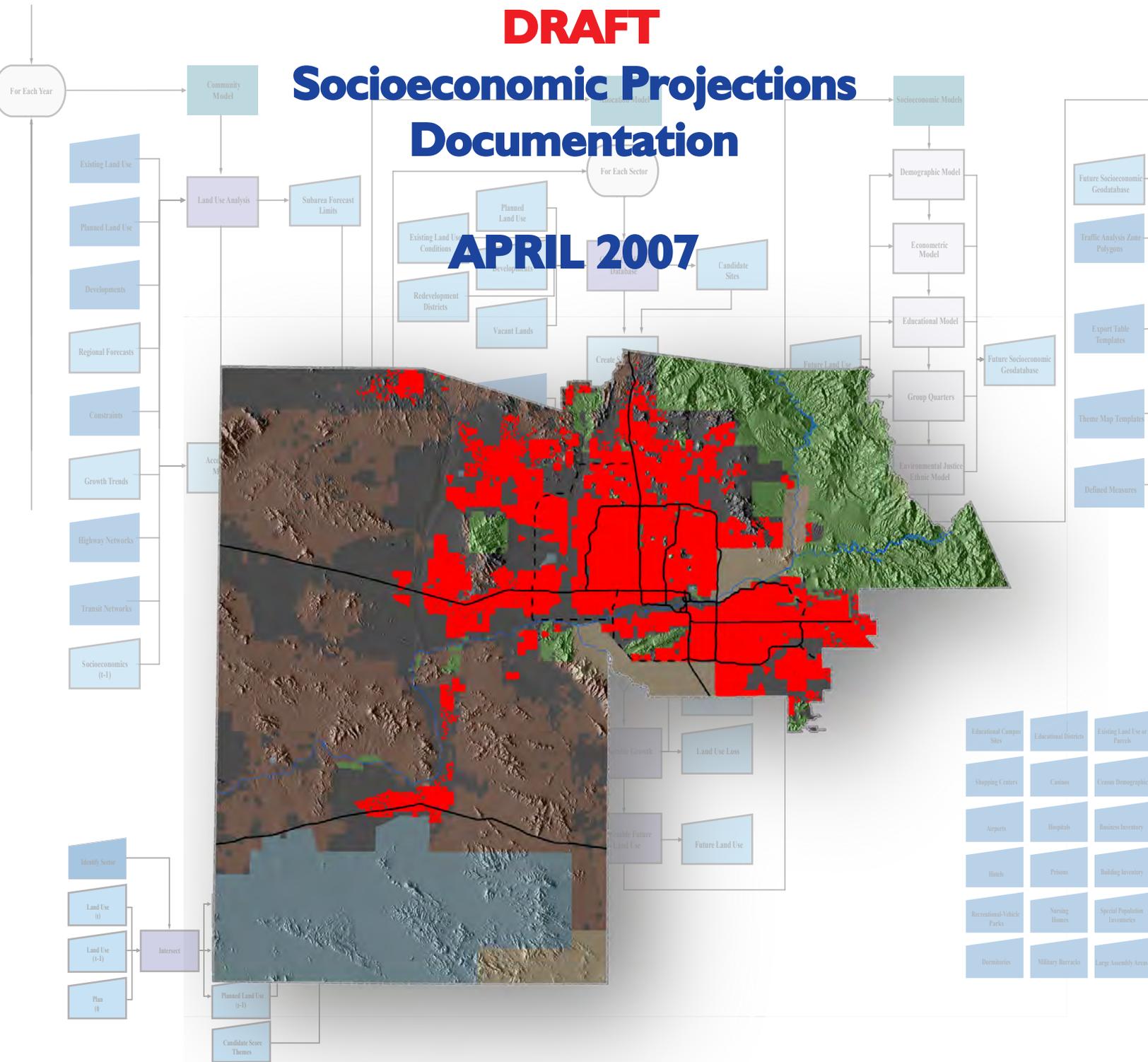


DRAFT
**Socioeconomic Projections
Documentation**

APRIL 2007





**SOCIOECONOMIC PROJECTIONS
DOCUMENTATION
D R A F T
APRIL 2007**

CONTENTS

| | |
|--|----|
| 1. Purpose | 1 |
| 2. Base Data | 1 |
| 2.1 Census Data | 2 |
| 2.2 2005 Employment Database | 2 |
| 2.3 Residential Building Completions | 3 |
| 2.4 Existing Land Use | 3 |
| 2.5 Future Land Use | 4 |
| 2.6 Large Scale Developments | 4 |
| 2.7 MAG Subregional Geography | 4 |
| 2.8 Other Data Collection Efforts | 5 |
| 2.9 Glossary of Terms | 5 |
| 3. Models & Modeling Process | 19 |
| 3.1 Methodology for Preparing Projections | 19 |
| 3.2 County-Level Model | 20 |
| 3.3 The Sub-Regional Model | 21 |
| 3.4 The Subarea Allocation Model (SAM-IM) | 22 |
| 3.5 Modeling Process | 22 |
| 4. Assumptions & Methods | 27 |
| 4.1 MAG Geography | 27 |
| 4.2 Base July 1, 2005 Population and Housing Variables | 27 |
| 4.3 Base July 1, 2005 Employment by Sector | 29 |
| 4.4 Population and Employment Control Totals | 30 |
| 4.5 County-level Projections by Land Use Classification Sector | 32 |
| 4.6 Basic/Non-Basic Employment | 32 |
| 4.7 Buildout Population and Housing Variables | 33 |
| 4.8 Buildout Employment Variables | 33 |
| 4.9 Vacancy and Occupancy Rate | 33 |
| 4.10 Persons per Household | 34 |
| 4.11 Multiple Use Definitions by Geographic Location by Time | 34 |
| 4.12 Single Family/Multi-family Split for Maricopa County by Time | 35 |
| 4.13 Cluster Size, Floor Area Ratios (FAR) and Employment Density | 36 |
| 4.14 Residential Development Density, Cluster Size and Velocity Curves | 36 |
| 4.15 Group Quarters | 37 |
| 4.16 Households by Age of Householder and Housing Units by Age of Unit | 38 |

| | | |
|------|---|----|
| 4.17 | Households by Income | 38 |
| 4.18 | Seasonal Population | 38 |
| 4.19 | Transient Population | 39 |
| 4.20 | Age Restricted Communities | 40 |
| 4.21 | Post Secondary Enrollment | 40 |
| 5. | The MAG Review Process | 41 |
| 5.1 | MAG Staff | 41 |
| 5.2 | MAG POPTAC | 41 |
| 5.3 | MAG POPTAC Ad Hoc Subcommittee | 42 |
| 5.4 | MAG Management Committee | 42 |
| 5.5 | MAG Regional Council | 42 |
| 5.6 | State Population Technical Advisory Committee | 43 |
| 6. | Notes and Caveats for 2007 Projections | 45 |

Attached Papers

| | | |
|----------|---|----|
| Paper 1: | Buildout Procedure for Population and Housing Variables | 46 |
| Paper 2: | Buildout Procedure for Employment Variables | 55 |
| Paper 3: | Single Family / Multi-Family Split | 65 |
| Paper 4: | Cluster Size, Floor Area Ratios, and Employment Density | 68 |
| Paper 5: | Residential Cluster Sizes | 71 |
| Paper 6: | Residential Development Velocity Curves | 73 |
| Paper 7: | Glossary of Terms | 75 |

LIST OF FIGURES

| | | |
|--------------|--|----|
| Figure 2-1: | Population Density, 2005 | 6 |
| Figure 2-2: | Vacancy Rates, 2005 | 7 |
| Figure 2-3: | Persons Per Household, 2005 | 8 |
| Figure 2-4: | Employment Locations, 2005 | 9 |
| Figure 2-5: | Residential Completions | 10 |
| Figure 2-6: | Existing Land Use, 2005 | 11 |
| Figure 2-7: | Future Land Use | 12 |
| Figure 2-8: | Large Scale Developments | 13 |
| Figure 2-9: | Municipal Planning Area and Regional Analysis Zone Geography | 14 |
| Figure 2-10: | Post High School Institutions | 15 |
| Figure 2-11: | Age Restricted Residential Areas | 16 |
| Figure 2-12: | Mobile Home and RV Parks | 17 |
| Figure 2-13: | Hotels and Motels | 18 |
| Figure 3-1: | Modeling Relationships | 19 |
| Figure 3-2: | Three-Tier Modeling Process | 20 |
| Figure 3-3: | DRAM/EMPAL Spatial Distribution Model | 21 |
| Figure 3-4: | Flowchart of Socioeconomic Modeling Process – COMPLETE MODELING CYCLE | 23 |
| Figure 3-5: | Flowchart of Socioeconomic Modeling Process – COUNTY CONTROL TOTALS | 24 |
| Figure 3-6: | Flowchart of Socioeconomic Modeling Process – RAZ CONTROL TOTALS | 25 |
| Figure 3-7: | Flowchart of Socioeconomic Modeling Process – SAZ POPULATION AND EMPLOYMENT | 26 |
| Figure 5-1: | Socioeconomic Data and Modeling Review Process | 44 |

1. PURPOSE

The purpose of this document is to explain the socioeconomic projections process used to prepare socioeconomic projections by Municipal Planning Areas (MPA), Regional Analysis Zones (RAZs) and Socioeconomic Analysis Zones (SAZs) for population, housing and employment variables.

Executive Order 95-2 requires that the Arizona Department of Economic Security (DES) develop state and county population estimates and projections for 50 years for each city and town with a population greater than 1,000 people. It also authorizes Councils of Governments to prepare subregional estimates and projections using the county population as a control total. In preparing these estimates and projections, MAG is required to follow standards established by DES.

Subregional projections are used:

- By MAG as input into the MAG transportation models to predict automobile traffic
- By MAG as input into the MAG air quality models to predict emissions and concentrations
- By local governments to evaluate infrastructure improvements
- For gauging regional development and land use plans
- By local governments to prepare General Plans
- By developers to identify sites for residential and commercial development
- By human services providers for planning
- By school districts for planning infrastructure

2. BASE DATA

The development of population and socioeconomic projections requires the collection of a substantial amount of base data. These base data include, but are not limited to, the following:

- Population and Housing: Census Survey 2005
- Group Quarters (Institutional and Non-Institutional): Census Survey 2005
- Employment: Employment July 1, 2005 Base
- Residential Completions: April 1, 2000 to June 30, 2005, submitted and reviewed by MAG member agencies
- Existing Land use: Land use current as of January 2005, reviewed by MAG Population Technical Advisory Committee (POPTAC)
- Future Plans: Future Plans current as of 2006 or later, reviewed by MAG POPTAC
- Development Data: Year 2006 data current as of 2006 or later, reviewed by MAG POPTAC
- SAZ system: SAZ2007
- Post High School Institutions: Inventory of Post High School institutions, reviewed by MAG member agencies in December 2006
- Mobile home and RV Parks: Inventory of mobile home and RV parks, reviewed and updated by MAG member agencies in December 2006

- Airport 2005 and projected enplanements for Sky Harbor and Williams Gateway airports
- Retirement Areas: Age restricted communities reviewed by MAG POPTAC
- Hotels/Motels/Resorts: Inventory of hotels/motels, reviewed and updated by MAG member agencies in December 2006

The method of deriving the base data is discussed in the following sections.

2.1 Census Data

The most recent Census provides a good source of information for developing projections. While the 1995 Special Census and the 2000 Decennial Census were actual population counts, the 2005 Census Survey estimated population and housing units based on a statistical sample. Because the sample was selected to achieve a 95 percent confidence interval plus/minus two percent, it provided a more reliable base than other available data.

The following variables were extracted from the 2005 Census Survey and used as a part of the projections base: resident population in households, resident population in group quarters, total housing units, occupied housing units and vacant housing units. Figure 2-1 shows the population density derived from the Census Survey. Figures 2-2 and 2-3 show the vacancy rates and persons per household respectively.

Because the 2005 Census Survey was conducted on September 1, 2005, it was necessary to adjust the database to July 1, 2005 to provide a mid-year benchmark for the projections series. This adjustment was carried out by deducting the sum of housing units constructed from July 2, 2005 through August 31, 2005 and demolitions during the same time period, from the September 1, 2005 housing unit figure. By applying Census Survey occupancy rates and persons per occupied household to the July 1, 2005 housing stock, a July 1, 2005 population was derived.

While the 2005 Census Survey information was collected by place, the MAG projections needed a 2005 base of housing units and population by SAZ. To derive this base, MAG added to the April 1, 2000 Census housing unit count by SAZ, new residential housing units completed less any demolitions between April 1, 2000 and September 1, 2005. Adjustments were then made to ensure consistency with results of the Census Survey and to allocate population and housing units in the unincorporated portion of the County to the appropriate SAZ.

2.2 2005 Employment Database

Total 2005 employment at the county-level was derived from a population control total developed by the Arizona Department of Economic Security. Total employment includes self-employed as well as wage and salary workers.

