Series 14 Regional Growth Forecast Documentation and Baseline Subregional Allocation

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Chapter One: Overview

SANDAG has produced economic and demographic forecasts for nearly 50 years, and transportation forecasts for nearly four decades. The *Series 14 Regional Growth Forecast* ("Series 14 RGF") will be the fourteenth forecast completed since SANDAG began developing regional growth forecasts. Each forecast process contains a set of assumptions, input data, computations, and model interactions, the output of which serves as an integral part of the SANDAG planning processes as well as a valuable resource to other governmental and private organizations in the region.

Evolving trends, policies, and data necessitate changes in forecasting methodologies, which is why each SANDAG forecasting effort is unique from its previous iteration. To ensure that forecasts maintain best practices, SANDAG subjects each effort to peer reviews by other forecasting professionals and experts from across the United States. Forecasting at SANDAG is an open process in that the models, inputs, and results are presented to professionals and policymakers at public forums. Many of the inputs directly come from jurisdictions and reflect current local planning assumptions and policies.

All forecast versions are comprised of both a regional total for housing, jobs, and population as well as a small area forecast of the regionwide data to the subregional areas of the county. The term "baseline" refers to the subregional allocation method that is used to determine the location of units, population, and jobs to the small area geographies of the region which relies mostly on the general plans of the local jurisdictions. This report presents a description of the regional and baseline subregional SANDAG forecast models used to produce the Series 14 RGF, including key inputs, assumptions, and computations for each of the components as well as the flow of data throughout the suite of models.

1.1 Historical Perspective

SANDAG has produced forecasts of demographic and economic growth in the region since 1971. Transportation forecasting at SANDAG began in 1981. Regional growth and transportation forecasts support long range transportation and regional planning efforts, such as the Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS), corridor and major capital investment studies, and a wide range of other regional planning initiatives. Local jurisdictions use the forecasts for general plan updates and capital facilities planning, including environmental impact reports (EIR), as well as for local transportation planning. Other agencies, such as the San Diego County Water Authority and the San Diego Regional Energy Office, use aspects of the SANDAG forecasts to develop plans for providing essential services.

The SANDAG forecasts anticipate changes in the region and its communities based on computer models and the best available information at the time the forecast is produced. Any housing or population forecast represents only one possible pattern of future growth in the region. They are meant to help policy- and decision-makers prepare for the future and are not an expression for or against growth. Additionally, as time passes, changes to plans and policies may result in a different pattern of development for any given year.

Similar to the processes used to create the *Series 13 Regional Growth Forecast* ("Series 13 RGF"), the Series 14 RGF includes assumptions about how local plans and policies may evolve over time in response to the region's continuing growth. Most current local plans typically only project ten or twenty years in the future. Starting with the Series 13 RGF, the horizon year was set to 2050. To bridge this gap, SANDAG began the forecast with adopted general plans and policies from the 18 incorporated cities and

the unincorporated county. Then, local jurisdictions are asked to provide detailed feedback on how land use plans may change in the future. Hence, the Series 14 RGF provides an assessment of where change may occur in the coming decades.

1.2 Committees, Peer Review, and Board of Directors Guidance

SANDAG forecasts are developed using a collaborative process where staff works closely with a wide range of professionals outside of the agency. For the Series 14 RGF SANDAG convened several panels of demographic, housing, and economic experts from state and local agencies, local universities, and the private sector. These panels reviewed the model structure, data inputs, and assumptions. Feedback and recommendations from these groups is incorporated into the model.

SANDAG also relies on the Regional Planning Technical Working Group ("TWG") for advice on the forecast, including local land use assumptions that are among the more important inputs to the forecasting process, as well as to provide information to jurisdictions, communities, and other areas within the region. This working group includes the local jurisdictions' planning directors or their designees and representatives from other agencies within the region that use the forecast data for facility and infrastructure planning.

In developing the Series 14 RGF the Board of Directors provided input on some of the regionwide assumptions that would be used in the forecast; specifically, the Board of Directors were asked to review and approve three assumptions that were new to the Series 14 Regional Growth Forecast process ("Series 14 RGF process") at a meeting on May 25, 2018:[1]

First, the Series 14 RGF classifies some units in the region as "unoccupiable" because they are presumed to be vacant due to their use as vacation homes or short-term rentals. This assumption effectively reduces the housing stock available to house the San Diego region's population by about 57,000 units. More information about the methodology used to estimate unoccupiable units in the region is in Chapter 2 Section 4.2.

Second, the Series 14 RGF should include accessory dwelling units (ADUs) as available capacity on existing single-family lots. The inclusion of this ADU capacity would account for recent legislation that encourages creation of ADUs to increase the housing supply in the state. In 2019 California Assembly bills 881 (Bloom) and 671 (Friedman) were passed, requiring cities and counties to adopt an ADU policy that makes it easier to build these types of units.[2] This assumption created capacity for about 20,000 ADUs in the county that are available in the forecast to house the future population in the region.

Third, the Series 14 RGF assumes the region's vacancy rate will increase to four percent by 2040 which would be maintained through the end of the forecast period. This assumption acknowledges that the present-day vacancy rate in the region is less than two percent but assumes a rising vacancy rate in the forecast period would reflect planning for a healthy housing market, which the California Department of Housing and Community Development (HCD) and the PRP panelists consider to be a five percent

[1] May 25th, 2018 Board of Directors meeting agenda available (page 854 of the pdf) at: https://www.sandag.org/uploads/meetingid/meetingid_4785_23865.pdf

[2] For more information on housing programs and policies please see 2021 Regional Plan Housing fact sheet, accessible at: https://sdforward.com/docs/default-source/2021-library/5335-rp-policyonepagers-04housing_final_en.pdf?sfvrsn=14b3fe65_2

vacancy rate. A vacancy rate of four percent also recognizes that both state and local housing policy has recently focused on accelerating housing production.

These board-approved assumptions ensure that the growth forecast provides enough housing to accommodate all the population growth in the region and that state and local housing policy are rapidly changing to address conditions of overcrowding and lack of housing. In this way, the Series 14 RGF is considered a projection of housing need in the region.

An integral part of the Series 14 RGF process is the inclusion of SANDAG's Peer Review Process (PRP) during several phases of model and data development. SANDAG convenes meetings with internal and external subject-matter experts to review projects for data, process, and methodological assumptions or changes. Although SANDAG incorporated expert advice before the Series 14 RGF, the implementation of PRP procedures instituted a more standardized process for how expert review is integrated into SANDAG's data and modeling workflows.

For the Series 14 RGF baseline subregional allocation, seven PRP meetings were held to review the new methodology to forecast population, jobs, and housing at the regional and subregional levels.[3] Two of these panels included demographic, economic, planning, and forecasting specialists from outside of the agency. The external panels concentrated on regional data and assumptions, which identified several improvements that are incorporated into the Series 14 RGF process or, due to time constraints for developing the Series 14 RGF, that will be considered for incorporation in future regional forecasting efforts.

1.3 Quality Assurance and Control

Along with PRPs, as a part of the agency's *Plan of Excellence*, SANDAG developed a formal Quality Assurance/Quality Control (QA/QC) program to review all data products and reports.[4] The QA/QC program is independent from the development teams to ensure that the review is thorough, unbiased, and consistent.

Each version of the Series 14 RGF generated throughout the development process underwent a QA/QC review. The results of these reviews are then shared with the forecasting team and documented. If components that need changes or adjustments are identified during the process, those changes are made, and a new version of the forecast is developed. Additional review is conducted until the latest version of the Series 14 RGF passed through quality assurance and control without recommendations for revision.

1.4 Modeling Components

The Series 14 RGF is composed of a suite of models that each develop one or more components of the forecast output. This suite of models consists of two main components: (1) the San Diego Demographic

[3] PRP 0 Forecast Review meeting held on March 1, 2017; PRP 21 Housing Estimates meeting held on November 13, 2017; PRP 30 Review Regionwide Forecast meeting held on February 14, 2018; PRP 39 Regional Forecast (1-Finalized Subregional) meeting held on June 13, 2018; PRP 50 Subregional Housing Allocation meeting held on February 5, 2019; PRP 92 Effects of the DOF Changes on the Regional Forecast held on January 31, 2020; PRP 123 Forecast Scenarios meeting held on March 24, 2021; PRP 124 Forecast Scenarios Land Use Analysis meeting held on April 14, 2021

[4] More information on SANDAG's Plan of Excellence can be accessed online at: https://www.sandag.org/index.asp?fuseaction=about.excellence

and Economic model (SanDE), the region-wide forecasting model, and (2) the Integrated Land Use, Demographic, and Economic Model (iLUDEM), the subregional allocation model. SANDAG continually refines and evaluates these models to incorporate updated techniques and information as necessary. A list of the variables available from the Series 14 RGF are available in Appendix A.

The suite of models used in the Series 14 RGF process is new from previous forecasting cycles and was developed to improve alignment between the subregional and regional data using a disaggregate process. This system ensures that data for small areas sum to larger areas. A development effort to create this a disaggregate model in 2015 resulted in the suite of models discussed in this document.

1.4.1 SanDE

SanDE is a rates-based model that develops demographic information at the regional level. The purpose of SanDE is to produce a demographic forecast consistent with the future population projections for the region. The major input to SanDE is the population projections developed by the California Department of Finance (DOF). The DOF periodically develops a population projection series by detailed demographic characteristics for every county in California. The SanDE model then applies cohort-specific rates to the population to arrive at all the socioeconomic detail needed for the forecast.

SanDE produces data about the region's future economic and demographic characteristics that are used to develop the variables needed for the Series 14 RGF. Data such as the size and composition of the population, employment by industrial sector, household income, housing units by structure type, occupancy status of housing units, and persons per household are produced by the SanDE model. More detail about how these regionwide data are used by the SanDE model to develop the Series 14 RGF are in Chapter 2.

1.4.2 iLUDEM

After the regionwide data are developed from the SanDE model, the iLUDEM process allocates this growth of population, jobs, and housing to subregional geographies. The output from this subregional forecast is then utilized by the activity-based model (ABM) for transportation planning purposes. The

iLUDEM uses the interaction between economic factors, housing and population factors, and land use patterns to forecast where future housing units and jobs will be located in the region.

Among the inputs to the iLUDEM process are the current spatial distribution of jobs, housing units, income, and population. A critical element is the land use input, which reflects local plans and policies.

Figure 1. Regional Growth Forecast and Subregional Allocation Flow

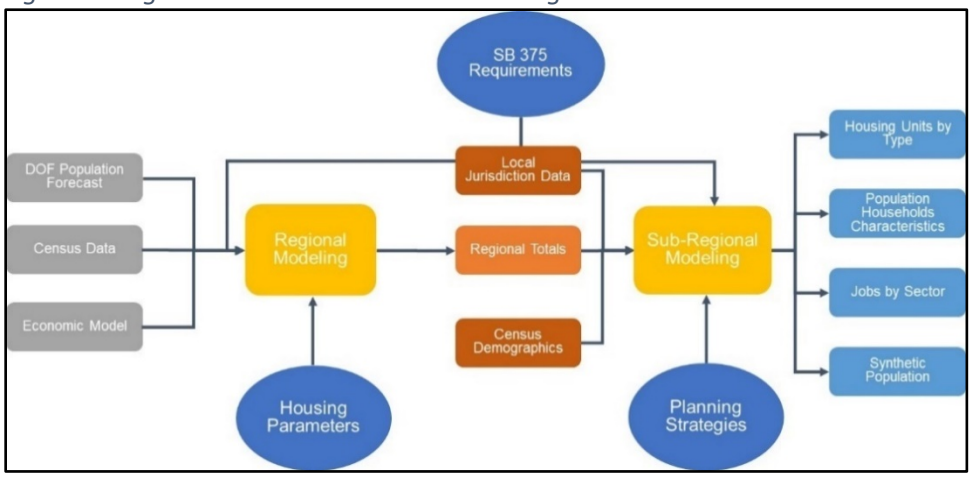

Figure 1 shows the general flow of input and feedback of the Regional Growth Forecast and its subregional allocation. Once the data and assumptions are determined for the regionwide forecast, population, housing, and jobs are allocated to the subregional geographies using local land use plans and policies. The output from the subregional forecast is used in the transportation model to support regional planning efforts.

