART, MUNI, VTA and AC Transit) and at the station level for BART stations within Alameda County.

Transportation Analysis Zones (TAZs)

The Alameda Countywide model includes the nine Bay Area counties as well as San Joaquin County. Compared to the MTC model, the Alameda Countywide model has a refined TAZ system in Alameda County and in the immediately adjacent sections of Santa Clara and Contra Costa Counties. The model uses MTC's zone system in the remaining six Bay Area counties and includes an aggregated zone system for San Joaquin County.

[1] For more information on Plan Bay Area 2040, see this website: http://2040.planbayarea.org/

Transportation Networks

The road network is a computerized representation of the street and highway system. It includes freeways, highways, expressways, arterials, collectors, ramps, and local roads. Intelligent transportation system (ITS) attributes can be applied to freeways, expressways, ramps, and arterials to represent benefits of technology such as signal coordination and ramp metering.

Express lane facilities, representing the Plan Bay Area 2040 express lanes system for 2020 and 2040, are also included in the network with a toll facility indicator based on the highway corridor segment, direction of travel and peak period.

For transit, individual transit routes are coded for each Bay Area transit operator, representing peak and off-peak service. Travel times for bus routes are scaled from the congested travel times on the corresponding road segments. Enhanced bus services such as bus rapid transit (BRT) are represented by reductions in the travel time factors on routes with bus priority treatments.

The Alameda Countywide model also includes a representation of the bicycle network infrastructure in the base year and forecast years for Alameda County, explicitly representing existing and future bike lanes and bike paths in travel time development, mode choice and bicycle assignments.

Trip Purposes

The Alameda Countywide model uses the following trip purposes:

- Home-based work trips (four income quartiles)
- Home-based shop/other trips
- Home-based social/recreation trips
- Non-home-based trips
- Home-based school: grade school, high school, and college trips
- Four categories of truck trips: Very Small, Small, Medium and Combo (heavy duty)

Pricing

The Alameda Countywide model uses MTC pricing assumptions for transit fares, bridge tolls, parking charges, express lane tolls and auto operating costs as assumed in MTC's Plan Bay Area 2040. All prices are expressed in year 1990 dollar values in the models. The 2040 forecasts produced by the Alameda Countywide model also assume, consistent with MTC that only 3+ person carpools will be allowed to travel in the express/HOV lanes without a charge for the entire model region.

Auto Ownership

The Alameda Countywide model applies the BAYCAST-90 auto ownership models to estimate the number of households with 0, 1, and 2+ autos by four income groups in each traffic analysis zone. The auto ownership models were recalibrated to the 2005-2009 American Community Survey to match workers per household and auto ownership by county.

Mode Choice

The Alameda Countywide model uses a nested-logit mode choice model for all trip purposes. Beyond the traditional mode choices, the model further stratifies the transit choices using a nesting structure for transit submodes of local bus, express bus, light rail, heavy rail and commuter rail.

Airport Model

Separate trip generation, trip distribution and mode choice models are applied for airport passenger trips at each of the three major regional airports (San Francisco, Oakland, San Jose). The airport passenger trips are stratified by residence (Bay Area resident versus visitor) and type of trip (business versus personal). The airport passenger trips are combined with other trips prior to assignments to the networks.

Traffic Assignments

The traffic assignments produce volumes for four time periods:

- AM peak 4-hour period (6 AM to 10 AM)
- PM peak 4-hour period (3 PM to 7 PM)
- Midday 5-hour period (10 AM to 3 PM)
- Evening 11-hours (7 PM to 6 AM).

The initial AM and PM peak 4-hour period assignments are used to estimate congestion levels as input to the toll lane assignment model. The AM and PM 4-hour trips are then reassigned to the network using a toll choice model that estimates how many single-occupant and two-occupant vehicles will choose to pay tools to use express lanes on segments where they are available.

The four time period volumes are then added together to develop daily vehicle volumes.

The Alameda Countywide model has two additional vehicle assignments for the AM and PM peak hours (7:30 to 8:30 AM and 4:30 to 5:30 PM respectively). These peak hour assignments are not included in the calculation of daily volumes.

Transit Assignments

The transit trips are assigned to the best available routes for peak (AM plus PM) and off-peak period services. The assignments are stratified by access type (park-and-ride, kiss-and-ride, walk access) and the walk access trips are further stratified by preferred submode (local bus, express bus, light rail, heavy rail and commuter rail). The separate assignments are combined to develop daily transit boardings on each route.