Using the 2005 Maricopa County employment control total, 2005 subregional employment estimates were prepared. An employer database for Maricopa County containing approximately 61,000 employers was purchased from Dunn & Bradstreet/Harris InfoSource. This database was merged with other sources of employment data,

verified through a telephone survey of the largest employers, subjected to quality control measures and reviewed by MAG member agencies.

The employment from the employer database was then benchmarked to the Arizona Department of Economic Security Standard Industrial Classification (SIC) county totals. A land use was assigned to each employer record based on industry, industry to land use relationships and Socioeconomic Analysis Zone (SAZ) land use.

Each employer was geocoded and employment then summed by land use classification to Traffic Analysis Zones. These estimates were then adjusted to the county employment control total for employment not captured in the major employer database based on the underlying land use. This resulted in subregional employment estimates which in turn were summed to Regional Analysis Zone (RAZ) and Municipal Planning Area (MPA). Figure 2-4 shows the distribution of employment locations and the number of employees at each site.

2.3 Residential Building Completions

A residential building completion requires a certificate of occupancy for each new residential unit. Since April 1990, MAG has collected residential building completions by unit type from MAG member agencies. The four unit types are single family, condo/townhouse, apartment and mobile home.

After initial collection efforts, the number of residential completions are summed by unit type and forwarded to MAG member agencies for review and verification. Adjustments to the total residential completions by unit type require the submittal of documentation. Each completion is also geocoded, enabling MAG to aggregate new development by MAG geography. Residential completions to June 30, 2005 were used in calculating the base for the 2007 projections. Residential completions from July 1, 2005 to December 31, 2006 were used in calculating the projection numbers by SAZ for the year 2010. Figure 2-5 shows the distribution of residential completions over time.

2.4 Existing Land Use

The existing land use database identifies the current land use pattern in the urban area. MAG maintains a 100+ land use category classification that was established by MAG in concert with its member agencies.

The existing land use database was created by MAG staff based on input from MAG member agencies and then circulated to the agencies for review and verification. Changes were made based on comments provided. Figure 2-6 depicts the existing land use derived from this process.

The existing land use coverage is important to the projections process because it establishes areas that have already been developed or are not suitable for further development. The developed areas become ineligible for the allocation of population and employment growth, except where the area is planned for redevelopment. Nondevelopable areas include open space or environmentally sensitive lands, or areas where the relief makes construction infeasible.

2.5 Future Land Use

The Future Land Use Database is based upon the plans of MAG member agencies and identifies both the type of development that is anticipated to occur in the future and the density of that development. For example, rural residential land use allows for up to 1 unit per acre. In those areas designated rural residential, a maximum is established so that the projections model does not exceed the 1 unit per acre density authorized.

The Future Plan Land Use database also uses the standard MAG land use categories that allows for a direct comparison between existing and planned land use. The difference between the existing and planned land use databases helps determine where development may take place. Figure 2-7 depicts the future land use derived from this process.

2.6 Large Scale Developments

A Large Scale Development Database was developed in conjunction with MAG member agencies. Information is collected on major residential and non-residential developments including number of units or square footage by land use parcel. An estimated date for the initiation of the development is also determined at the same time. Member agencies review the Large Scale Development Database regularly for completeness and accuracy. The Large Scale Development Database was used to calibrate the MAG projections model to ensure that it captured anticipated development. Figure 2-8 depicts the developments derived from this process.

2.7 MAG Subregional Geography

Maricopa County is subdivided into 28 Municipal Planning Areas (MPAs), 148 Regional Analysis Zones (RAZs) and 1955 Socioeconomic Analysis Zones (SAZs). Municipal Planning Areas include the corporate limits of a municipality plus any adjacent areas that are anticipated to become a part of those corporate limits in the future. Regional Analysis Zones are subunits of MPAs, and are the basic unit used by the spatial allocation model to prepare subregional projections. RAZs are further divided into Socioeconomic Analysis Zones. The SAZ is the smallest unit for which MAG prepares projections. Their boundaries are defined using major streets and landmarks. In addition, MAG also includes parts of Pinal County in its transportation modeling area, as transportation needs are partially dictated by the people living and working in Pinal County. The transportation model uses a geography called the Traffic Analysis Zone (TAZ). The TAZ is similar to the SAZ, but is only within the transportation modeling area and its numbering system is sequential.

The projections by Municipal Planning Area (MPA) and Regional Analysis Zone (RAZ) were prepared to be consistent with the September 1, 2005 Special Census Survey and have been prepared for July 1 of the following years: 2010, 2020 and 2030. The projections by Socioeconomic Analysis Zone (SAZ) and Traffic Analysis Zone (TAZ) were prepared to be consistent with the Socioeconomic Projections by Municipal Planning Area (MPA) and Regional Analysis Zone (RAZ). Figure 2-9 shows the MPAs and RAZs in Maricopa County.

2.8 Other Data Collection Efforts

Other data needed by the modeling process include post high school institutions and enrollment, mobile home and recreational vehicle parks and number of residential and non-residential units, current and projected enplanements for Sky Harbor and Williams Gateway airports, current and projected retirement areas, and hotels, motels and resorts and number of beds and employees. The data on recreational vehicle parks, hotels, motels and resorts are used to develop estimates and projections of non-resident population. The MAG Population Technical Advisory Committee (POPTAC) reviewed this information and provided comments. Figures 2-10 to 2-13 show some of the databases derived from this process.

2.9 Glossary of Terms

Paper 7, Glossary of Terms, defines the terms used in this document to describe the socioeconomic data collection, update and enhancement and the modeling activities.