1.5 Changes in Forecast Assumptions

The Series 13 RGF forecasted a population in the region of about 3.98 million persons by the year 2050, whereas the Series 14 RGF forecasts a population of about 3.74 million persons. The main reason for this difference between previous forecast versions is described in this Section. There are other subregional differences between forecast versions, as well. These differences in the subregional forecast will be discussed in more detail later in this document (see Chapter 5: Comparing the Regional Growth Forecasts).

1.5.1 DOF Population Projections vs Demographic Economic Forecasting Model

As described above, the Series 14 RGF process uses the DOF population projections as an input to forecast the regionwide job and housing unit count. In the Series 13 RGF process and in prior processes, a regionwide forecasting model called the Demographic Economic Forecasting Model (DEFM) was developed and used by SANDAG. Because the Series 14 RGF process uses the DOF population projections data as a control, the population in each year of the Series 14 RGF aligns with the DOF data.[5] The DOF projections used in the Series 14 RGF were developed in late 2019 and finalized in early 2020.

[5] The specific ways that the DOF population totals differ from the population data used in the Series 14 RGF relate to the estimation of the group quarters and household population and is discussed in more detail later in this document (see section 2.2.3 of Chapter 2).

Notably, these projections have a lower population total than the prior DOF projections for most California counties, including San Diego.

In 2017 Assembly Bill 1086 (Daly) was passed, which provides that HCD and councils of governments ("COG") must consult if the difference between the population forecast developed by a COG for use in its regional transportation plan and the total regional population forecast developed by the DOF is greater than 1.5 percent.[6] This is a revision to the previous statutory language which included a threshold of 3.0 percent. Because the threshold is smaller for this forecast, SANDAG controlled to the population totals from DOF instead of developing new population totals for use in the Series 14 RGF process. An item describing the proposed approach was presented to the Board of Directors meeting on December 15, 2017.[7]

1.5.2 Integration with the Yearly Population and Housing Estimates Data

The subregional allocation process iLUDEM is new to the Series 14 RGF process. An important element of this model is its integration of the forecast data with the yearly population and housing estimates data that are also developed by SANDAG. The iLUDEM uses the latest vintage of population estimates as the base data of the forecast. The intent of this change is to facilitate yearly updates to the forecast as well as ensure alignment with SANDAG estimates.

1.5.3 Parcel-based Inputs

Another change to the Series 14 RGF process is the use of parcel-based inputs. In previous forecasts, inputs for the subregional modeling efforts used subparcel-based information, which assigned a land use code and dwelling unit count at a subparcel-level when appropriate. For the Series 14 RGF process, the decision was made to develop the forecast inputs at the parcel-level to align with the data development effort of the new subregional allocation model. This entailed an additional data development effort of assigning a singular land use to the parcels that have more than one land use.

1.5 Organization of This Document

The remainder of the report details the SANDAG forecasting system used in the Series 14 RGF process, including individual model features and components, assumptions and parameters, and other major input requirements.

Chapter 2 discusses features of the regionwide forecasting model SanDE. Chapter 3 describes the derivation of housing and employment capacity based on land use plans and policies. While not a specific model per se, land use plans and policies are a critical aspect of the Series 14 RGF process. Chapter 4 describes the iLUDEM subregional allocation process. Finally, Chapter 5 presents the key differences in assumptions between the Series 13 RGF and the Series 14 RGF. In each case, the summary model descriptions are designed to provide insight into the process and a basic understanding of the relationships among the models and the data requirements.

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[6] AB 1086 https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB1086

[7] Meeting agenda from the December 15th, 2017 Board of Directors meeting is available at: https://www.sandag.org/uploads/meetingid/meetingid_4610_22971.pdf

Chapter Two: Regionwide Forecasting Model

SanDE uses cohort-specific rates developed from a variety of historical data sources to project detailed sociodemographic and economic information. In conjunction with the DOF population projections, SanDE produces annual projections of pertinent variables to the forecast horizon year of 2050. This section will describe the components of this model and some of the high-level output produced in the Series 14 RGF.

2.1 Regional Modeling System

The SanDE model uses a rates-based approach to forecasting the population, housing, and jobs at the regional level. The county-level population projections from the DOF have accurate race and ethnicity information as well as a breakdown by sex and single years of age. These projections are publicly available in a downloadable file.[8] After obtaining the county-level projections from DOF, a series of rates are applied to the population in SanDE's demographic model and economic model separately. These two components of SanDE produce the economic and sociodemographic variables needed for planning and research purposes. The sections below describe in more detail how each component of the regionwide forecast is developed.

2.2 Demographics

The population from the Series 14 RGF is comprised of detailed demographic information for all residents of the region. As previously discussed, the DOF projections used as controls provide single years of age, sex, race, and ethnicity detail for the total population in the region. Race and ethnicity in the SANDAG forecast are a mutually exclusive designation, meaning that Hispanic residents are assigned to their own category and can be of any race, while all other race groups represent non-Hispanic populations. The eight racial or ethnic categories are: (1) Hispanic (Any Race), (2) Non-Hispanic White, (3) Non-Hispanic Black, (4) Non-Hispanic American Indian or Alaskan Native, (5) Non-Hispanic Asian, (6) Non-Hispanic Native Hawaiian and Other Pacific Islanders, (7) Non-Hispanic Some Other Race (Other), and (8) Non-Hispanic Two or More races.

The population from the Series 14 RGF also provides information on the population by type--group quarters or household--in the region. Once developed, the same detail available for the total population is also available for the population by type.

2.2.1 Population Characteristics

The DOF projects the population by race and ethnicity, sex, and age, therefore SanDE does not account for changes to the composition of the population in the county. Other characteristics of the population, such as the active-duty military population and their dependents, and labor force participation, are

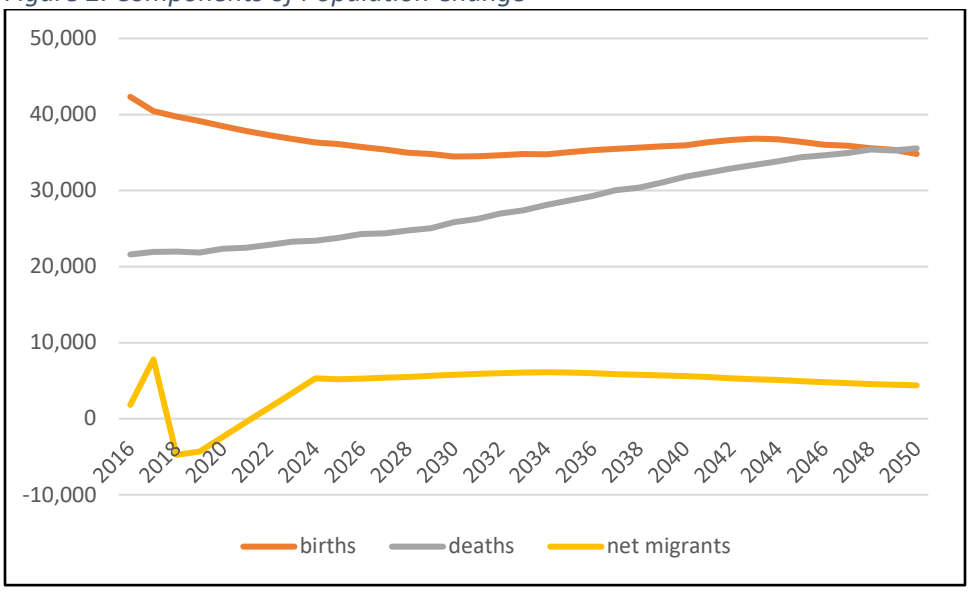
[8] Information about and the latest data from the DOF population projections are available online at: https://www.dof.ca.gov/Forecasting/Demographics/Projections/
Once the series is revised, the DOF replaces the older series with the new series online. To access the data used in the Series 14 RGF (which is no longer available online from DOF) please contact SANDAG staff.

derived from external data sources. A description of these sources and the assumptions used to forecast them are contained in the subsequent sections.

2.2.2 Components of Population Change

Births, deaths, and migration are the three demographic measures by which a population can change. Together, these measures are referred to as "components of change". Separately looking at these three components can provide further insight into the population of interest, such as how and why it grows or changes over time. The DOF provides tables with the components of change data for each projection series that is released to the public.

Figure 2. Components of Population Change



Source: Department of Finance Components of Change, January 2020 Projection Series

Figure 2 shows the components of change for the total population in the region between 2016 and 2050. The Figure shows that the projected deaths exceed projected births by the end of the forecast period. This, when combined with projected low levels of net migration, means that the population is expected to decline due to more deaths than births in the region. Data before 2020 reflect real levels of net migration in the region, showing a dip to negative overall migration. However, for the forecasted years, dips in migration or other components of change are not forecasted. Therefore, migration is projected to level out and stay very low through the horizon year.

2.2.3 Group Quarters Population

The population of a given area is comprised of household population (the population living in households), and group quarters population (the population living in group quarters facilities such as dorms, barracks, or assisted living homes). San Diego has several universities with residence halls as well as group quarters facilities for personnel living on military installations. The population living in these facilities should be treated differently from the household population in the region because the population's characteristics and location in the region tend to stay the same over time.

The data used to parse the group quarters population from the DOF total population come from a few sources. The DOF's annual *Dorms and Exclusions Report* is a major data source, containing the

population living in military, college, or other group quarters facilities by jurisdiction. This information provides the count of the group quarters population in the region; however, SANDAG develops and maintains additional group quarters facilities data as a supplement to the *Dorms and Exclusions Report* such as the location of group quarters facilities in the region.

It is important to know the location of group quarter facilities within the region because, as stated above, the demographic composition of their population does not change greatly over time. This is true for any region, but the measurement of this population is especially important in San Diego County because of the substantial military and college population. Although the individuals who live in military, college, or other group quarters facilities do change, the demographic make-up of that population stays fairly constant. Typically, when someone leaves a group quarters living situation, they are "replaced" by someone with similar demographic characteristics. For example, if a student lives in a dorm in one year, then the next year moves out, they are likely replaced by a student of the same age who has a similar living situation (meaning they live with roommates or alone). Knowing the location and count of this population in the region allows the forecast to hold the characteristics and size of this population constant in these specific locations to account for unique changes.

The group quarters population also has certain considerations that need to be modeled in terms of their participation in the labor force. Individuals living in student housing are assumed to be full-time students, and military personnel living in barracks are assumed to be active-duty military. Both of these populations do not participate in the civilian labor force in the same manner as the rest of the county's residents. The models account for this distinction when projecting income and employment for the residents of the region.

2.2.4 Military Population Living in Households

Of course, not all active-duty military personnel live in barracks or on military installations; many live in households, either alone, with their families, or with roommates. Just as with the active-duty military population who live in group quarters facilities, it is also likely that the active-duty military population who live in households maintain a similar demographic composition over time. For this reason, it is also important to identify the location of the active-duty military population living off-base.