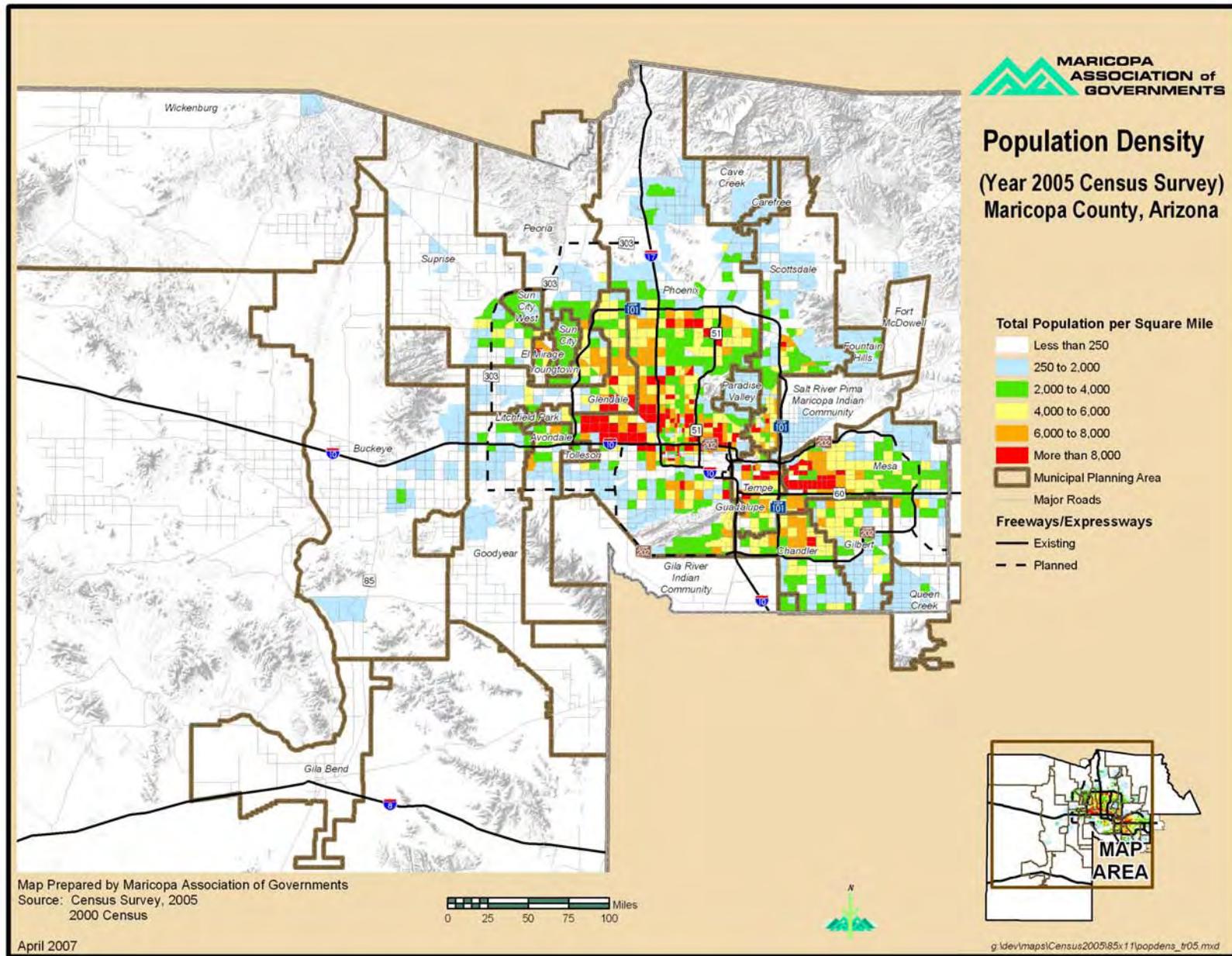


Figure 2-1: Population Density, 2005

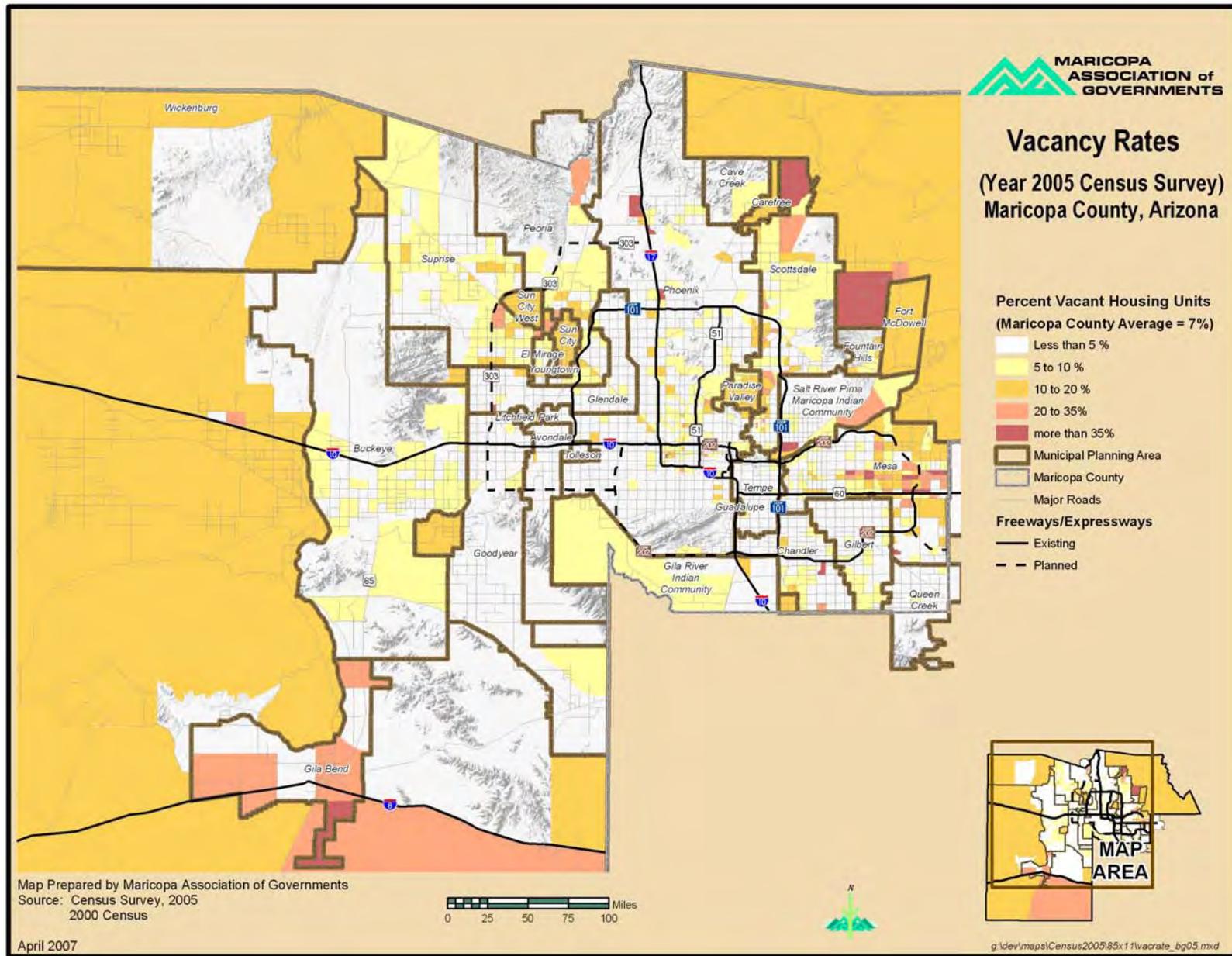


Figure 2-2: Vacancy Rates, 2005

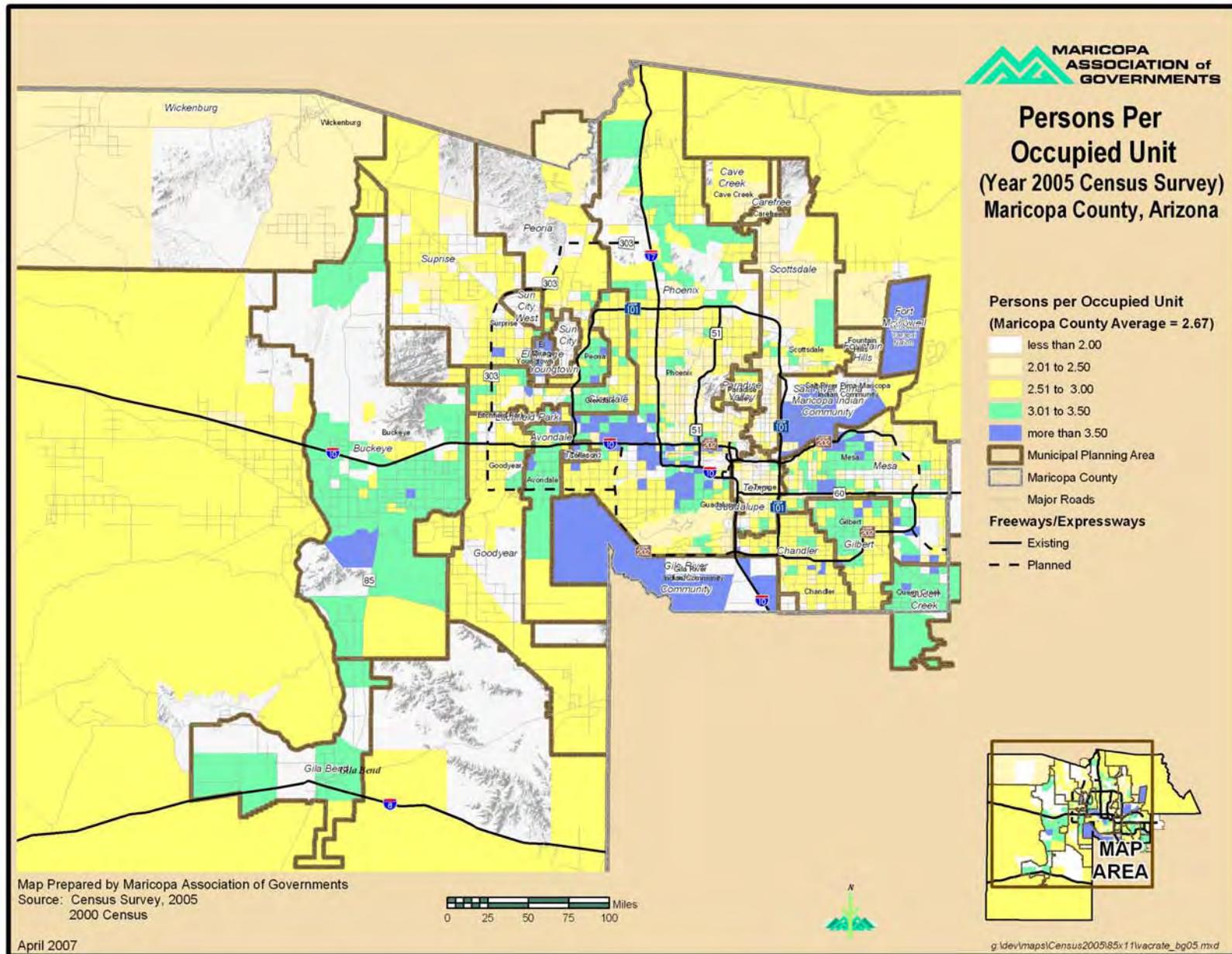


Figure 2-3: Persons Per Household, 2005

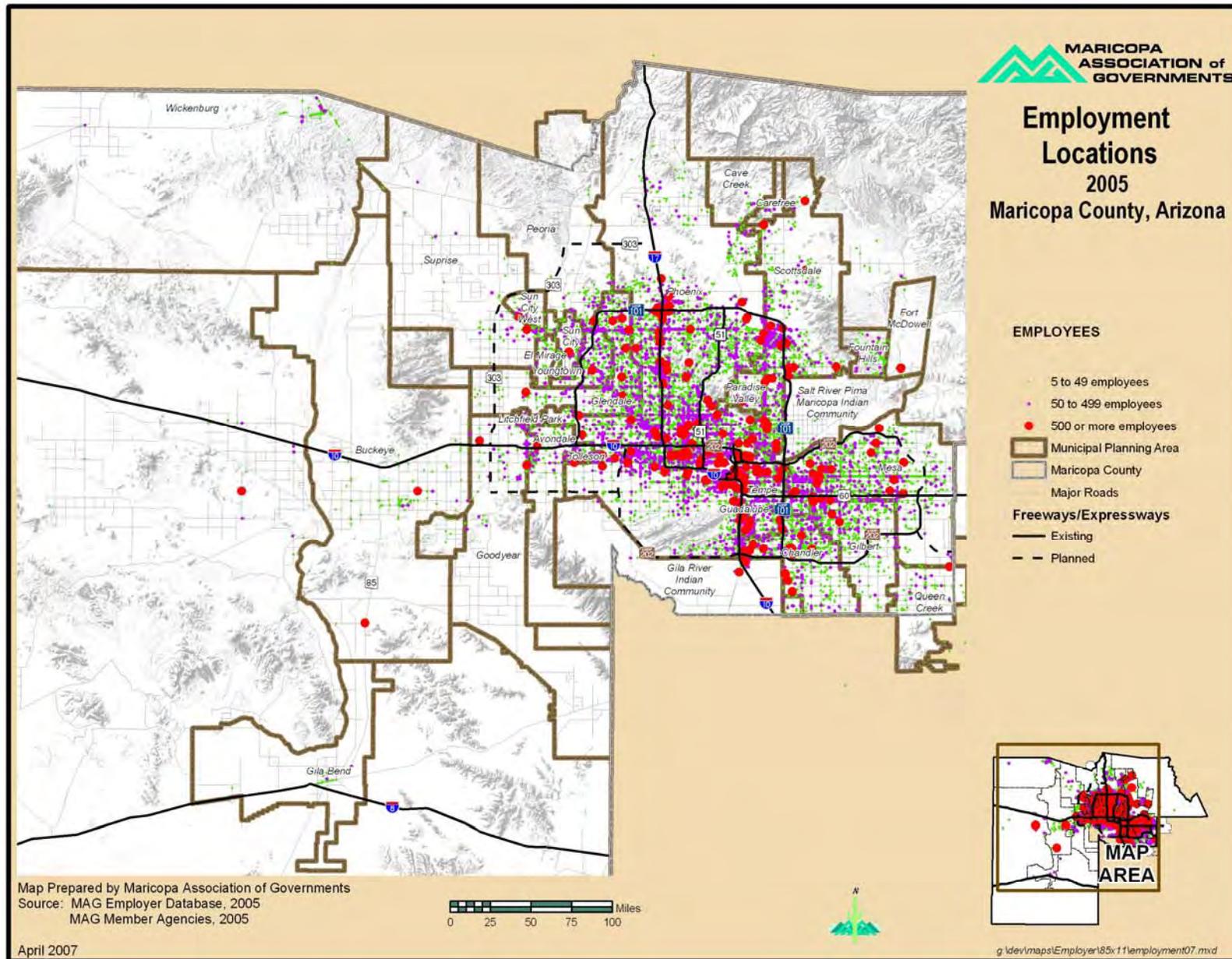


Figure 2-4: Employment Locations, 2005

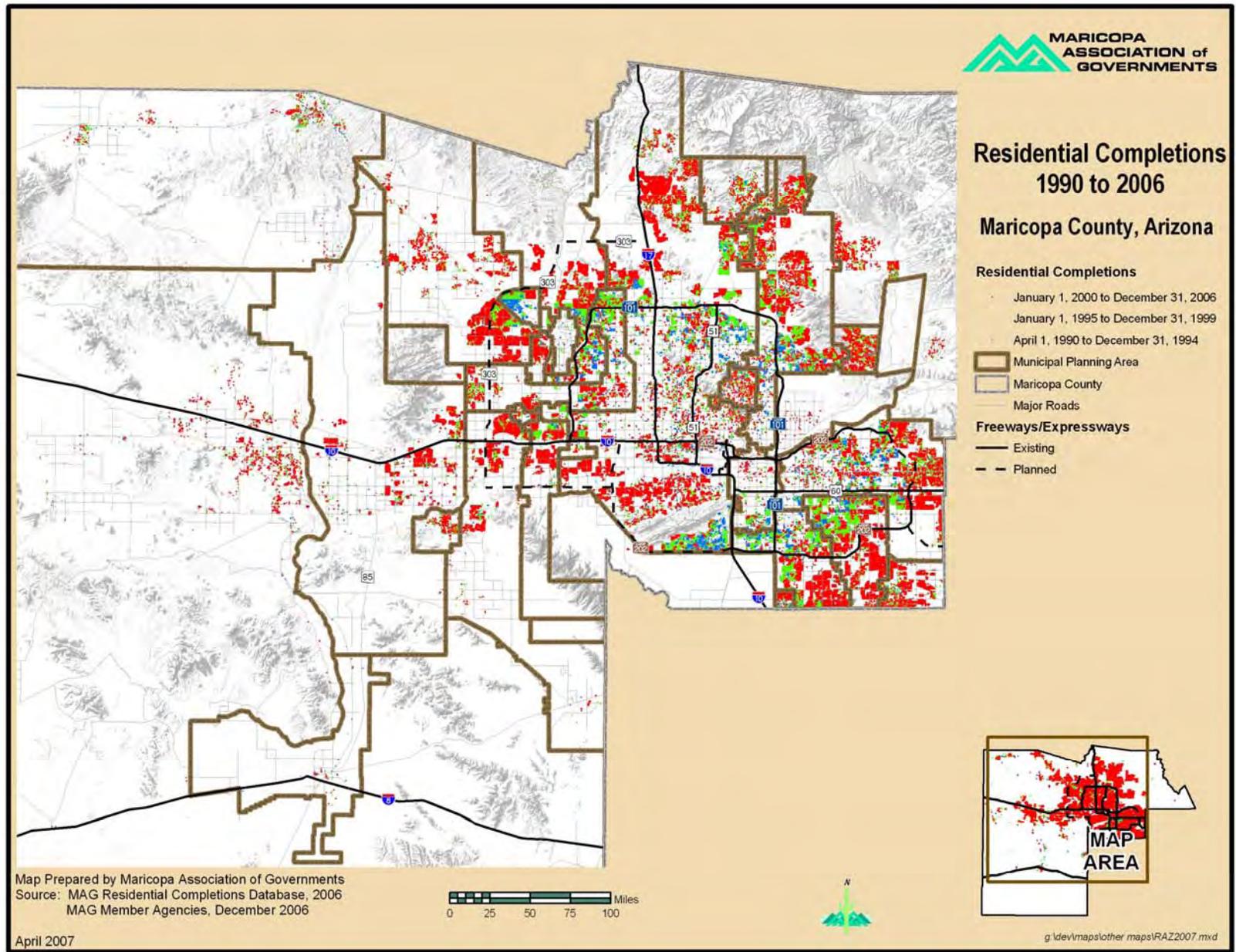


Figure 2-5: Residential Completions

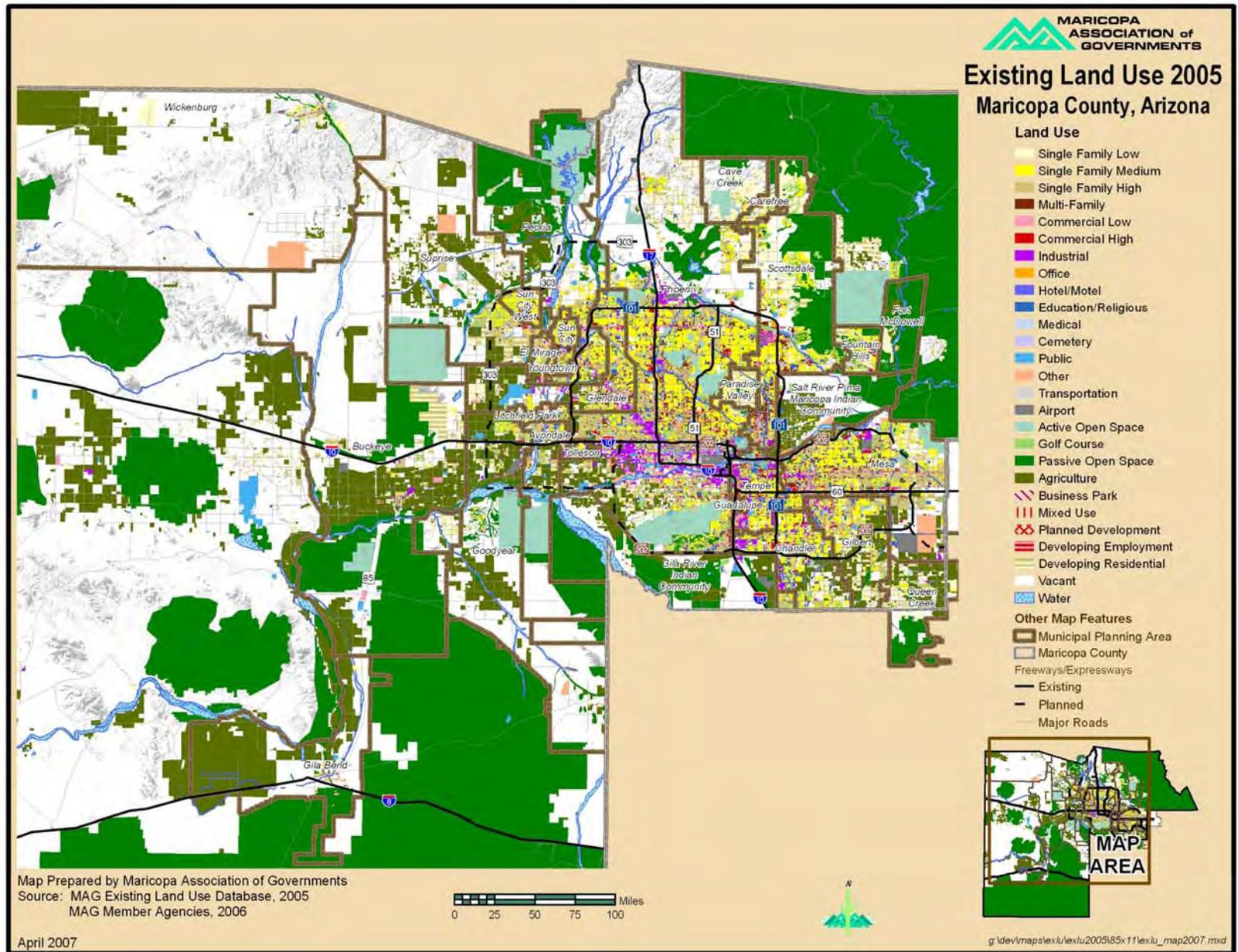


Figure 2-6: Existing Land Use, 2005

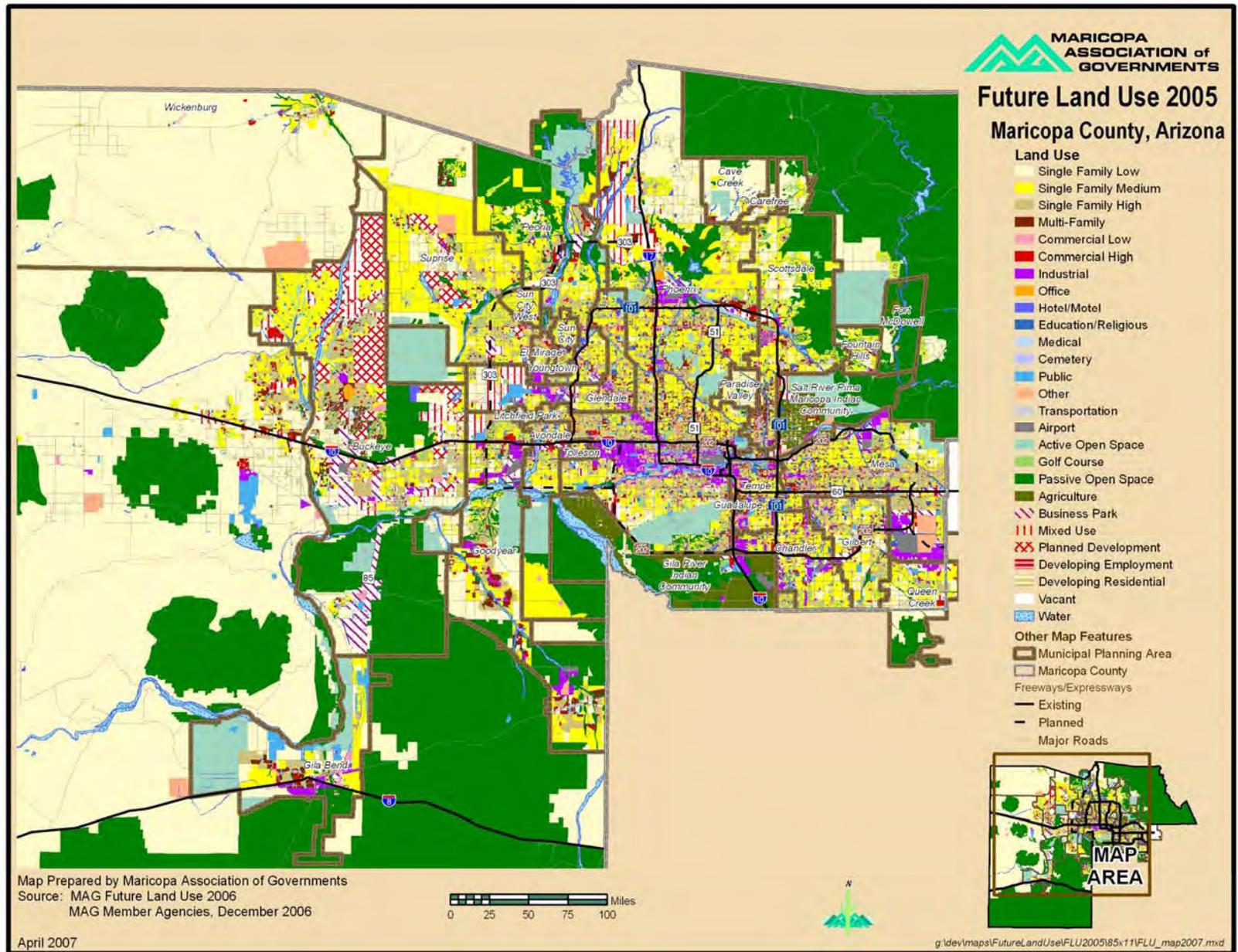


Figure 2-7: Future Land Use

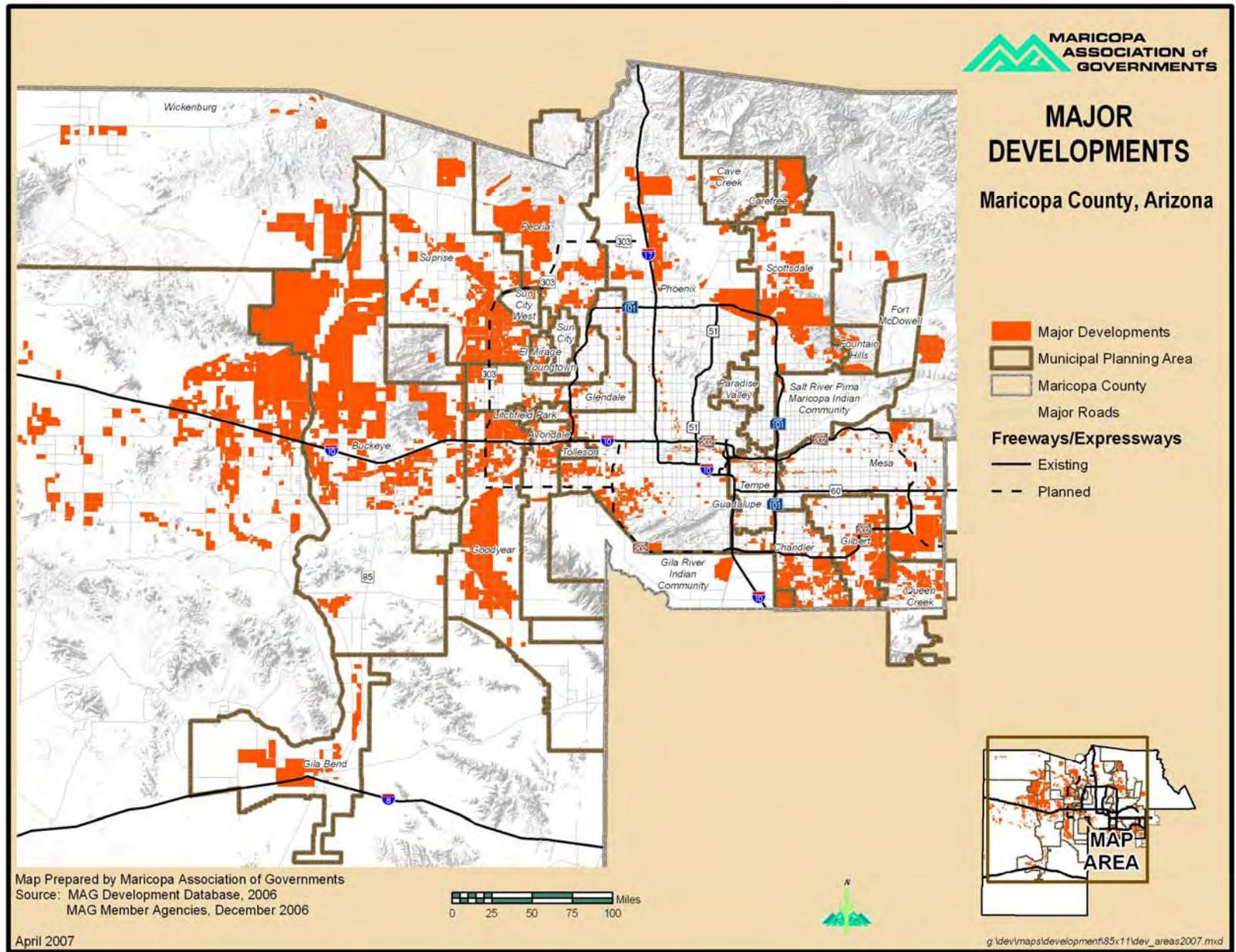


Figure 2-8: Large Scale Developments

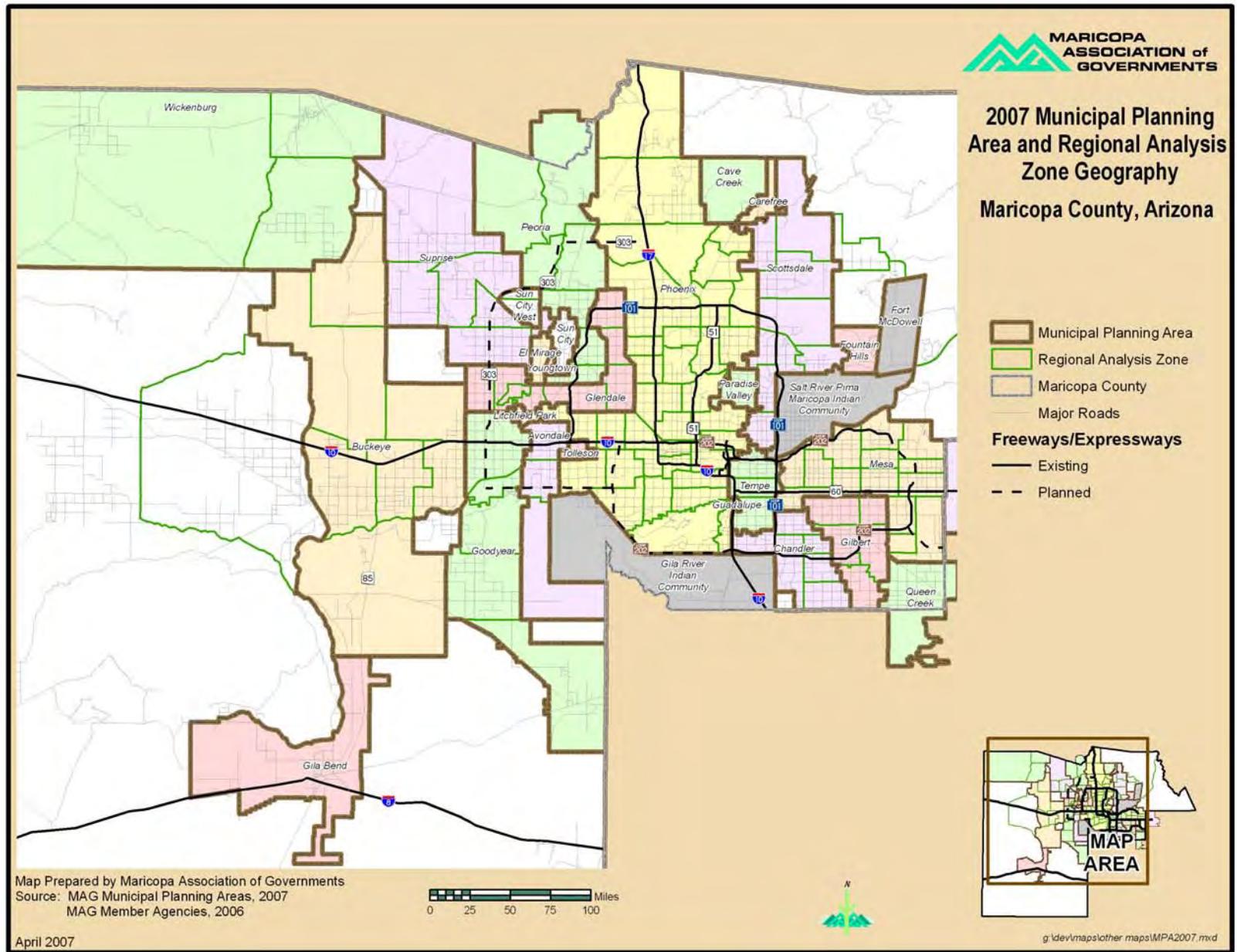


Figure 2-9: Municipal Planning Area and Regional Analysis Zone Geography

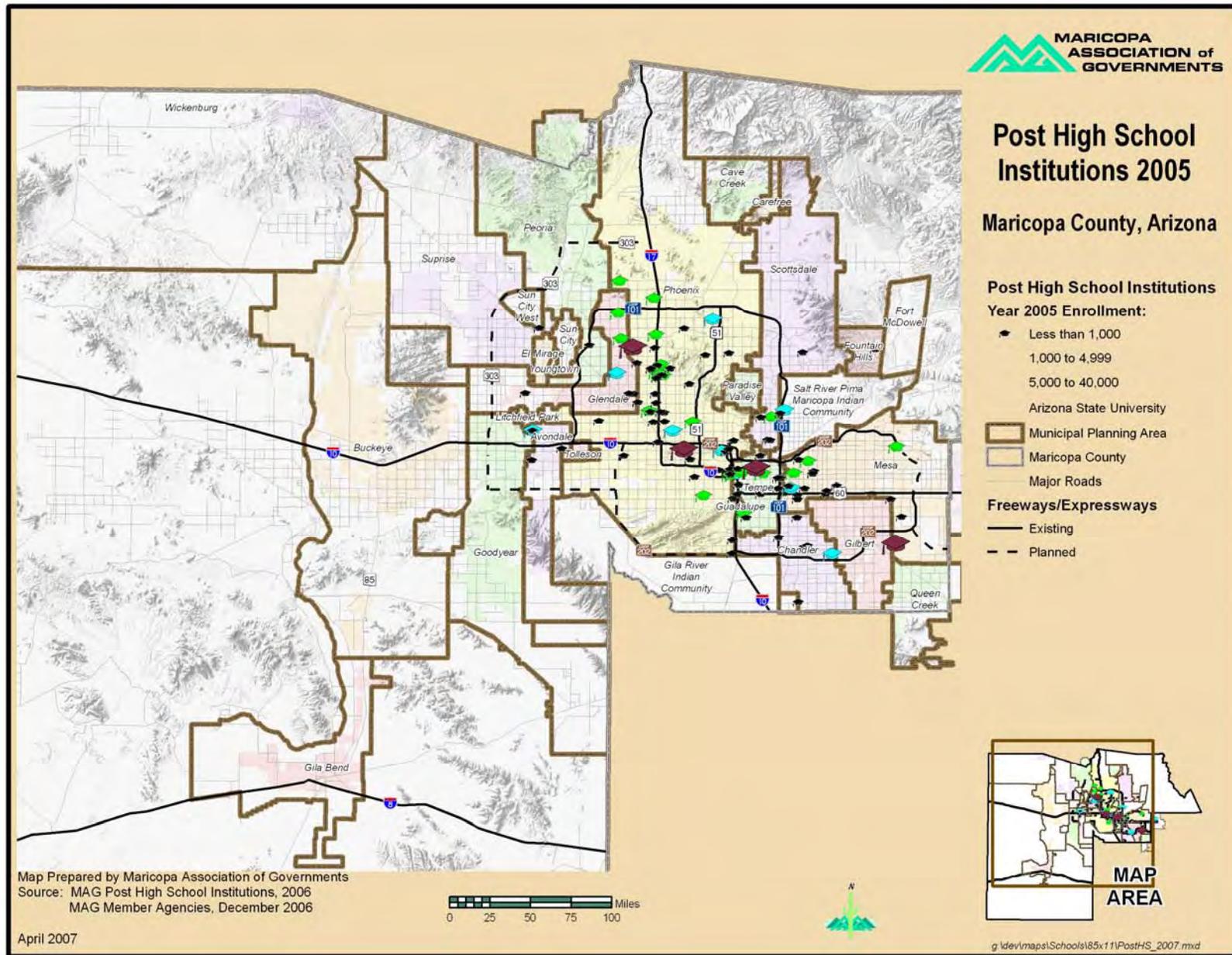


Figure 2-10: Post High School Institutions

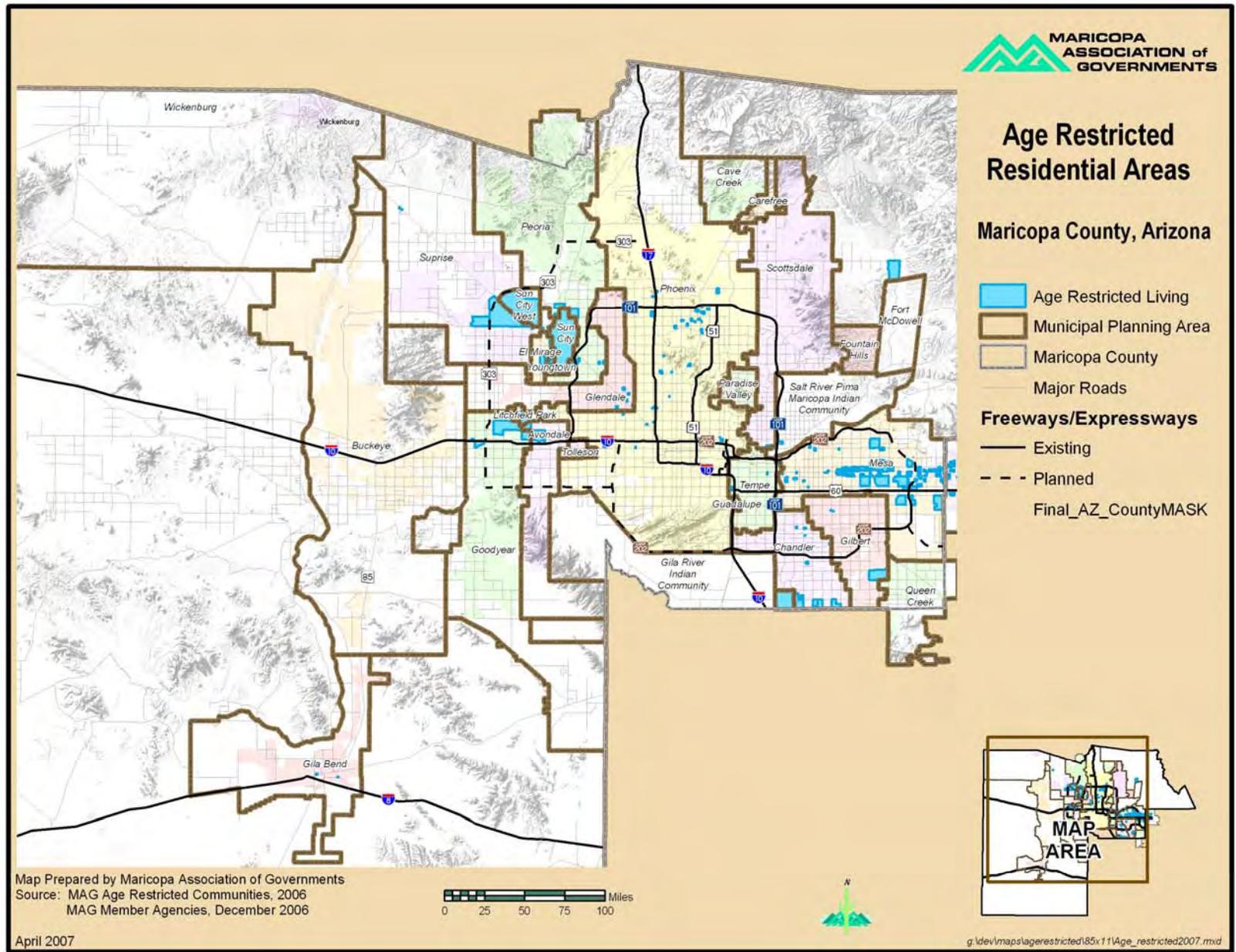


Figure 2-11: Age Restricted Residential Areas

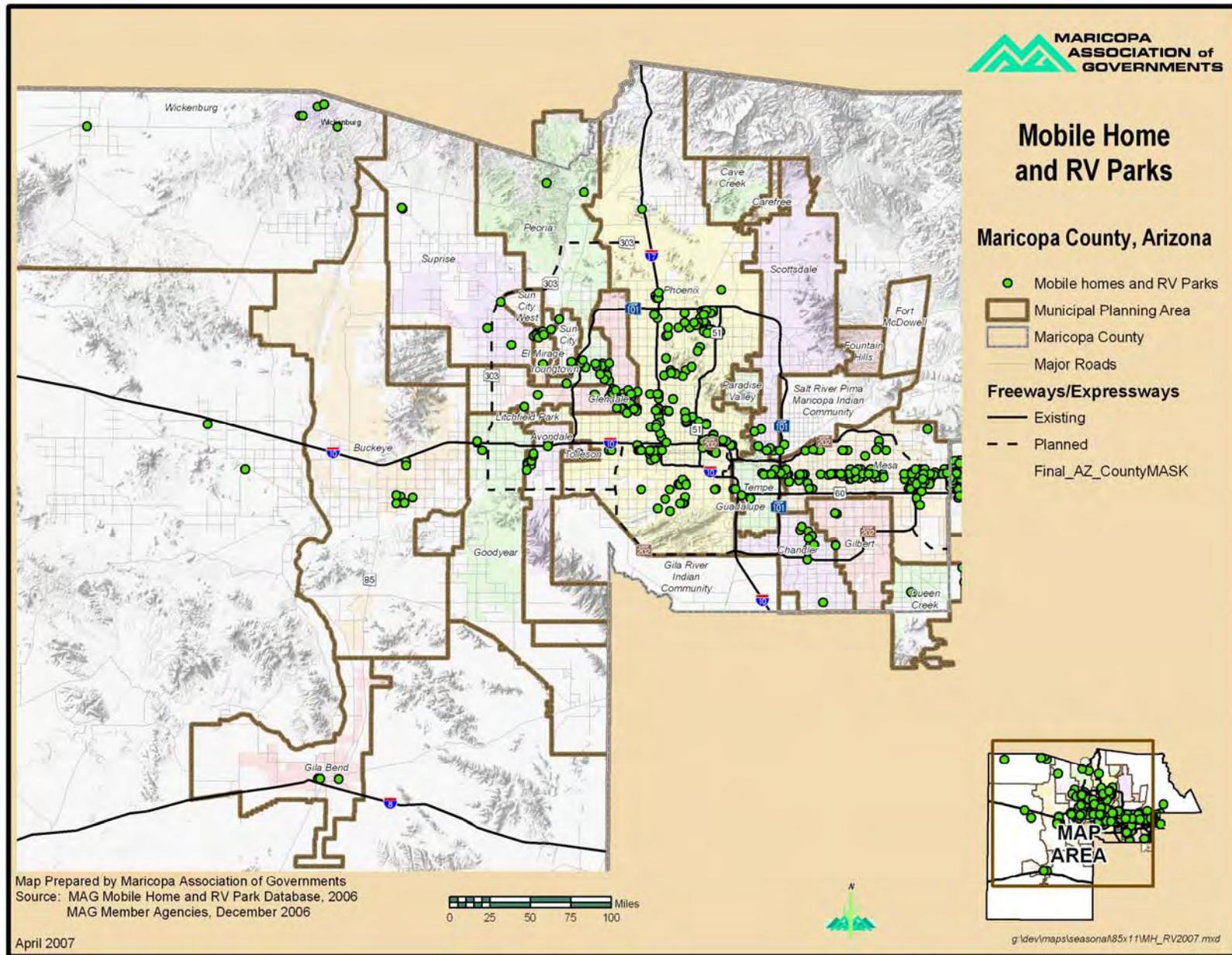


Figure 2-12: Mobile Home and RV Parks

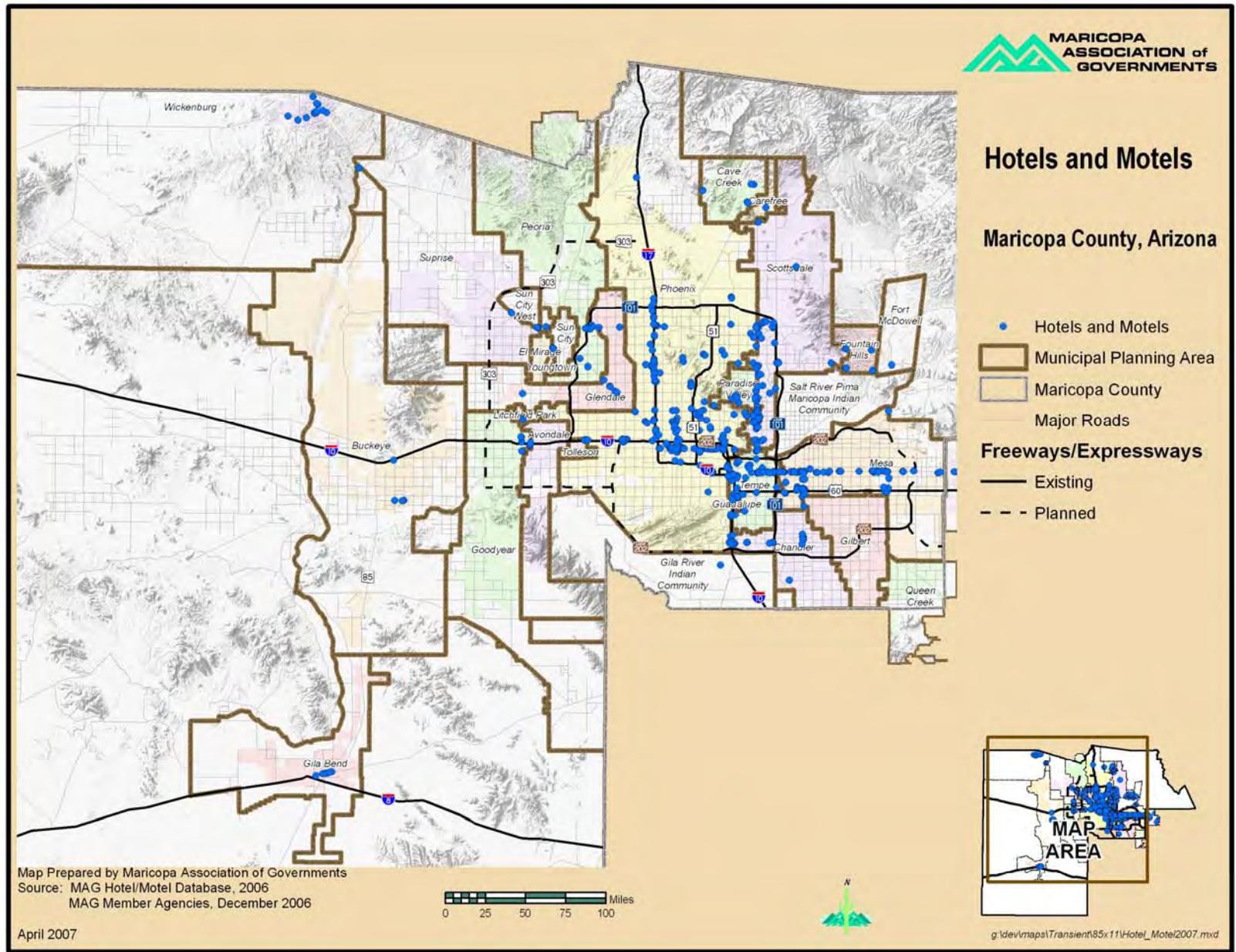


Figure 2-13: Hotels and Motels

3. MODELS & MODELING PROCESS

The primary purpose of the population and socioeconomic projections developed by MAG is for input into the MAG transportation and air quality models. However, they are also used for a wide variety of regional planning programs such as human services, regional development and by MAG member agencies in developing their plans.

Important objectives of the modeling process are to:

- Establish a linkage between transportation, land use and air quality models. This linkage is depicted in Figure 3-1.
- Test various policy alternatives and land use scenarios.
- Incorporate a Geographic Information System (GIS) into the process for better data sharing and review with member agencies and for maintaining an innovative approach to land use planning.

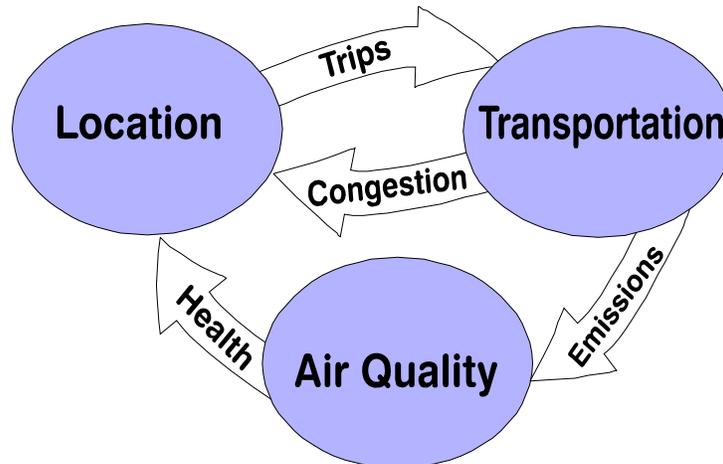


Figure 3-1: Modeling Relationships

3.1 Methodology for Preparing Projections

The land use, population and socioeconomic modeling is based on a three-tier modeling process as shown in Figure 3-2. The first tier is a demographic model that is used to produce county control totals. The second tier involves using a spatial interaction model to allocate the county control total population and employment to subregions. The third tier allows for the allocation of the subregional population to smaller areas drawing upon GIS representation of land use plans and local policies of MAG member agencies.

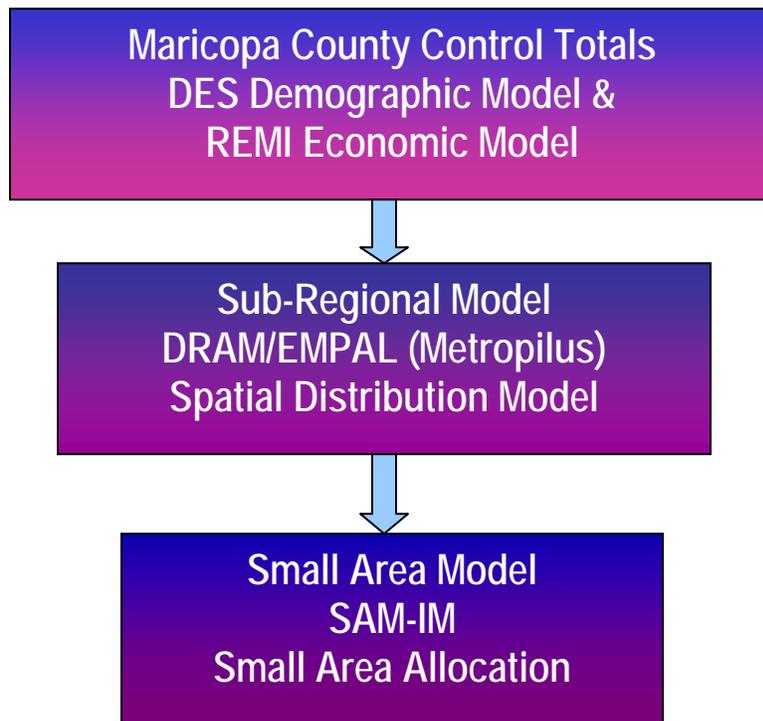


Figure 3-2: Three-Tier Modeling Process

3.2 County-level Model

The first tier model is a county-level model. In accordance with Executive Order 95-2, the preparation of county and state level population projections is the responsibility of the Arizona Department of Economic Security (DES). This model is a demographic model, projecting births, deaths and net migration in each county for a fifty-year time horizon. This model incorporates population by age and sex, birth rates, death rates and net migration trends. The model takes into account short-term economic conditions, but not long-range employment trends. The Arizona Department of Employment Security (AZ-DES) created a population data series, including age distributions, to be consistent with the results of the 2005 Census Survey.