The active-duty military population is estimated using decennial census data from 2010 and American Community Survey (ACS) data post-2010.[9] The count of military dependents is derived from the Defense Manpower Data Center's yearly report on the demographics of the military population in the country.[10]

[9] For more information on the American Community Survey and how to access data, please visit https://www.census.gov/acs/www/data/data-tables-and-tools/
For more information on the 2010 decennial census and to access data, please visit https://www.census.gov/programs-surveys/decennial-census/data/datasets.html

[10] *Demographics Profile of the Military Community*, Defense Manpower Defense Center. (Latest version accessible at: 2019 DEMOGRAPHICS PROFILE OF THE MILITARY COMMUNITY (militaryonesource.mil))

After developing an estimate of these populations, their characteristics are held mostly stable over the forecast time frame.

2.2.5 Household Population and Total Households

The population living in households comprises the majority of the region's population, and this population and their characteristics are treated differently from the way group quarters population are treated in the Series 14 RGF process.

The household population is initially created by subtracting the group quarters population by cohort from the total population by cohort, the latter figure provided by the DOF. The count of households in the region is derived from estimates from the 2010 decennial census and ACS data, similar to the development of the active-duty military population described above. For the future year count of households, headship rates derived from 2010 decennial census data are applied to the future household population.

Headship rates calculate the likelihood of someone forming a household, as well as who will be a member of their household based on their characteristics and data on historical headship rates by cohort. These rates are developed for each age, race and ethnicity, and sex cohort and are applied to the population. This is how the SanDE process develops the household population and how it determines the size and characteristics of the population that are placed into households in the region in later steps of the modeling process.

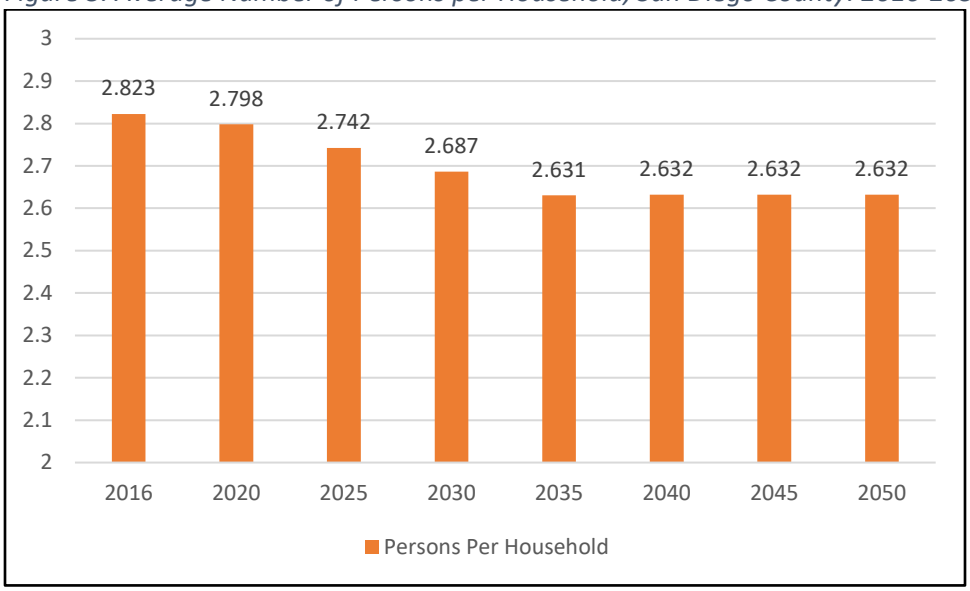
SANDAG staff presented the assumption of declining household headship rates over the forecast time frame to the Board of Directors at its May 25, 2018 meeting.[11] This assumption is made based on the analysis of data which shows that populations with an older median age have smaller household size than populations with a younger median age. This decline is the effect of the headship rates changing to reflect the ageing population that maintains their household even as the members of the household leave to form their own households, or due to one or more members of a household dying, in which case their household would dissolve with the remaining members moving elsewhere or staying in place and reducing their household size. The assumption that household size will decline effects not only the composition of households in the region, but the total number of households that the population requires to live in the region.

Based on these household headship rates, it is assumed that a region-level average household size of 2.632 will be reached in 2036 and will be maintained at this rate through the forecast time frame. This rate is obtained by converging to household headship rates from the 2010 decennial census between

[11] May 25th, 2018 Board of Directors meeting agenda available at: https://www.sandag.org/uploads/meetingid/meetingid_4785_23865.pdf

the base year of 2016 and the target year of 2036. Figure 3 shows the average household size from the Series 14 RGF.

Figure 3. Average Number of Persons per Household, San Diego County: 2016-2050



Source: SANDAG Series 14 Regional Growth Forecast and Baseline Subregional Allocation.

2.3 Economics

The next component of the Series 14 RGF process develops the economic characteristics of the population in the region. This module of the SanDE model is run separately from the demographic module and uses the cohort-specific demographic data that are output from that process along with several external data sources to estimate jobs, employment, income, and unemployment in the region. A flow chart of the economic model can be found in Appendix B.

2.3.1 Labor Force Participation

Similar to household headship rates, labor force participation rates are calculated using 2010 decennial census and ACS data to estimate the likelihood that an individual will work outside the home given their demographic characteristics. These cohort-specific rates are applied to the cohort-specific population to derive this subsection of the population.

One focus of the PRP 30 meeting that included external experts was whether, and to what degree, future labor force participation rates should change over time. The Series 14 RGF assumes a slight increase to the labor force participation of the population over age 65 because of the region's population ageing and because of improvements in health which makes it possible for someone to work later in their lives than generations before them.

Specifically, by 2050, a composite rate is calculated based on the 2010 decennial census data and 2007-2016 1-year ACS Public Use Microdata Sample (PUMS) data.[12] Labor force participation was at a historic low in 2010 because of the slow recovery following the Great Recession. When using a composite of these rates, labor force participation rises to the highest observed rate for each race and ethnicity, sex,

[12] For more information about the ACS PUMS data and to access data online, please visit: https://www.census.gov/programs-surveys/acs/microdata/access.html

and age cohort up to the forecast horizon year. The differences between racial and ethnic cohorts also decrease so that all rates begin to converge by 2050. Once labor force participation rates are applied to the population, the total labor force in the region can be calculated. This labor force in the region is then used to estimate other economic variables in the forecast.

2.3.2 Unemployment

Unemployment in the region is derived from the labor force in the region. Once the labor force is calculated, cohort-specific unemployment rates are applied to that cohort-specific population. Next, the SanDE model computes the initial total unemployed population in the region by summing up the cohort-specific unemployment.

The PRP 30 meeting attendees also provided input on expected future unemployment rate in the region. From this discussion, the assumption is made to reach and maintain an unemployment rate of five percent. An unemployment rate of five percent represents the 23-year average for the San Diego region. In the Series 14 RGF, this rate is achieved by 2020 and maintained until 2050.

Maintaining an unemployment rate of five percent is accomplished by computing an unemployment rate adjustment factor by dividing the target unemployment rate of five percent by the initial unemployment in the base year. This adjustment is then applied to employment in the region until the target rate is obtained. Cohort-specific unemployment is then obtained by applying the unemployment rate adjustment factor to the initial cohort-specific unemployment.[13]

2.3.3 Workforce

Next, the cohort-specific unemployed population is subtracted from the cohort-specific labor force to arrive at the cohort-specific workforce in the region. The sum of this cohort-specific workforce is the total regional workforce. Assumptions about the future workforce in the region are implicit in the labor force and unemployed population. The population in the workforce is used later in the economic module to calculate in- and out-commuting in the region.

2.3.4 In- and Out-Commuting

During the PRP 30 meeting, the external panelists were asked about the assumptions of in- and out-commuting in the forecast.[14] It was agreed that both in- and out-commuting rates should rise over the forecast time period. This is because of rising housing costs that may prompt some workers to look outside the region for housing, as well as employment in adjacent areas that might pull workers from the region into other areas.

In- and out-commuting counts are taken from tabulations of ACS data called the County-to-County Commuting Flows data.[15] These data use the ACS data collected on a person's primary workplace

[13] All data and rate development for the demographic and economic modeling components of the Series 14 RGF were developed before the COVID-19 pandemic and therefore do not reflect the economic or social conditions in the region during that time period.

[14] PRP 30: Review DEFM Forecast, held on February 14, 2018

[15] Information on the ACS County-to-County Commuting Flows data is available on the US Census Bureau website: https://www.census.gov/topics/employment/commuting/guidance/flows.html

location and links it to their place of residence. With these two pieces of data linked, a commuting flow is generated which can measure how many people flow into and out of a given county for work.

Using these data, staff then computes the rate of out-commuters and in-commuters, applying that rate to the total workforce that is calculated in an earlier step. Next, the workforce employed locally (non-commuters) is calculated by subtracting the out-commuters from the total workforce. Then, the count of jobs attributed to local workers can be found by applying the local jobs rate to the local workforce. Lastly, the regional jobs rate is applied to the number of jobs attributed to the local workforce to arrive at the total number of jobs for the region.

The San Diego region is also unique because of its proximity to the Mexican border. Trips are also made by either Mexican or US citizens who live in Mexico and commute daily from San Diego for work over the international border. These cross-border trips are accounted for in the Series 14 RGF process. The *2016 Border Delay Survey* is the source of the daily in-flow data on workers who commute to San Diego County from Mexico.[16] The survey consists of 9,852 responses, representing a sample of persons crossing by foot or by privately owned vehicle (POV), or in commercial vehicles.

The *Border Delay Survey* data are analyzed to develop an estimate of the number of persons who make daily work commutes to San Diego County from Mexico. The percentage of respondents living in Mexico who reported that they commute to San Diego County daily for work is applied to data on the daily traffic flow that crosses over the border.[17] By applying the percent of the population who reported commuting daily to San Diego county to the total number of persons who cross the border daily, an estimate of about 4,000 persons is developed to represent the population who live in Baja California and commute to San Diego County every day for work. The Series 14 RGF process uses this estimate to account for in-commuting from Mexico to the region.

2.3.5 Employment by Sector

The California Economic Development Department (EDD) develops periodic, county-level projections of jobs by two-digit North American Industry Classification System codes (NAICS2) for a ten-year time period. NAICS2 codes are representative of the sector of that given industry.[18] The latest projections available when the Series 14 RGF process was developed are from 2012 and provide sector-specific projections of employment for San Diego County to 2022.[19] These projections are used to calculate proportions of employment in each sector as a part of the total employment in the region. These

[16] For more information on the 2016 Border Delay Study please visit: https://www.sandag.org/uploads/publicationid/publicationid_2110_21857.pdf

[17] Information on the number of border crossings is available from the Bureau of Transportation Statistics, accessible online: https://www.bts.gov/browse-statistical-products-and-data/border-crossing-data/border-crossingentry-data

[18] For more information on NAICS codes please visit: https://www.census.gov/programs-surveys/economic-census/guidance/understanding-naics.html

[19] EDD Employment Projections are accessible online at: https://www.labormarketinfo.edd.ca.gov/data/employment-projections.html

proportions are then applied to the future total employment in the region to develop the future sector-specific employment in the region.

2.3.6 Total Annual Pay by Sector

Historical data from 1990 to 2014 on annual average pay by NAICS2 sector for San Diego County from the Bureau of Labor Statistics' (BLS) Quarterly Census of Employment and Wages (QCEW) are used to develop projections of total annual pay by sector.[20] Annual pay is converted from current dollars to 2016 dollars in the BLS dataset by using the BLS consumer price index (CPI) data.[21]

The total annual pay for wage and salary jobs in each sector is computed by applying the future sectoral average annual pay to the jobs in each of the NAICS2 sectors. The assumption is made that differentials in pay across the sectors will stay constant over the forecast time period; however, pay for all sectors increases by 1.15% annually to reflect overall wage growth in the region.

2.3.7 Income

Income for residents of the region is derived from several sources and are applied to the cohort-specific population and other components calculated in earlier steps. The flow chart for the income model can be seen in Appendix C.