Since the MAG transportation models require employment projections, the total labor force participation was calculated by using econometric forecasted participation rates applied to the AZ-DES population by age, taking into account the projected unemployment rates and historic multiple job holding rates. These regional employment projections by industry were then transformed into employment by land use categories.

3.3 The Sub-Regional Model

For the second tier process, MAG is using METROPILUS (DRAM/EMPAL). DRAM and EMPAL are registered trademarks of S.H. Putman Associates. The two models, DRAM (Disaggregated Residential Allocation Model) and EMPAL (EMPloyment Allocation Model), forecast household location, and employment location. These models are being used by a number of major metropolitan areas.

DRAM/EMPAL projects the spatial patterns of households and employment in the MAG region. The forecasting procedure starts with regional trends, transportation facility descriptions and data on the current location of employment by sector. This information is then used to project the future location of households. Figure 3-3 displays this process. The projections are done for five-year intervals.

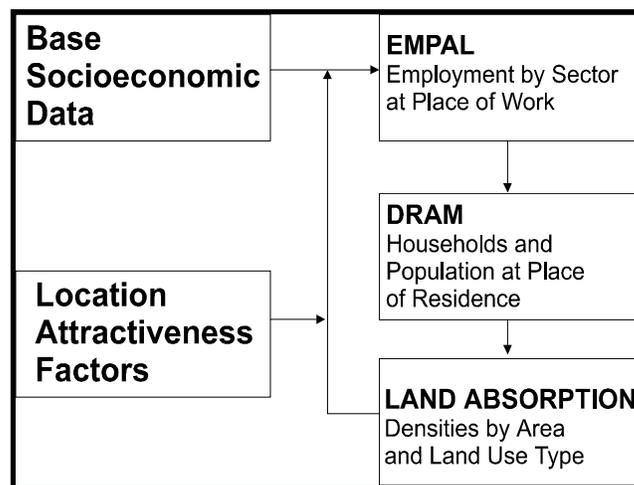


Figure 3-3: DRAM/EMPAL Spatial Distribution Model

Each five-year step begins with the EMPAL model to project employment by sector by zone. DRAM modeling to project households by income category follows the EMPAL run for that time period. The specific data that were input into the DRAM/EMPAL models are as follows:

EMPAL

- Employment by sector by zone for the previous time period