Income forecasts for San Diego County residents are developed for the following income sources:

1) Wage and salary;
2) Other (e.g. Veteran Administration benefits, alimony, unemployment and compensation, etc.);
3) Self-employed;
4) Interest and dividends;
5) Public assistance;
6) Retirement;
7) Social security, and;
8) Supplemental security

Data on income by type from the ACS are used to calculate per capita rates of income by source. Cohort-specific rates of income by source are applied to the cohort-specific population developed in earlier modules of the forecast. Next, the total earned, and unearned income are derived by summing up the value of specific unearned income types.

2.3.8 Household Income

During the PRP 30 meeting, staff asked the participants to weigh in on how median income should grow throughout the forecast time frame. All of the participants agreed that the target median household income should be between $70,000 and $75,000.

Before median income can be calculated, each household should be assigned a discrete income value. This is based on both the ACS summary file tabulated data and the ACS PUMS microdata available online.[22] These data provide both a median income value and a count of households in each categorical

[20] BLS QCEW data are accessible online at: https://data.bls.gov/cew/apps/data_views/data_views.htm#tab=Tables
[21] BLS CPI data are accessible online at: https://www.bls.gov/regions/west/ca_sandiego_msa.htm
[22] ACS summary file data are available from the US Census Bureau's online data portal at: data.census.gov

income value. The SanDE process uses these two pieces of information along with the median income goal provided by the PRP 30 participants to create a distribution of households by income for the region.

2.3.9 Income by Source

To develop forecast data on future non-wage income, data from the ACS on income from sources, such as self-employed, retirement, social security, supplementary security, public assistance, as well as interest, dividends, and rental income are used. Other income such as Veteran's Affairs (VA) payments, unemployment compensation, and alimony is also accounted for in this estimate. Data are available for eight age cohorts (18-24, 25-34, 35-44, 45-54, 55-59, 60-64, 65-74, and 75 plus). The income attributed to these other sources is also held constant over the forecast period based on historic percentages of persons reporting income from these sources.

2.4 Housing

The number of housing units that are forecasted in the Series 14 RGF process is derived from the household population in the region and the number of housing units needed to house that population and obtain and maintain a healthy vacancy rate in the region. There are several external controls and exogenous variables that influence the housing construction in the region over the forecast horizon. Namely the vacancy rate, assumptions about headship rates, and accounting for unoccupiable units that were approved by the Board of Directors and from feedback received from subject matter experts. These elements interact with data on households and population that have already been derived to determine the number and timing of housing units that are created by the SanDE model.

Based on the expectation of declining household size during the forecast period, the supply of new housing units needed to:

1) meet the demand of the growing forecasted population;
2) reach the target of 4% regional vacancy rate by 2040, and;
3) converge to the household headship rates from the 2010 decennial census data by 2036

Several constraints are put on the housing unit forecast that create an increase in housing unit supply in the first half of the forecast. To meet these targets, forecasted housing units increase from the current rates of construction and throughout the 2020s. This rate is held constant until the early 2030s, when the constrained targets are closer, at which point the number of units added per year declines again.

Data on historical housing construction shows that an average of 12,500 units were built annually in the region between 2000 and 2010. This represents a time in the region when construction was more prolific, and construction declines towards the end of the decade with the beginning of the Great Recession. At the height of construction between 2000 and 2010 about 15,000 units were built annually. Since 2010, only about 7,400 units were constructed annually on average, showing that the region has not returned to the pre-recession rates of construction. According to data from the Real Estate Research Council of Southern California, the highest observed construction took place in 1986 when more than 43,000 units were built. The Series 14 RGF assumes that housing will be constructed at a rate of less

than 13,000 units annually based on the historical levels of development in the region between 2000 and 2010.[23]

2.4.1 Unoccupiable Units

Another exogenous variable that affects the number of new units in the regionwide forecast is the assumption that some units are not available to be occupied by the resident population in the region. These units are referred to as "unoccupiable" in the Series 14 RGF and are typically second homes or vacation rentals that may be vacant for most of the year but are not available for rent or sale for year-round occupancy. This assumption was also discussed at the May 25, 2018 Board of Directors meeting and at the PRP 30 meeting. Leaving these units as "unoccupiable" is congruous with other efforts to forecast a "healthy" housing market in the region.

The estimate of unoccupiable units is derived from single-year ACS data from 2007 to 2016 on vacancy rates in San Diego County. Census tracts that have higher vacancy rates than adjacent tracts are flagged as having vacation rentals or second homes that are unlikely to be available for long-term rentals or for purchase. The count of unoccupiable units from each tract is estimated based on the total number of units and the number of vacant units in the tract. The number of vacant units is reduced based on calculating the number of units which would make the vacancy rate in the tract more comparable to adjacent tracts.

These data show that the number of "unoccupiable" units has fluctuated between 50,000 and 65,000 over that ten-year period. SANDAG estimates that on average annually, there are 57,000 units in the region that are not available to house the San Diego County residents. In the Series 14 RGF process, these units would not be available to house the resident population in the region. Table 1 shows the

[23] Information on the Real Estate Research Council of Southern California is available online at: https://www.cpp.edu/cba/real-estate-research/

count of estimated unoccupiable units in each jurisdiction. Unoccupiable units are held constant for the entire forecast period.

Table 1. Estimate of Unoccupiable Units by Jurisdiction

Jurisdiction	Unoccupiable Units
Carlsbad	2,100
Chula Vista	1,500
Coronado	1,900
Del Mar	400
El Cajon	600
Encinitas	900
Escondido	1,000
Imperial Beach	200
La Mesa	100
Lemon Grove	200
National City	300
Oceanside	3,400
Poway	100
San Diego	17,300
San Marcos	400
Santee	400
Solana Beach	500
Vista	700
Unincorporated	7,200
Region Total	39,200

Source: SANDAG estimate

Chapter Three: Land Use Plans and Policies

Determining the amount and location of housing unit and employment capacity in the region is critical to allocating the growth forecast to jurisdictions, communities, and neighborhoods. These capacities represent key policy inputs to the forecasting process, reflecting current land use plans and policies as well as the implementation of smart growth development strategies throughout the region. Land use data collected from the local jurisdictions provides policy inputs to the iLUDEM.

Prior to the Series 13 RGF, the forecasts developed for the regional planning efforts approached the subregional allocation differently. The Series 8 Forecast, released in 1995, simply assumed slight residential density increases across the board in all jurisdictions. That approach was criticized as arbitrary and not addressing the nexus between land use and transportation.

The *2020 Forecas*t, released in 1999, was the first SANDAG attempt to model future smart growth development patterns. Residential and employment capacity was added throughout the urban areas of the region in the form of transit-oriented development within walking distance of approximately 150 current and future transit stops, called transit focus areas (TFA). However, in areas where several TFAs were clustered, the resulting land use patterns sometimes were too removed from current plans and caused concern for some jurisdictions.

The *2030 Cities/County Forecast* was developed as a component of the Regional Comprehensive Plan (RCP). This forecast was based on current plans and policies of the incorporated jurisdictions and the draft general plan update for unincorporated areas. No smart growth areas other than those contained in the current plans and policies of the jurisdictions were included in the land use assumptions.

Starting with the Series 13 RGF, SANDAG staff worked directly with local jurisdictions to understand how local land use plans and policies might change and evolve over the next forty years. Through this process the subregional forecast is based primarily on local land use plans, many of which have been recently updated.[24]

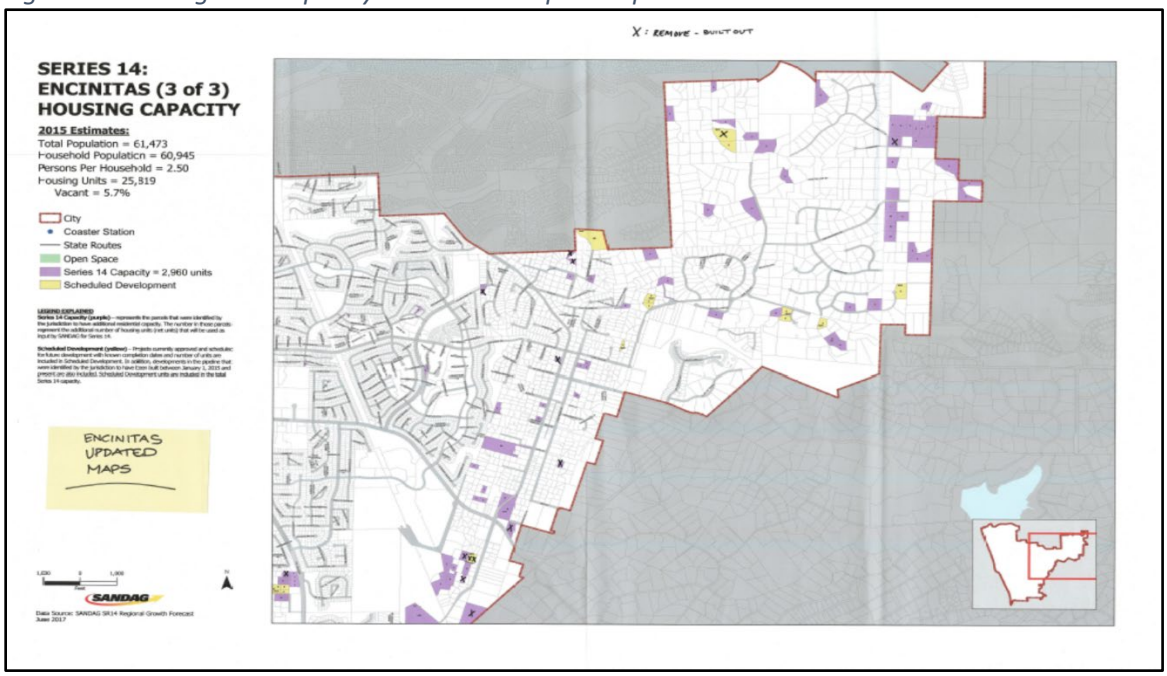
For the Series 14 RGF, SANDAG staff relied on planning staff from each of the local jurisdictions to provide the inputs necessary to reflect increased housing unit and job capacity throughout the region through 2050. To facilitate this process, SANDAG develops a series of maps for 17 of the 19 jurisdictions (capacity for the City of San Diego and the unincorporated county are developed similarly but use GIS files due to their size). These maps display parcel-level capacity that was developed during this process for the Series 13 RGF as a starting point. The Series 13 RGF capacity is adjusted to account for development that occurred in the years since the Series 13 RGF. Jurisdictions then assess which capacity

[24] More information on the history of regional growth forecasts at SANDAG can be found on the SANDAG website (see https://www.sandag.org/index.asp?subclassid=118&fuseaction=home.subclasshome).

is no longer relevant or whether there are additional areas that could accommodate future housing development.

Figure 4 shows an example of one of these maps for the City of Encinitas. This shows their comments and feedback used to develop housing unit capacity for use in the forecast.

Figure 4. Housing Unit Capacity Collection Map Example



Source: SANDAG

Each jurisdiction was additionally asked to provide SANDAG with information about "scheduled development" projects. These are development projects that are either currently under construction or have final approval and financing.

Next, SANDAG staff creates a GIS dataset for the region that coded all of the housing capacity from the jurisdictional review. This dataset is used during the subregional allocation process to indicate where future additional housing units could be accommodated. This process is iterative, involving several months' worth of effort on the part of SANDAG and local staff.

3.1 Housing Capacity

After the collaborative capacity collection process, the parcel-level data are aggregated for jurisdictions and community plan areas. These capacities are also presented to the planning directors at the TWG meetings for their review and comment. If a jurisdiction determines that the capacities conflict with their current plans and policies, the inconsistencies are noted and corrected, and the capacity database is recomputed and redelivered. This process is repeated until there is consensus among the jurisdictions that the capacity database reflects a reasonable representation of their current plans and policies, or likely land use alternatives based on draft plans.

The capacity for the Series 14 RGF additionally assumes accessory dwelling units on five percent of all single-family lots of at least 5,000 square feet in each jurisdiction. This equates to roughly 20,000

additional units of housing capacity throughout the region outside of the rural villages of the unincorporated area. This is consistent with a report from the San Diego Housing Commission that projected a rate of ADUs occurring on about 5% of available single-family zoned parcels. Including lots 5,000 square feet or larger ensures that ADUs are assumed to be possible in all areas of the region, including the more urbanized areas where lot size is smaller. As discussed in Chapter 1 Section 1.2, the methodology for developing the number of ADUs assumed to be available for future housing unit development was agreed upon by the Board of Directors at its May 25, 2018 meeting.

3.2 Employment Capacity

Along with housing unit capacity in the region, the iLUDEM process uses capacity for future jobs to develop the subregional allocation of employment in the region. Scheduled development events that include nonresidential developments are also collected from the jurisdictions and used to allocate near-term jobs in the region.

For the Series 14 RGF, the employment capacity in the region is developed based on the employment capacity from the Series 13 RGF, with adjustments for the distribution of current employment. Additional capacity for future employment comes from two sources other than nonresidential scheduled development events: adjusted employment capacity that was identified during the jurisdiction outreach process in for the Series 13 RGF, and vacant job spaces that are assigned where current employment exists in the base year of the forecast.[25] Both of these types of capacity in the region are developed at the parcel-level and are industry-specific.

Nonresidential events are also how military jobs increase over the forecast time period. During the data collection process, SANDAG received information on installation expansions and timing for additional personnel to be added to those local installations. Other than these scheduled development events, additional employment in the forecast is civilian. Similarly, staff collected input from the local universities on anticipated expansions from both their planning staff and online information in order to estimate the number of future employees for each university. Government and military jobs are only placed on parcels that are the location of government and military jobs in the base year of the forecast.

[25] Information and programming related to the creation of base year jobs and job spaces are available on SANDAG's GitHub: https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/job_spaces.sql
https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_private.sql
https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_selfemployed.sql
https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_gov.sql
https://github.com/SANDAG/sandag_urbansim/blob/master/etl/sql/views/jobs_mil.sql

Chapter Four: Subregional Forecasting Model

4.1 iLUDEM

The iLUDEM process allocates employment, population, housing, and income from the regional forecast to produce the subregional allocation of the Series 14 RGF. It is designed to forecast the location of residential and nonresidential activity within the region. The iLUDEM is based on the spatial interrelationships among economic factors, population and housing factors, land use patterns, and constraints to growth to determine the location of future housing and jobs.

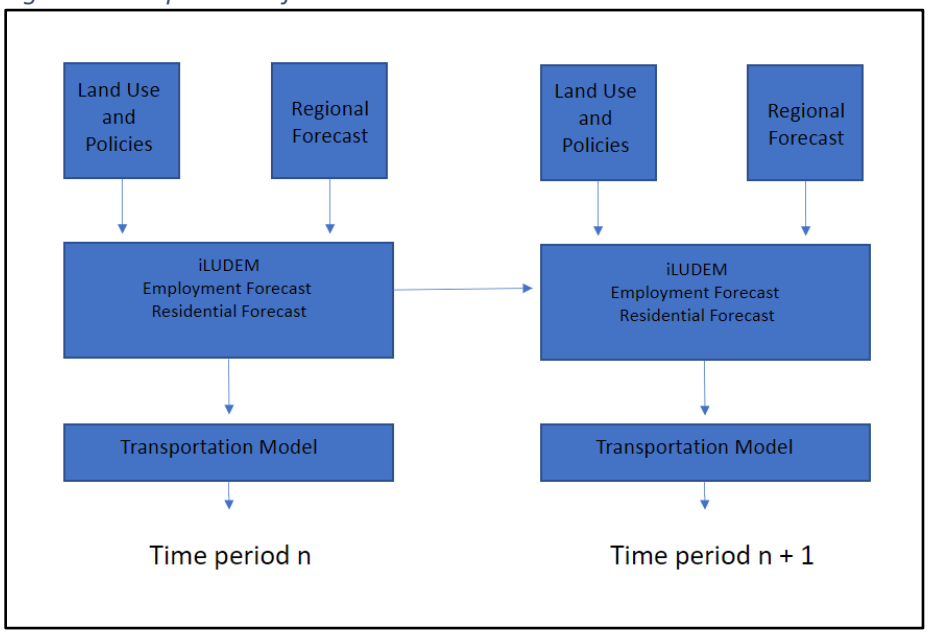
4.1.1 Overview and Key Relationships

The iLUDEM process has three main components. The first component allocates residential units, the second component allocates regional employment, and the final component provides a forecast of other demographic and economic characteristics of both the jobs and the population in the region. This includes occupied units (households), population by characteristics, household income, and employment by industrial classification. The iLUDEM process allocates this regional information to housing units, jobs, and population at a small geographic scale, specifically to over 800,000 parcel polygons in San Diego County. These polygons are geographic areas based on the tax assessor's parcel data. These parcel polygons are referred to as "parcels" for the remainder of this document.

After the iLUDEM determines the location of additional housing units in a given year, it uses several factors to place the resident population in those units and allocate region-level jobs to subregional areas. Figure 5 illustrates the iLUDEM's relationships to the regional forecast controls and the

interactions of this information between two time periods. The iLUDEM process provides a forecast at one-year intervals; however, data are typically displayed in five-year increments.

Figure 5. Components of the iLUDEM Process



Source: SANDAG

4.1.2 Housing units, parcel-level

After the number of units at the regional level are calculated, the number of units needed in each of the 19 jurisdictions is determined for every year of the forecast. These jurisdiction-level controls are determined by the proportion of units between jurisdictions in previous SANDAG forecasts and by an analysis of the available capacity in each jurisdiction based on the workflow described above. The iLUDEM process then allocates the needed units to the parcels within each jurisdiction using a criterion developed during consultation with subject matter experts and several PRP meetings held at SANDAG. There are three major premises that underlie the forecast of residential growth:

1. Residential growth occurs only in areas with additional capacity for residential development;
2. The greater the capacity that is available for residential development in a jurisdiction, the greater the potential for residential growth in that subregional area, and;
3. Capacity in some areas are constrained based on a set of parameters in a manner that promotes urban infill.

The iLUDEM process first assigns scheduled development events based on start or end date information that is provided to SANDAG during the capacity collection process. These units are prioritized over other housing unit capacity that was identified during the collection process. This means that if a jurisdiction has both scheduled development capacity and general plan capacity, the scheduled development events are selected first before other available parcels. Parcels with a high amount of capacity are typically capped at 250 units added per year, with some exceptions for certain projects. This means that for large

parcels and some scheduled development projects with more than 250 total units, the project will be built over multiple years.

Not all jurisdictions have scheduled development projects for every year; therefore, at the beginning of the forecast, the units built in the region are a combination of scheduled development and units resulting from the jurisdiction's interpretation of their own general plan capacity.

Once parcels are developed with housing units, that capacity is no longer available for future development. No demolition of units occurs during the iLUDEM process. The capacity that is developed from the jurisdiction collection process is added to the parcels in addition to any existing units.

4.1.3 Employment, parcel-level

Employment at the parcel-level is allocated from the regional totals in a similar way; however, there are no jurisdiction-level controls of employment totals, so the region-level employment is allocated to parcels in one step. Employment capacity is industry-specific, meaning that additional jobs will be filled based on the available spaces of a given industry (depending on the number of jobs that need to be allocated to that industry). This means that the number of jobs being developed in any given jurisdiction is not based on control targets, but rather the industry-specific targets developed at the regional level and industry-specific capacity. Parcels are selected randomly when there are multiple sites available for jobs of a given industry that need to be built.

Next, the iLUDEM process selects which parcels will be developed in the region for each year of the forecast based on the SanDE process' controls for additional employment at the region-level. Future jobs are then placed on the parcels with capacity, with high-capacity parcels favored over parcels with less capacity. This process is repeated for each year until the yearly region-level controls are met.

4.1.4 Socioeconomic Characteristics

The characteristics of the population are assigned once the units have been allocated throughout the San Diego region. This process is informed by several external datasets that use historical subregional allocations to determine where future growth should occur by the characteristics of a resident, such as race and ethnicity, sex, age, population type (household or group quarters), income level of the household, and structure type of the housing unit. These historical rates or proportions are applied to the given housing unit to develop the forecast by socioeconomic characteristics.

Occupied housing units

"Households" are another way to refer to occupied housing units. The count of households is a function of housing units in the region and the characteristics and size of the household population in the region (compared to the population living in group quarters facilities). At the subregional-level, the count of households is derived from cohort-specific household headship rates that measure the likelihood that a person, given their demographic characteristics, would be the head of a household and who will be the members of their household. When applied to the population, this gives the total number of households that will be formed given the race and ethnicity, age, and sex distribution of that population. These

household headship rates are informed by Summary File data from the 2010 decennial census, which allows rates to be estimated at the census block-level.[26]

Group quarters population

The group quarters population is distributed to the subregional areas based on the location of group quarters facilities. SANDAG staff create an annual spatial dataset that contains the locations of such facilities in the region.

Group quarters population characteristics are developed based on the 2010 decennial census data at the census block-level. This cohort-specific population is allocated to group quarters facilities based on the characteristics of the people and the type of facilities. For example, persons in college dorms or residence halls would be in their late teens and early twenties and would have a racial, ethnic, and sex distribution that was observed in the 2010 decennial census. Compare this to the sociodemographics of the population living in assisted living facilities, which are also considered group quarters.

Jobs by type

As discussed above civilian and military employment is assigned to job spaces in the region based on the location of subregional capacity for jobs. Once this employment is placed, the industry of that job is assigned based on general plan information. These attributes inform the development type for each parcel. Jobs are assigned to spaces based on the development type of the parcel where there is job capacity in order to meet the industry-specific targets set at the regional level.

Housing units by type

Once housing units are forecasted to occur in the region, the structure type needs to be assigned to the unit. In SANDAG data products, housing structure is broken into four types: single-family attached, single-family detached, multi-family, or mobile homes. These categories align with the Census Bureau definitions of structure type.[27] The designation of single-family attached and detached are new to the Series 14 RGF. Previously, all single-family units are referred to as “single-family detached units”. For the purposes of the Series 14 RGF, “single-family attached units” refers to units that share a wall, but not a floor or ceiling, with an adjacent unit. These units are commonly referred to as townhomes or rowhomes.

To forecast future housing growth by structure type, the iLUDEM process classifies each unit based on the count of units and the development type of the given parcel. For scheduled development event units, the jurisdictions identify the structure type of the new units during the outreach process, which is then used to classify future units that are a part of a scheduled development event.

Household income to households

Household income is developed based on the distribution of income in the 2010 decennial census and ACS data. The distribution of median income and households by grouped income category in these external data sources inform the subregional distribution of households by income category. Median income grows over the forecast period as determined in the SanDE model, and these increases apply to

[26] For more information on the 2010 decennial census Summary Files and how to access the data, please see: https://www.census.gov/prod/cen2010/doc/sf1.pdf

[27] Information about the Census Bureau definitions of housing by structure type are available online: https://www.census.gov/construction/chars/definitions/

the subregional areas, as well. Measures are instituted at the subregional level to ensure that the distribution of household income remains similar to the distribution in the base year and estimates data.