- Population by income category by zone for the previous time period
- Total area of each zone
- PM peak hour travel times from each zone to every other zone
- Regional employment forecasts by sector for the time period

DRAM

- Population by income category by zone for the previous time period
- Land used for residential purposes in each zone for the previous time period
- The percentage of developable land in each zone which is already developed
- Vacant developable land in each zone
- PM peak hour travel times from each zone to every other zone

- Employment by sector by zone for this time period
- Regional population forecasts by sector for the time period

Land consumption in each zone is performed after the DRAM model is run. Land consumption in this version of DRAM/EMPAL is derived from zone specific densities of housing and employment.

3.4 The Subarea Allocation Model (SAM-IM)

The third tier Subarea Allocation Model- Information Manager (SAM-IM) allocates population and employment from RAZs to one-acre grids that are then aggregated to SAZs.

The method for ranking one acre grids (220 feet on each side) which receive development are based on a number of factors:

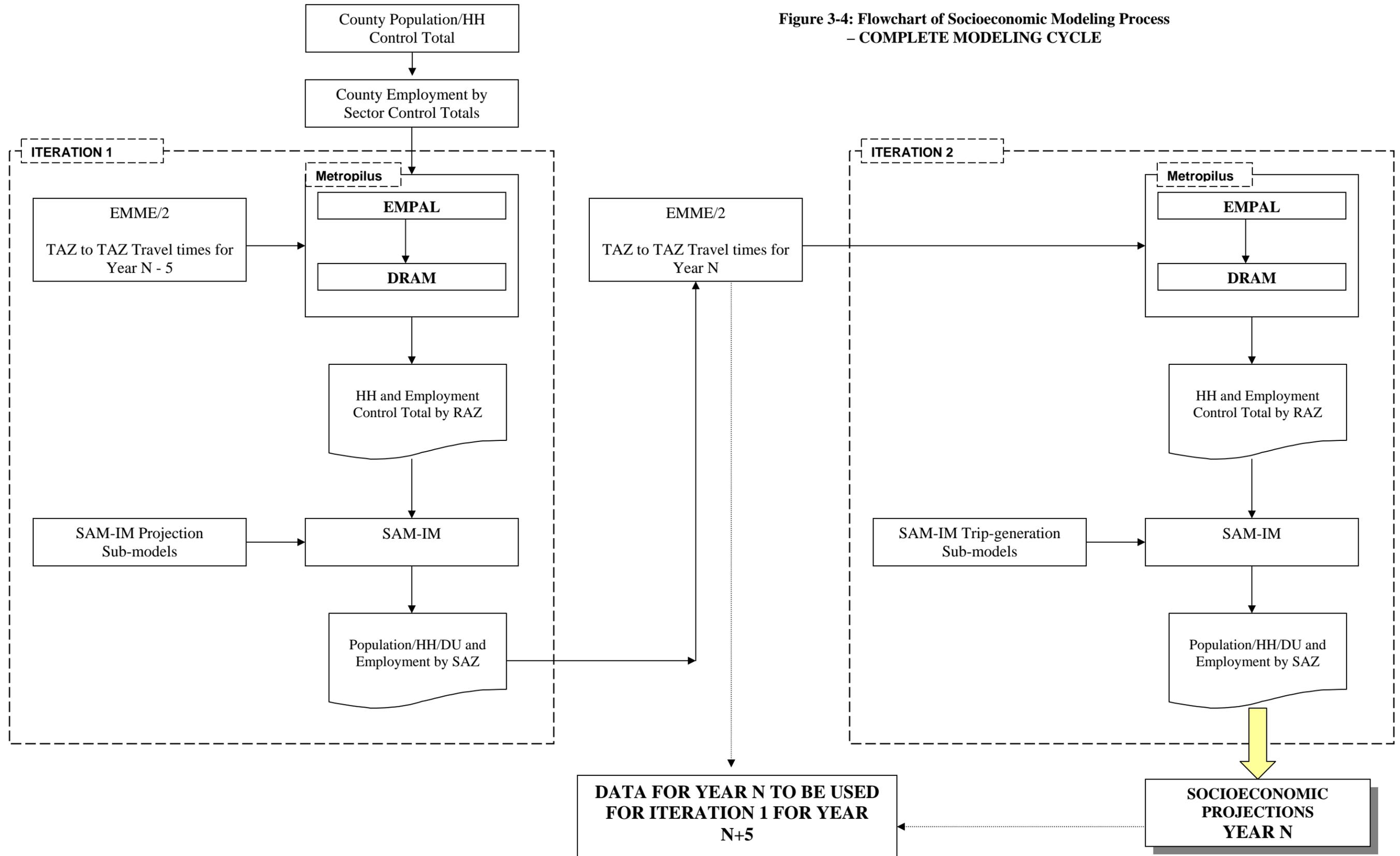
- Land use, to insure that the grid is vacant and eligible to receive either employment or population;
- Active and planned development, to include development underway, or anticipated initiation of development;
- Urbanization, to indicate the extent to which development occurs close to existing development;
- Highway access, to identify proximity to the nearest arterial; and
- Infill, to determine the extent to which a grid is surrounded by development.

The composite score derived from this ranking process is then used to determine the allocation of population and employment from each RAZ. Land uses are allocated separately, and buildouts, floor area ratios and square feet per employee are all used to determine the final allocation to grids and then to SAZ.

3.5 Modeling Process

The following four figures (Figures 3-4 to 3-7) depict schematically the MAG socioeconomic modeling process.

**Figure 3-4: Flowchart of Socioeconomic Modeling Process
– COMPLETE MODELING CYCLE**



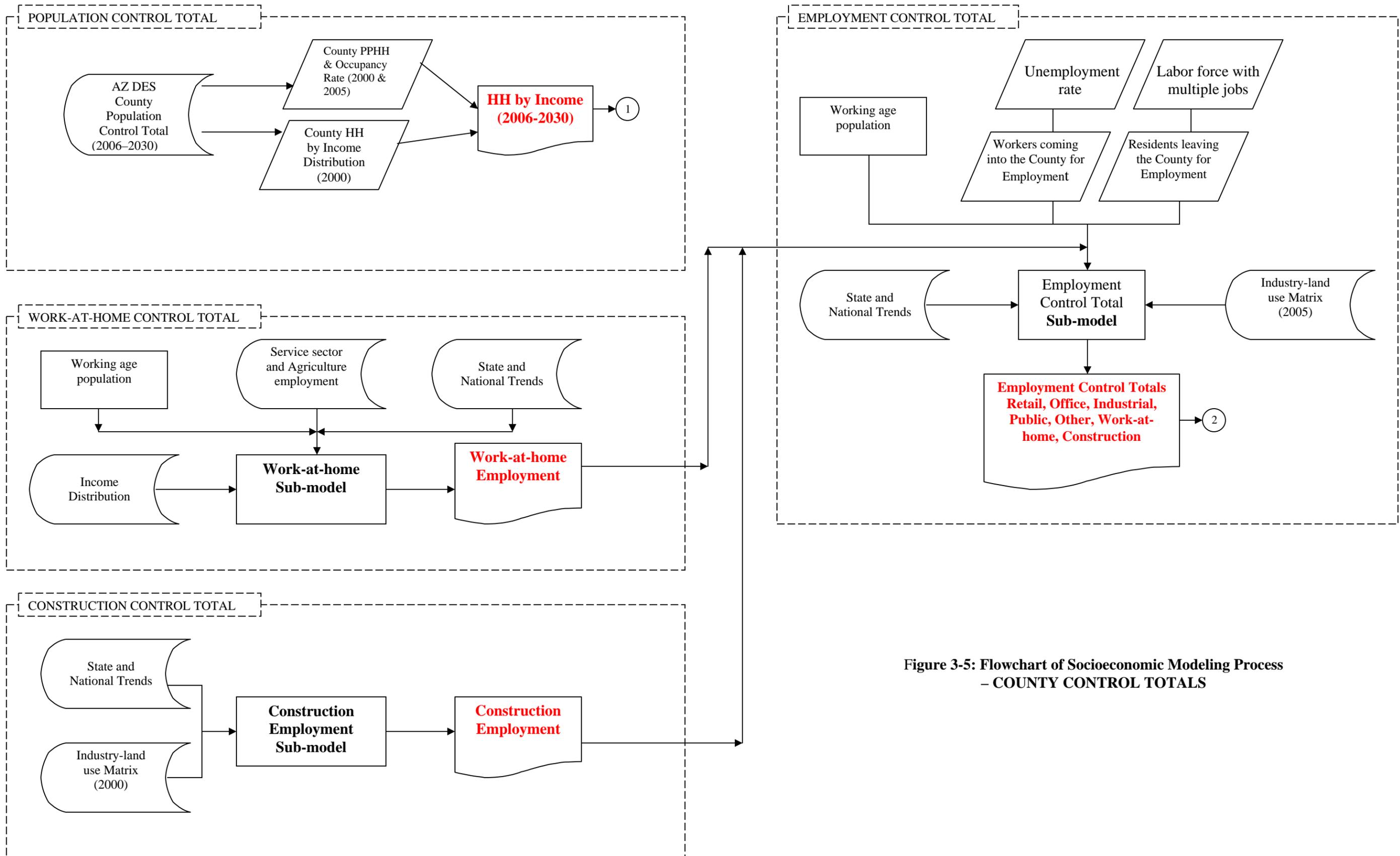
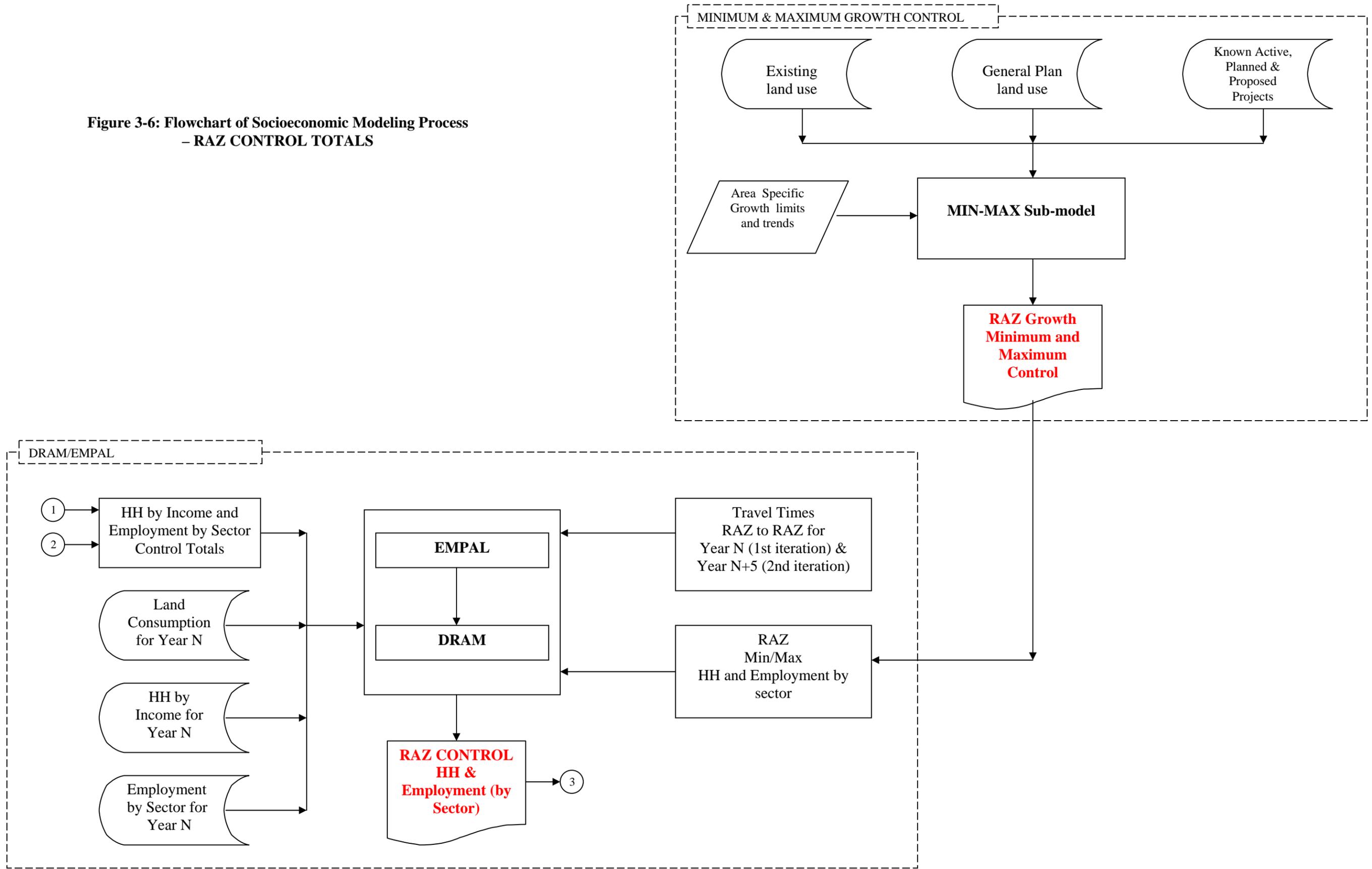


Figure 3-5: Flowchart of Socioeconomic Modeling Process
- COUNTY CONTROL TOTALS

**Figure 3-6: Flowchart of Socioeconomic Modeling Process
– RAZ CONTROL TOTALS**



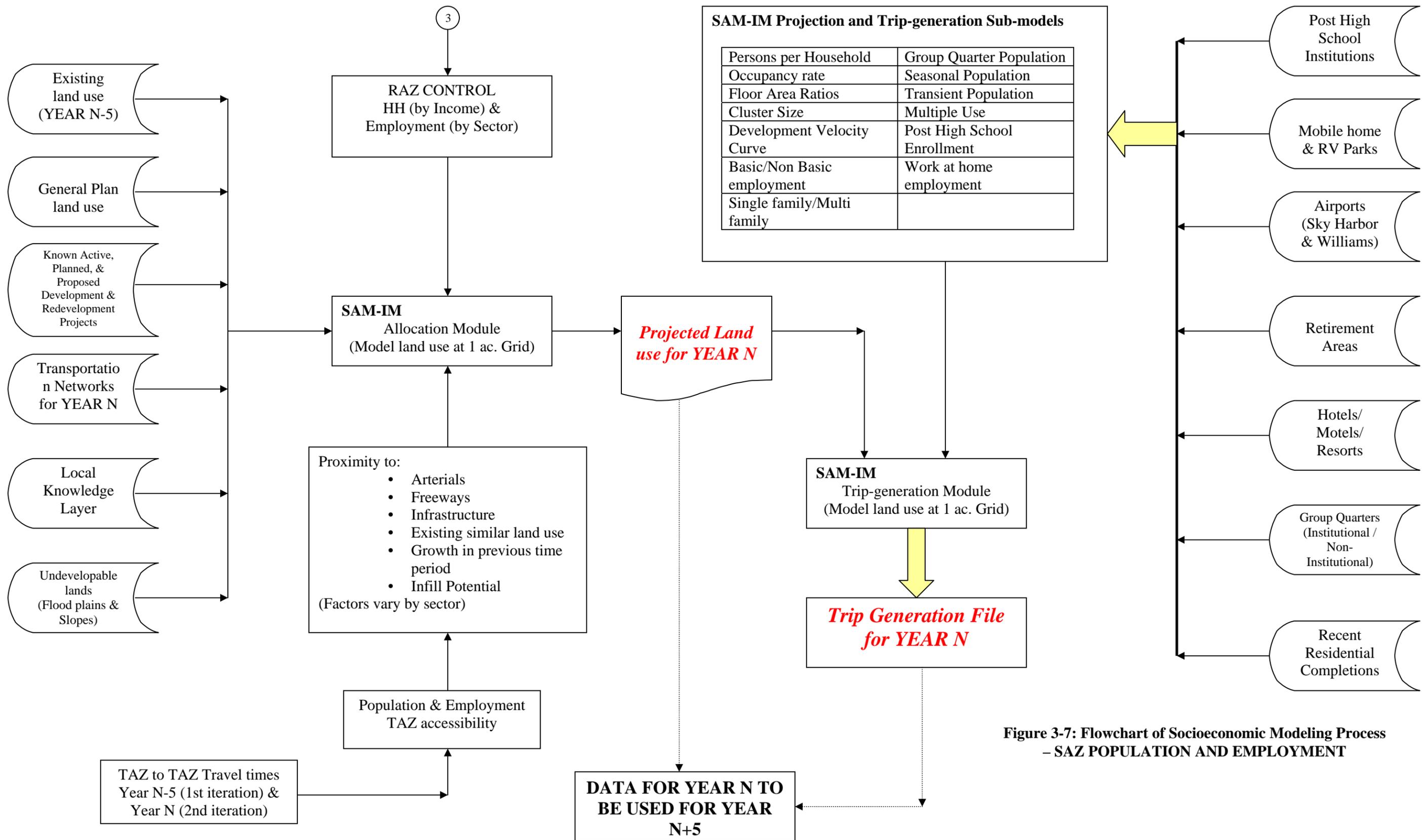


Figure 3-7: Flowchart of Socioeconomic Modeling Process – SAZ POPULATION AND EMPLOYMENT

4. ASSUMPTIONS & METHODS

The following is a list of assumptions and methods approved by the MAG Population Technical Advisory Committee (POPTAC).