4.1.5 Key Assumptions to Develop the Baseline Subregional Housing Allocation

Several key assumptions inform the detail of the subregional forecast. Many of these assumptions are developed during consultation with subject matter experts during PRP meetings or other collaborative discussions between SANDAG staff. Multiple options are presented at the PRP meetings when possible, and the group was asked to comment and make recommendations about what assumptions to make.

During several PRP meetings and internal discussions, SANDAG staff from the Data, Analytics, and Modeling Department as well as the Planning Department developed an approach to prioritize the subregional areas that show capacity for future housing unit development. [28] Incorporating feedback from planning and modeling staff ensured that the approach included not only information gathered on

[28] PRP39: Regional Forecast and Finalized Subregional, held on June 13, 2018; PRP 50: Subregional Housing Allocation, held on February 5, 2019

housing unit capacity, but also aligned with the vision that each jurisdiction had for future development beyond that contained within general plans.

Several specific metrics classify the likelihood of development on a given parcel in order to prioritize and phase growth in the region. First, each parcel is analyzed for the following characteristics in order to assess how much of the capacity provided by the local jurisdictions are on "favorable" parcels:

1) Is the parcel inside of or outside of a "Very High" fire hazard zone according to data collected from Cal Fire?
2) Is the parcel inside or outside of the San Diego County Water Authority (CWA) boundary or the city of Coronado?[29]
3) Is the parcel more than or less than 5 miles from an existing rail or rapid bus stop?

Using these specific measures ensure that future development is not located in high fire hazard zones, has access to water services, and is near high-quality transit options.

Next, this information is used to score each parcel to determine how much of the total regional capacity should be allocated to each jurisdiction, in addition to their scheduled development events. Table 2 below shows the components used for this part of the process and the weight each element is assigned.

Table 2. Measures Used for Parcel Scoring with Weights

Variable	Weight
Total jurisdiction-provided capacity	0.35
Total scheduled development or jurisdiction-provided capacity, whichever is lower	0.35
Capacity that is not within Cal Fire's "Very High" fire hazard zone areas	0.1
Capacity that is on parcels that are within 5 miles of rail or Rapid bus stops	0.1
Capacity that is on parcels that are within the CWA boundary or are in Coronado	0.1
Total	1.0

Source: SANDAG

The weighting shown in Table 2 is used to help determine how much capacity will be allocated within each jurisdiction. Parcels are selected as sites for the location of future housing units by assigning a score of 0-3 based on the following factors:

1) If the parcel is in a "Very High" fire hazard zone;
2) If the parcel is more than five miles away from any rail or Rapid bus stop, and;
3) If the parcel is not within the CWA boundary or in the City of Coronado.

Parcels are ranked based on the above factors, with one point assigned to each parcel for fulfilling each factor. Parcels with a lower score are selected before parcels with a higher score. For example, all parcels in a given jurisdiction with a score of 0 will be developed before any parcel with a score of 1. Once the scoring is complete and the parcels that will be developed are determined, parcels within a jurisdiction are randomly selected until subregional targets are met. The exception are parcels with

[29] The City of Coronado is not within the CWA boundary, water is provided by American Water. However, because the intent of this metric to assess whether future development would have access to utilities like water, staff included the boundary of the City of Coronado along with the CWA boundary for analyses.

residential scheduled development projects, which are all included and developed before other parcels (if phasing allows). In this case, the scoring is still used to determine relative order of these parcels.

Due to the geographic size of the City of San Diego and the Unincorporated County, available housing unit capacity is grouped by Community Planning Area (CPA) instead of by the entire jurisdiction. Next, a time series ratio of housing units added in a jurisdiction or CPA by year in the Series 13 RGF is used as a baseline for the Series 14 RGF time series. This means that the relative phasing of the Series 14 RGF is similar to the Series 13 RGF, which was approved by the Board of Directors with the adoption of the 2015 Regional Plan. A jurisdiction or CPA that developed a higher proportion of capacity earlier in the Series 13 RGF will do the same in the Series 14 RGF.

With the information assigned to parcels as described above, the iLUDEM process proceeds as follows for each jurisdiction or CPA (subregion):

1) Parcels are checked for phasing information. If a parcel's phasing information is not set to start in the year that is being modeled, then it is set aside;
2) The amount of capacity on a given parcel is limited to 250 units per year (with some exceptions for residential scheduled development projects requested by the local jurisdictions);
3) Next, parcels that had some capacity utilized in the prior year and have remaining capacity are prioritized, followed by scheduled development capacity, then all other capacity;
4) After the parcels are sorted as described in step three, they are further sorted by the scoring described above into subgroups, with the lower scores being ranked above higher scores, and;
5) Lastly, within these subgroups, parcels are randomly sorted and selected until enough capacity is available to meet the subregional targets for the year.

Not all parcels are selected using the iLUDEM process, as there is excess capacity based on the number of forecasted housing units in the region and the amount of capacity that is provided by the jurisdictions. However, the additional dwelling unit capacity developed in earlier iterations of the forecast are included in the pool of available units and treated like general plan capacity. This means the ADU capacity is available along with capacity from the jurisdictions and the scheduled development events and may be randomly selected in the parcel selection process.

Chapter Five: Comparing the Regional Growth Forecasts

This section contrasts the primary assumptions and results of the prior forecast (the Series 13 RGF used in the 2015 RTP) with the Series 14 RGF. For the most part, the differences in assumptions reflect revised data that are available for the Series 14 RGF process, as well as differences in methodology between the two forecasting models. Results from the Series 14 RGF at the jurisdiction-level can be found in tables in Appendix D.

5.1 Base Years

When a forecast is produced, the first decision made is to select the base year, or starting year, of the forecast. The base year represents the most current information about the region's population, job count, and housing. The base year for Series 13 is 2012, and for Series 14 it is 2016. Years beyond the base year are forecasted and no longer represent the most current information; instead, these forecasted years represent one possible outcome of development given the assumptions, data sources, and methodology that has been discussed in this document.

Because the process of developing the forecast occurs over several years, new data become available after the base year is set. A feature of the iLUDEM process is that the estimates data are integrated into the forecast models. For the Series 14 RGF model runs, the 2018 vintage of estimates is used to supplement the base year data. This vintage of estimates was created in 2018 and includes data for 2016, 2017 and 2018 that are integrated into the forecast data. So, in the case of the Series 14 RGF, the first three years of the forecast represent on-the-ground development and population and 2019 is the first year of forecasted data.

5.2.1 Fertility Rates

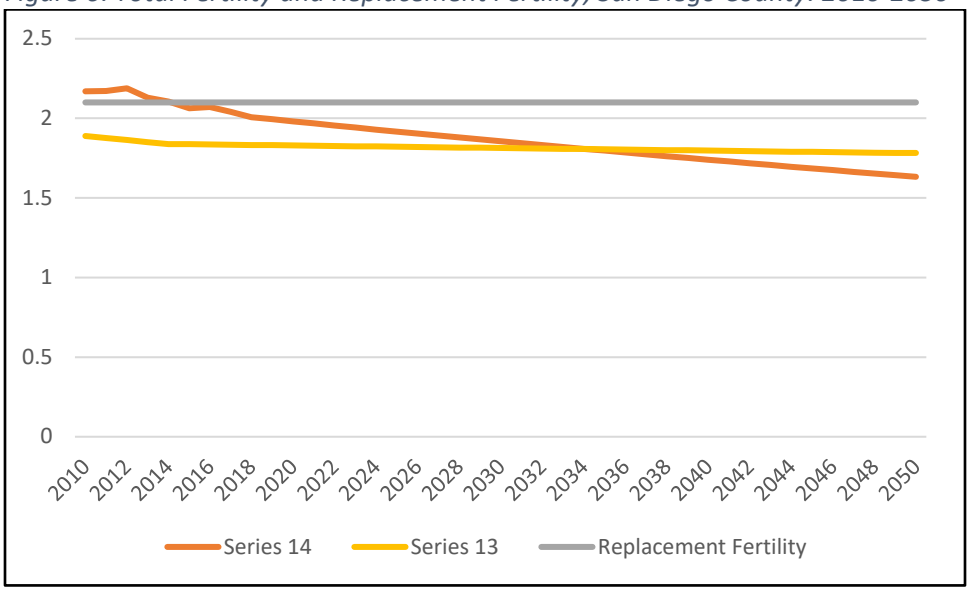
Fertility rates in the Series 14 RGF are derived from or controlled to the population projections from the DOF. Assumptions about fertility, mortality, and migration are inherent to the DOF projection series and are reflected in the total population data that are provided by demographic detail.

Figure 6 illustrates the changes to the total fertility rates over the forecast time period. Total fertility is the hypothetical number of children a woman would have in her lifetime given the present-day fertility rates of a given location. For reference, replacement fertility, the "level of estimated fertility that is necessary for a population to reproduce itself, assuming no in-migration or out-migration" is also included in the figure.[30] Over the past few decades birth rates declined in the San Diego region, much

[30]Livingston, Gretchen. *Is US Fertility at an all-time low? Two of three measures point to yes.* May 22, 2019 accessible at: https://www.pewresearch.org/fact-tank/2019/05/22/u-s-fertility-rate-explained/

like the rest of the world. The expectation is that fertility will continue to decline in the later years of the Series 14 RGF.

Figure 6. Total Fertility and Replacement Fertility, San Diego County: 2010-2050



Source: SANDAG Series 13 Regional Growth Forecast, Series 14 Regional Growth Forecast

5.2.2 Household Size

The differences in household size, by forecast, are presented in Table 2. Household size is inversely related to household formation. For example, lower household formation rates for the same population mean that, on average, more persons will live in each house. Future household formation rates decline more notably in the Series 14 RGF compared to the Series 13 RGF based on the assumption that the San Diego region's household size will move toward the household size of 2.63 persons per household for San Diego County according to data from the 2010 decennial census.

Table 2. Average Persons per Household, Series 13 RGF and Series 14 RGF: 2012-2050

Forecast Version	2012	2016	2020	2025	2030	2035	2040	2045	2050
Series 14	n/a	2.82	2.80	2.74	2.69	2.63	2.63	2.63	2.63
Series 13	2.76	n/a	2.82	2.82	2.83	2.82	2.81	2.80	2.81

Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast

5.2.3 Labor Force Participation

Labor force participation rates determine the age, sex, and racial and ethnic composition of the labor market from a given population mix. Higher participation rates mean that more local residents will be in the local labor market, reducing the need for in-migration to fill jobs. During PRP 30, experts met to discuss possible future labor force participation rates for the region. The consensus is that labor force participation rates should rise over time, meaning that more people will enter into or remain in the labor force in the future compared to current conditions. Specifically, labor force participation rates of

those over age 65 should increase, which follows recent trends of later retirement among American workers.

5.2.4 Income

Income is assumed to grow modestly, by about 0.3 percent per year regionwide over the forecast time period. There is also the assumption that median household income in the region will only slightly increase and stay between $70,000 and $75,000 for the duration of the forecast. Both of these assumptions were vetted by the attendees of PRP 30. This median income is lower than what was assumed in the Series 13 RGF and is reflective of the stagnating income in the region that has been observed over the past ten years.

5.3 Changes to Land Use Policies

For housing unit and employment capacities, the forecast begins with land use plans and policies that were collected during the outreach process in the Series 13 RGF. These are then adjusted to account for development since 2012. In most cases, the horizon year of these local land use plan inputs are 2020 or 2030. Since the horizon year of the Series 14 RGF is 2050, it extends 20 or more years out beyond the horizon year of local land use plans. To account for future development that might occur outside of the scope of their general plans, SANDAG staff worked with local jurisdictions to understand ways in which plans might change in the coming decades. These additional land use inputs are derived from draft plan updates, rezoning programs, and other locally recommended alternatives.

This process resulted in an increase of about 200,000 units of capacity in the region between the base year of the Series 13 RGF and the current Series 14 RGF base year. This increase is due to the updated capacity information provided by jurisdictions, as well as updates to some of the community plans in the City of San Diego and to El Cajon's Transit District. Lastly, as shown below in Table 3, 19,557 units of

capacity are available as accessory dwelling units, this capacity was not assumed for the Series 13 RGF process.

Table 3. Housing Unit Capacity, Series 13 Regional Growth Forecast (2012) and Series 14 Regional Growth Forecast (2016) by Jurisdiction

Jurisdiction	Series 14 Capacity (2016)	Series 14 ADU Capacity (2016)	Series 13 Capacity (2012)
Carlsbad	9,202	1,009	21,155
Chula Vista	47,740	1,657	55,643
Coronado	289	88	241
Del Mar	60	52	687
El Cajon	9,143	586	14,386
Encinitas	2,706	593	4,306
Escondido	17,341	990	14,996
Imperial Beach	3,902	110	2,064
La Mesa	10,192	520	13,024
Lemon Grove	1,229	241	3,253
National City	6,409	223	20,127
Oceanside	10,187	1,390	14,370
Poway	1,566	600	6,534
San Diego	291,855	4,974	339,391
San Marcos	17,120	621	32,285
Santee	5,481	517	11,044
Solana Beach	532	120	1,410
Vista	8,309	651	111,058
Unincorporated	70,851	4,615	17,880
Region Total	514,114	19,557	683,854

Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast and Baseline Subregional Allocation

Similar to housing unit capacity in the region, a part of the data development process for the Series 14 RGF requires projected employment capacity for the region. In Table 4, there is a comparison between the employment capacity by jurisdiction. Employment capacity for the Series 14 RGF is derived from the Series 13 RGF capacity that is adjusted for development between 2012 and 2016, along with employment capacity from vacant job spaces that are in buildings that have jobs in the base year of 2016. There are some large differences between the two series by jurisdiction, this is due to development that occurred between 2012 and 2016 along with additional capacity on those vacant job spaces.

Table 4. Projected Employment Capacity, Series 13 Regional Growth Forecast (2012) and Series 14 Regional Growth Forecast (2016) by Jurisdiction

Jurisdiction	Series 13 Job Capacity	Series 14 Job Capacity
Carlsbad	21,155	33,013
Chula Vista	55,643	43,830

Coronado	241	2,014
Del Mar	687	1,217
El Cajon	14,386	15,562
Encinitas	4,306	3,356
Escondido	14,996	27,273
Imperial Beach	2,064	1,079
La Mesa	13,024	5,325
Lemon Grove	3,253	1,750
National City	20,127	8,315
Oceanside	14,370	17,949
Poway	6,534	7,297
San Diego	339,391	241,969
San Marcos	32,285	23,701
Santee	11,044	9,335
Solana Beach	1,410	1,126
Vista	17,880	8,325
Unincorporated	111,058	82,284
Region Total	683,854	534,720

Source: SANDAG Series 13 Regional Growth Forecast Subregional Capacity, SANDAG Series 14 Regional Growth Forecast and Baseline Subregional Capacity

5.4 Subregional Forecast Results

The iLUDEM is used to produce the subregional allocation of the Series 14 RGF. Most of the differences between the iLUDEM process and the models used in the Series 13 RGF and prior forecast versions are the result of land use assumptions and how they translate into housing stock and employment allocations.

The differences in housing unit forecasts by jurisdiction in the year 2050 are presented in Table 5. Overall, about 20,000 fewer units are developed by 2050; however, the differences are not evenly distributed throughout the county. For example, La Mesa, National City, and the City of San Diego all

develop approximately 1,000 fewer units in the Series 14 RGF when compared to the Series 13 RGF, whereas Carlsbad, Chula Vista, Oceanside, and San Marcos build more than 1,000 additional units.

Table 5. Count of Housing Units in Series 13 Regional Growth Forecast and Series 14 Regional Growth Forecast, 2050 by Jurisdiction

Jurisdiction	Series 14 Housing Units	Series 13 Housing Units	Difference (Series 14 – Series 13)
Carlsbad	52,494	50,505	1,989
Chula Vista	114,346	108,273	6,073
Coronado	9,716	9,801	(85)
Del Mar	2,668	2,674	(6)
El Cajon	40,464	40,810	(346)
Encinitas	27,746	27,686	60
Escondido	58,201	56,034	2,167
Imperial Beach	11,027	11,528	(501)
La Mesa	31,151	33,405	(2,254)
Lemon Grove	9,821	10,526	(705)
National City	20,901	24,736	(3,835)
Oceanside	72,953	70,942	2,011
Poway	17,640	17,839	(199)
San Diego	686,843	95,703	(8,860)
San Marcos	42,050	37,337	4,713
Santee	24,611	23,886	725
Solana Beach	6,854	7,121	(267)
Unincorporated	204,726	222,948	(18,222)
Vista	37,074	40,181	(3,107)
Region Total	1,471,286	1,491,935	(20,649)

Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast and Baseline Subregional Allocation

Table 6 presents a comparison for employment in the Series 14 RGF and Series 13 RGF. The county-level differences in jobs between the two forecasts are larger when compared to the differences between the housing units. In the Series 14 RGF, about 180,000 more jobs are added by 2050 when compared to the Series 13 RGF. The largest difference is in the City of San Diego, which adds more than 86,000 jobs over

the forecast period. This is mostly due to higher labor force participation rates and a larger working age population in the Series 14 RGF.

Table 6. Count of Jobs: Series 13 Regional Growth Forecast and Series 14 Regional Growth Forecast, 2050 by Jurisdiction

Jurisdiction	Series 13 RGF Jobs	Series RGF 14 Jobs	Difference (Series 14 RGF – Series 13 RGF)
Carlsbad	85,757	103,979	18,222
Chula Vista	114,550	101,374	(13,176)
Coronado	29,275	28,791	(484)
Del Mar	4,726	5,604	878
El Cajon	49,826	60,890	11,064
Encinitas	29,551	31,572	2,021
Escondido	59,081	82,806	23,725
Imperial Beach	4,857	6,397	1,540
La Mesa	36,552	34,524	(2,028)
Lemon Grove	8,656	10,211	1,555
National City	39,839	58,529	18,690
Oceanside	53,998	63,166	9,168
Poway	37,173	40,956	3,783
San Diego	1,008,793	1,095,374	86,581
San Marcos	64,328	63,031	(1,297)
Santee	18,570	25,997	7,427
Solana Beach	8,803	10,922	2,119
Vista	48,814	50,127	1,313
Unincorporated	208,256	219,767	11,511
Region Total	1,911,405	2,094,017	182,612

Source: SANDAG Series 13 Regional Growth Forecast, SANDAG Series 14 Regional Growth Forecast and Baseline Subregional Allocation

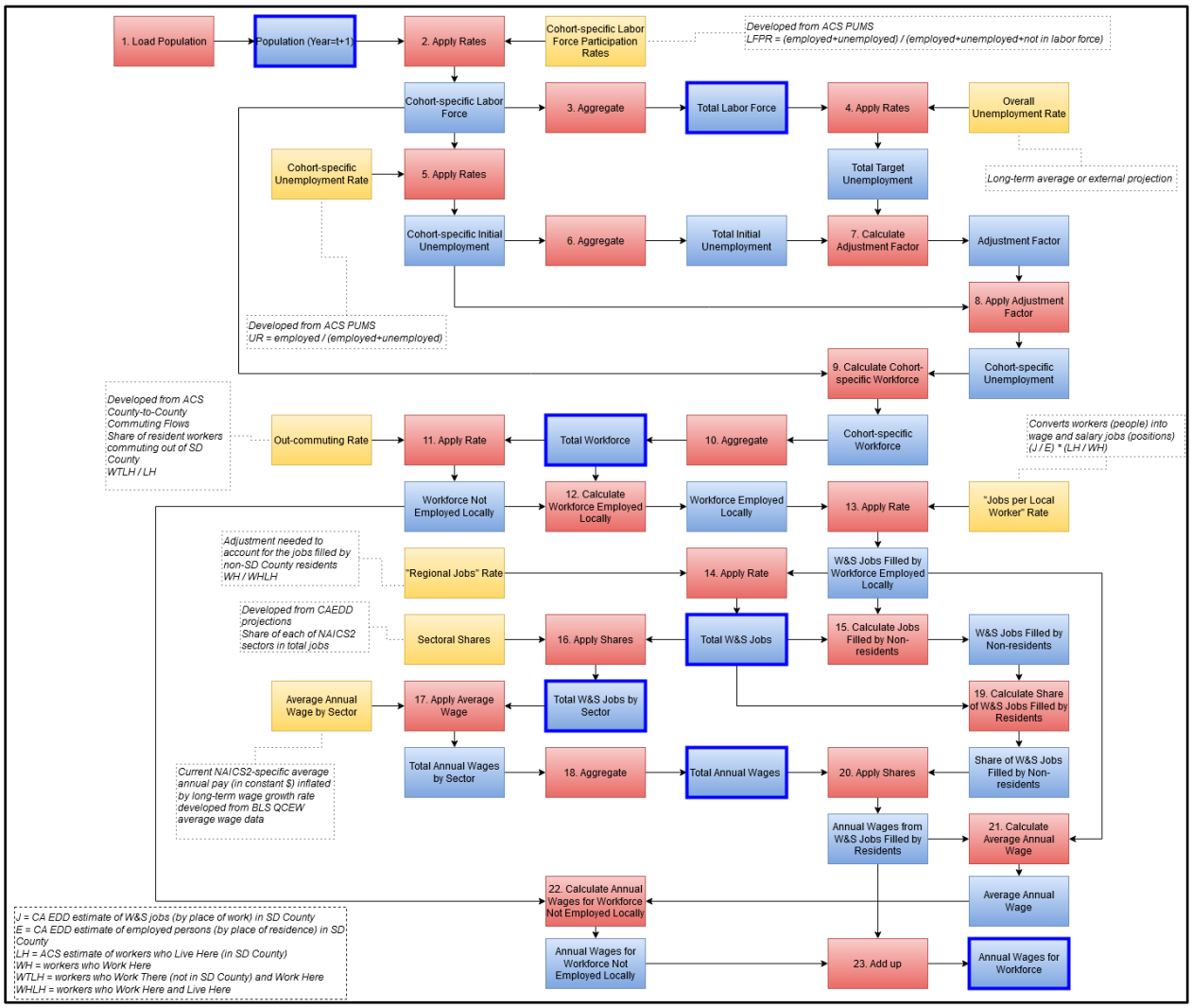
Appendix A: List of Series 14 Regional Growth Forecast Variables

Table Name	Column	Data Type	Description	Values
age	yr_id	smallint	year	
age	mgra_id	int	id for master reference geographic area (mgra)	
age	age_group_id	smallint	age group id	1) Under 5 2) 5 to 9 3) 10 to 14 4) 15 to 17 5) 18 and 19 6) 20 to 24 7) 25 to 29 8) 30 to 34 9) 35 to 39 10) 40 to 44 11) 45 to 49 12) 50 to 54 13) 55 to 59 14) 60 and 61 15) 62 to 64 16) 65 to 69 17) 70 to 74 18) 75 to 79 19) 80 to 84 20) 85 and Older
age	population	int	count of population in each group	
age_sex_ethnicity	yr_id	smallint	year	
age_sex_ethnicity	mgra_id	int	id for mgra	
age_sex_ethnicity	age_group_id	smallint	age group id	
age_sex_ethnicity	sex_id	smallint	sex id	
age_sex_ethnicity	ethnicity_id	smallint	ethnicity id	
age_sex_ethnicity	population	int	count of population in each group	
ethnicity	yr_id	smallint	year	
ethnicity	mgra_id	int	id for mgra	
ethnicity	ethnicity_id	smallint	ethnicity id	1) Hispanic 2) Non-Hispanic, White 3) Non-Hispanic, Black 4) Non-Hispanic, American Indian, or Alaska Native 5) Non-Hispanic, Asian 6) Non-Hispanic, Hawaiian or Pacific Islander 7) Non-Hispanic, Other 8) Non-Hispanic, Two or More Races
ethnicity	population	int	count of the population in each group	
household_income	household_income_id	int	unique id for each household income group	
household_income	yr_id	smallint	year	
household_income	mgra_id	int	id for mgra	

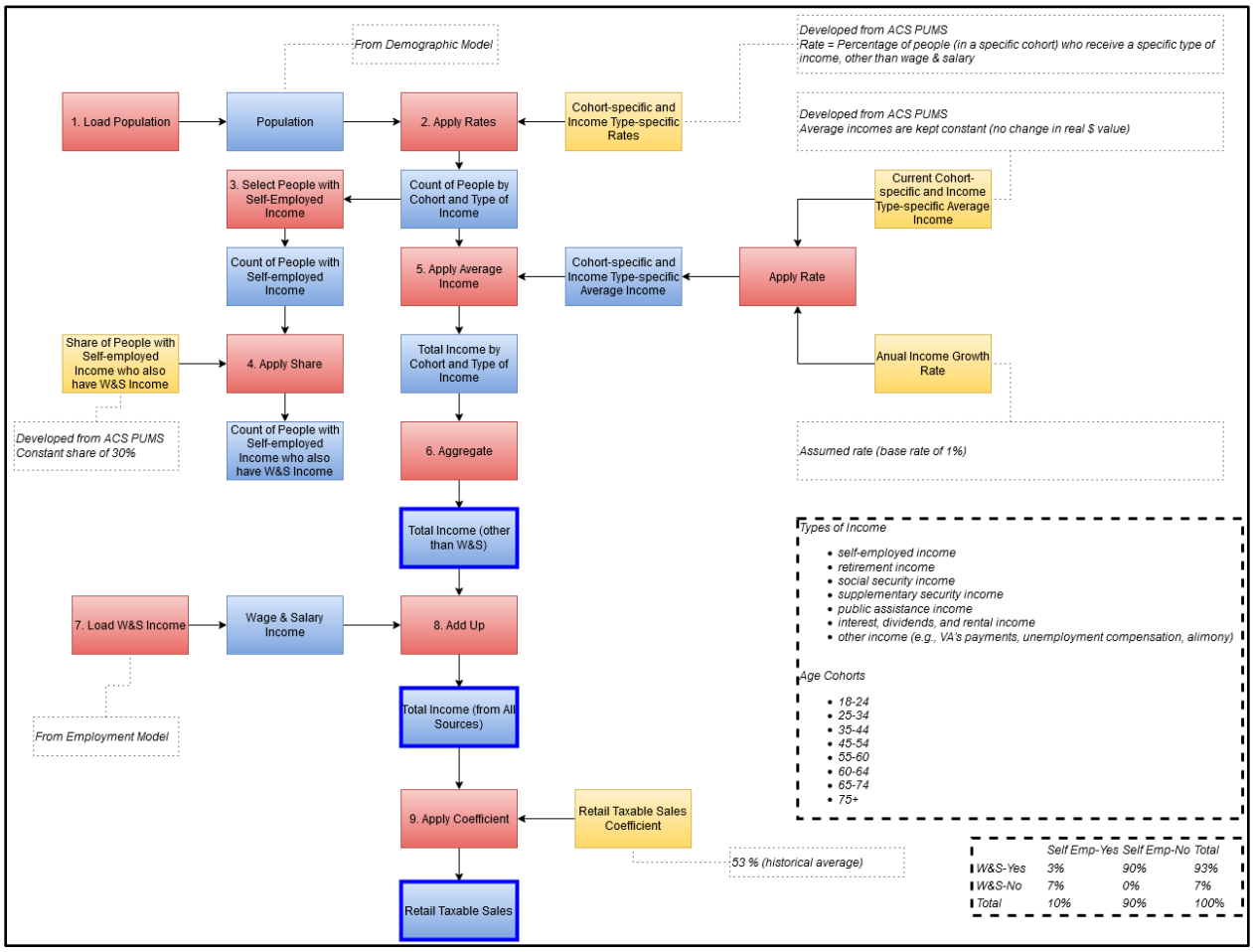
household_income	income_group_id	int	income group category id	11) Less than $15,000 12) $15,000 to $29,999 13) $30,000 to $44,999 14) $45,000 to $59,999 15) $60,000 to $74,999 16) $75,000 to $99,999 17) $100,000 to $124,999 18) $125,000 to $149,999 19) $150,000 to $199,999 20) $200,000 or more
household_income	households	int	count of households	
housing	housing_id	int	unique housing unit id	
housing	yr_id	smallint	year	
housing	mgra_id	int	id for mgra	
housing	structure_type_id	smallint	id for the structure type of the household	3) Multifamily 4) Mobile Home 5) Single-family 6) Detached 7) Single-family Attached
housing	units	int	count of units	
housing	unoccupiable	int	count of unoccupiable units	
housing	occupied	int	count of occupied units	
housing	vacancy	float	count of vacant units	
jobs	yr_id	smallint	year	
jobs	mgra_id	int	id for mgra	
jobs	employment_type_id	smallint	id for the employment type (industry)	1) Military 2) Agriculture and Mining 3) Construction 4) Manufacturing 5) Wholesale Trade 6) Retail Trade 7) Transportation, Warehousing, and Utilities 8) Information 9) Finance and Real Estate 10) Professional and Business Service 11) Education and Healthcare 12) Leisure and Hospitality 13) Office Service 14) Government 15) Self-Employed
jobs	jobs	int	count of jobs for each employment type category	
population	yr_id	smallint	year	
population	mgra_id	int	id for mgra	

population	housing_type_id	smallint	housing type id	1) Household Population 2) Group Quarters - Military 3) Group Quarters - College 4) Group Quarters - Other
population	population	int	count of population for each housing type id	
sex	yr_id	smallint	year	
sex	mgra_id	int	id for mgra	
sex	sex_id	smallint	sex id	1) Female 2) Male
sex	population	int	count of the population	

Appendix B: Economic Model Flow Diagram



Appendix C: Income Model Flow Diagram



Appendix D. Series 14 Regional Growth Forecast and Baseline Subregional Allocation Results

Table D.1. Total Housing Units, 2016-2050 by Jurisdiction

Jurisdiction	2016	2025	2035	2050	Change (2016-2050)	
					Number	Percent
Carlsbad	46,152	49,299	51,552	52,494	6,342	13.7%
Chula Vista	82,794	89,448	96,765	114,346	31,552	38.1%
Coronado	9,577	9,592	9,641	9,716	139	1.5%
Del Mar	2,611	2,615	2,641	2,668	57	2.2%
El Cajon	36,012	36,751	39,012	40,464	4,452	12.4%
Encinitas	26,040	26,703	27,249	27,746	1,706	6.6%
Escondido	48,462	54,551	56,647	58,201	9,739	20.1%
Imperial Beach	9,756	10,506	10,765	11,027	1,271	13.0%
La Mesa	25,760	26,455	30,852	31,151	5,391	20.9%
Lemon Grove	9,032	9,349	9,617	9,821	789	8.7%
National City	16,641	18,297	20,456	20,901	4,260	25.6%
Oceanside	65,851	69,225	72,049	72,953	7,102	10.8%
Poway	16,606	17,243	17,331	17,640	1,034	6.2%
San Diego	531,423	583,765	661,826	686,843	155,420	29.2%
San Marcos	30,539	34,250	36,113	42,050	11,511	37.7%
Santee	20,525	21,683	24,064	24,611	4,086	19.9%
Solana Beach	6,497	6,605	6,749	6,854	357	5.5%
Vista	32,195	34,305	36,431	37,074	4,879	15.2%
Unincorporated	174,082	187,565	200,093	204,726	30,644	17.6%
Region	1,190,555	1,288,207	1,409,853	1,471,286	280,731	23.6%

Source: Series 14 Regional Growth Forecast and Baseline Subregional Allocation

Table D.2. Total Jobs, 2016-2050 by Jurisdiction

Jurisdiction	2016	2025	2035	2050	Change (2012-2050)	
					Number	Percent
Carlsbad	75,912	88,373	98,168	103,979	28,067	37.0%
Chula Vista	72,852	79,749	88,042	101,374	28,522	39.2%
Coronado	26,772	27,356	28,028	28,791	2,019	7.5%
Del Mar	4,440	4,540	5,466	5,604	1,164	26.2%
El Cajon	47,942	51,092	55,244	60,890	12,948	27.0%
Encinitas	28,450	29,337	30,607	31,572	3,122	11.0%
Escondido	57,670	76,085	79,233	82,806	25,136	43.6%
Imperial Beach	5,490	5,814	6,055	6,397	907	16.5%
La Mesa	29,807	31,140	32,664	34,524	4,717	15.8%
Lemon Grove	8,976	9,359	9,646	10,211	1,235	13.8%
National City	42,037	53,689	55,721	58,529	16,492	39.2%
Oceanside	46,385	50,280	59,833	63,166	16,781	36.2%
Poway	35,047	36,636	38,530	40,956	5,909	16.9%
San Diego	885,298	949,332	1,022,083	1,095,374	210,076	23.7%
San Marcos	41,096	45,786	51,523	63,031	21,935	53.4%
Santee	18,186	20,288	23,427	25,997	7,811	43.0%
Solana Beach	9,975	10,216	10,618	10,922	947	9.5%
Vista	43,696	45,485	47,427	50,127	6,431	14.7%
Unincorporated	149,917	174,413	193,250	219,767	69,850	46.6%
Region	1,629,948	1,788,970	1,935,565	2,094,017	464,069	28.5%

Source: Series 14 Regional Growth Forecast and Baseline Subregional Allocation

Table D.3. Total Population, 2016-2050 by Jurisdiction

Jurisdiction	2016	2025	2035	2050	Change (2016-2050)	
					Number	Percent
Carlsbad	13,179	118,068	118,719	120,313	7,134	6.3%
Chula Vista	265,357	275,950	285,194	330,255	64,898	24.5%
Coronado	24,512	24,678	24,802	24,991	479	2.0%
Del Mar	4,284	4,378	4,517	4,677	393	9.2%
El Cajon	105,276	105,649	107,294	110,253	4,977	4.7%
Encinitas	62,625	63,253	63,360	64,136	1,511	2.4%
Escondido	150,978	163,593	163,791	167,211	16,233	10.8%
Imperial Beach	28,041	29,314	29,522	30,077	2,036	7.3%
La Mesa	60,980	61,602	68,227	68,680	7,700	12.6%
Lemon Grove	26,710	26,939	27,025	27,432	722	2.7%
National City	61,350	69,118	72,951	76,098	14,748	24.0%
Oceanside	176,666	180,500	180,624	182,311	5,645	3.2%
Poway	49,986	50,438	50,565	51,234	1,248	2.5%
San Diego	1,399,925	1,486,787	1,594,300	1,633,002	233,077	16.6%
San Marcos	94,258	101,707	104,365	119,098	24,840	26.4%
Santee	56,434	58,358	61,897	63,070	6,636	11.8%
Solana Beach	13,860	14,006	14,128	14,359	499	3.6%
Vista	102,933	106,495	108,208	109,273	6,340	6.2%
Unincorporated	512,156	530,005	540,840	549,584	37,428	7.3%
Region	3,309,510	3,470,838	3,620,329	3,746,054	436,544	13.2%

Source: Series 14 Regional Growth Forecast and Baseline Subregional Allocation