4.1 MAG Geography

- Maricopa County is subdivided into 29 Municipal Planning Areas (MPAs), 148 Regional Analysis Zones (RAZs), 1955 Socioeconomic Analysis Zones (SAZs) or Traffic Analysis Zones (TAZs).
- Traffic Analysis Zones (TAZs) are required for transportation planning and are set by the MAG Street Committee with input from the MAG POPTAC. The TAZ is only within the transportation modeling area and its numbering system is sequential.
- Socioeconomic Analysis Zones (SAZs) are consistent with TAZs for the same projection year.
- Each projection series requires a reevaluation of SAZs. If a SAZ is not split, the number remains the same in all projection series. If a SAZ is split, the old number is discarded and new unique numbers are assigned. This avoids invalid comparisons of new data to old data.
- SAZs are modified as expected growth in a 30-year horizon expands geographically or densities in existing SAZs warrant SAZ splits.
- Each municipality has its own Municipal Planning Area (MPA), which delineates the area of planning concern for each jurisdiction. SAZs and Regional Analysis Zones (RAZs) fall completely within only one MPA, as SAZs add up to RAZs, and RAZs add up to MPAs.
- SAZs used for the 2007 projections will be identified as SAZ2007.

4.2 Base July 1, 2005 Population and Housing Variables

- The MAG socioeconomic models require a July 1, 2005 base population, housing and households by SAZ2007 from which to begin the modeling process.
- The MAG transportation models use number of households (occupied housing units) by SAZ as the base for trip-generation.
- With the completion of Census Survey 2005, the following data are available:
 - 2005 Census Survey data by jurisdiction for September 1, 2005 housing units, occupied housing units and population in households and group quarters.
 - Census 2000 data for April 1, 2000 with detailed population and housing data by unit type accumulated from Census geographies to SAZ2007.
 - Residential Completions for April 1, 2000 to July 1, 2005 submitted by each member agency.
- Use the following method to create July 1, 2005 totals consistent with the 2005 Census Survey:
 - Using residential completions between July 1, 2005 and September 1, 2005 and results of Census Survey 2005 create July 1, 2005 housing units, occupied housing units, and population by jurisdictions.

- Use the following method to create base housing and population information by MPA:
 - Proportionally distribute the population and housing in unincorporated county parts for each MPA based on its individual proportion of Census 2000 data augmented by residential completions between April 1, 2000 and July 1, 2005.
 - Cumulate housing units from Census 2000 and residential completions (between April 1, 2000 and July 1, 2005) to MPA2007. Stratify the data by incorporated and unincorporated portions of each MPA.
 - Derive overall vacancy rates and persons per household for the incorporated part of the MPA from the jurisdiction level rates from the 2005 Census Survey.
 - Derive overall vacancy rates and persons per household for the unincorporated parts of the MPA by adjusting the 2000 unincorporated SAZ data to match the balance of county from the 2005 Census Survey.
 - Factor housing units by MPA where needed to ensure a match on households and population in households with the 2005 Census Survey. It is assumed that these areas may have been miscounted by the 2000 Census.
 - Cumulate the housing units, households, and population for the incorporated and unincorporated areas to derive total housing and population data by MPA.
- Use the following method to create base housing and population information by SAZ2007:
 - Cumulate housing units by type (single and multi family) from Census 2000 and residential completions between April 1, 2000 and July 1, 2005 to SAZ2007.
 - Factor the housing unit data by SAZ2007 where needed to ensure consistency with the 2005 Census Survey. It is assumed that these areas may have been miscounted by the 2000 Census.
 - Calculate the SAZ level vacancy rates and persons per household by unit type from Census 2000.
 - Create vacancy rates and persons per household by unit type by SAZ2007 by keeping the same relationship as the Census 2000 vacancy rates and persons per household, but matching the MPA level rates derived from Census 2005.
 - Calculate occupied households and population in households by unit type by applying the corresponding vacancy rates and persons per household.

POPTAC Recommendation:

- Use the method as described above for cumulating the base July 1, 2005 population and housing data to SAZ2007.

4.3 Base July 1, 2005 Employment by Sector

- The MAG transportation models require employment projections by 5 land use types, namely, Retail, Office, Public, Industrial, and Other, and 2 non-land use types, Work at Home and Construction.
- For effective transportation modeling, the employment by sector must be identified by land use sector and not by SIC categories. Thus, if an office is in a retail center, and the underlying land use is “Retail,” then the office employees are in a Retail sector. Care must thus be taken to ensure proper interpretation of the results.
- The MAG socioeconomic models, therefore, require a base July 1, 2005 employment by the same 5 land use types, namely, Retail, Office, Public, Industrial, and Other, and 2 non-land use types, Work at Home and Construction, from which to begin its modeling process.
- For the July 1, 2005 employment base, a database of employment of 3 or more employees at any one site was collected by MAG. This database included, among other items, the name, address, SIC code and number of employees at the site. This database was updated with the 2005 Maricopa County Trip Reduction data and reviewed by MAG member agencies.
- A coverage of existing land use as of January 2005 was collected by MAG and was reviewed by each MAG member agency. This coverage was based on land use categories approved by POPTAC prior to beginning the creation of the coverage. Changes and updates were made to the coverage as identified by the member agencies.
- The employment locations are address matched, compared to a database of employment-based buildings, and assigned to the underlying land use sector as identified in the existing land use database.
- Where employment appears incompatible with land use sectors, such as open space, the land use code as derived from the NAICS code is used. This will account for possible issues with small parcels of employment-based land use not identified on the existing land use database.
- Where employment appears in a multiple use land use sector, such as Business Park, the underlying base employment is derived from the NAICS code.
- After all of the known employment is allocated, the residual employment is assumed to be the employees per site that are not collected in the MAG Employment Database. This employment is allocated to the employment-based land use sectors identified on the existing land use coverage with limited or no employment. A database of employment-based buildings is also used. Floor Area Ratios and Employment Density factors are used to allocate this remaining employment at the appropriate densities.
- The majority of construction employment is not located at the corporate offices of the company, but at construction sites across the region. Therefore, construction employment is assigned spatially to locations where new construction was identified in the prior years, using both the Residential Completions database and the Development database. This employment is considered to be in the Other Sector and follows new construction.
- Work-at-Home employment was derived separately using the Census 2000 data on home employment factored using the 2005 total employment. This was prorated to SAZ using Census 2000 data and new residential development.

- Non-Basic employment was derived separately as identified in 5 below.

POPTAC Recommendation:

- Use the method as described above for cumulating base July 1, 2005 employment by sector to SAZ2007.

4.4 Population and Employment Control Totals

- MAG member agencies contracted with the U.S. Census Bureau to perform the 2005 Census Survey for Maricopa County.
- Arizona Department of Employment Security (AZ-DES) created a population data series to be consistent with the results of the 2005 Census Survey.
- MAG develops its subregional resident population projections to be consistent with population control totals for Maricopa County developed by the Arizona Department of Employment Security (AZ-DES).
- AZ-DES Population Projections have prescribed age distributions, which affect household formation and size and labor force control totals.
- AZ-DES does not produce employment projections for counties beyond 2007, and for Arizona beyond 2010.
- The MAG socioeconomic projections and transportation models require detailed information about households and employment.
- Other available forecasts for counties in Arizona have varied population levels and age distributions for the projection periods associated with their employment and fiscal forecasts.
- Residents and firms located in Maricopa and Pinal counties are increasingly reflecting economic, social, and behavioral choices of a metropolitan area.
- Research and observations from other metropolitan areas show location and timing patterns of development integrating both counties into a single market area.
- Most current forecasts do not explicitly link the counties of the Phoenix-Mesa-Scottsdale Metropolitan Area within their forecasts.
- Pinal County is part of the Central Arizona Association of Governments, which along with the county and municipalities maintain and produce development information about Pinal County.

Key assumptions and methods for producing 2007 socioeconomic control totals are identified below:

a. Households and Housing Units

- Using existing group quarter characteristics (from U.S. Census Bureau information), maintain population share of group quarter residents (excluded are military and inmate population in Maricopa County).
- Based on current U.S. Census data, calculate the number of households for the primary population groups, total housing units, and owner-occupied units.

b. Labor Force and Employment of Residents

- Calculate total labor force participation by using econometric forecasted participation rates applied to the AZ-DES population by age.
- Calculate employed persons by county of residence using econometric forecasted unemployment rates.

- Using historic multiple job holding rates for the nation and Arizona, calculate the number of additional jobs and total jobs held by residents.
- c. Total Jobs, Non-Farm Employment, and Other Employment Activities
- Using existing patterns and forecasted changes in employment and population relationships, calculate adjusted employment levels to meet employment and service requirements of the AZ-DES resident population for the metropolitan area.
 - Adjust forecasted employment levels for other employment activities (agriculture, military, and other) by related change in employment levels.
 - Calculate sole proprietorship and self-employment totals by maintaining existing employment patterns within the metropolitan area.
- d. Employment by Industry and County Employment Totals
- Based on econometric forecasted industry change patterns, recalculate employment by industry to match adjusted total employment levels. Additionally, produce final employment levels for other employment activities.

POPTAC Recommendation:

- Produce total employment control totals for Maricopa County and the metropolitan area for each five-year period between 2010 and 2035.
- Use the AZ DES population projections for 2010 through 2035 that are consistent with the U.S. Census 2005 Special Survey results for Maricopa County and the official AZ DES 2005 estimation for the remainder of the metropolitan area.
- Use Moody's Economy.Com economic forecast for detailed labor force and employment information as needed for the MAG socioeconomic projections.
- Adjust the labor force and employment outcomes of the Economy.com forecast to be consistent with the population total and detailed characteristics of the AZ DES projection.
- Adjust the labor force and employment outcomes to maintain demographic and economic relationships within the Economy.Com econometric forecast, consistent with the DES forecast.
- Reflect an employment development pattern in the metropolitan area representing an increased economic interdependence of emerging areas.

4.5 County-level Employment Projections by Land Use Classification Sector

- The MAG transportation models require employment projections by 5 land use types, namely, Retail, Office, Public, Industrial, and Other, and 2 non-land use types, Work at Home and Construction.
- For effective transportation modeling, the employment by industry sector must be identified by land use sector and not by NAICS categories. Thus, if a professional services office is in a retail center, and the underlying land use is “Retail,” then these employees are in a Retail sector.
- Arizona Department of Employment Security (AZ-DES) created a population data series to be consistent with the results of the 2005 Census Survey.
- AZ-DES Population Projections have prescribed age distributions, which affect household formation and size and labor force control totals.
- Calculate total labor force participation by using econometric forecasted participation rates applied to the AZ-DES population by age.
- Calculate employed persons by county of residence using econometric forecasted unemployment rates.
- Using historic multiple job holding rates for the nation and Arizona, calculate the number of additional jobs and total jobs held by residents.
- Based on the current patterns of firm location patterns by industry within each land use category, the regional employment projections by industry were transformed into employment by land use categories.
- Based on econometric forecasted industry change patterns, recalculate employment by industry to match adjusted total employment levels. Additionally, produce final employment levels for other employment activities.

POPTAC Recommendation:

- Use the method as described above for calculating regional employment projections and distributing then into the identified land use categories for each five years to 2035.

4.6 Basic/Non-Basic Employment

- The MAG Socioeconomic model assigns employment to areas based on land use designations in MAG Member Agency General Plans.
- Since the General Plans are general in nature, many large tracts of residential land use will have some non-basic retail, public and other employment associated with them and should have some retail, public and other employment assigned to them as population growth occurs.
- Based on an analysis of non-basic employment in larger tracts of existing land use, it appears that in future years 10% of retail employment, 5% of public employment and 10% of other employment should be held back for non-basic employment. This non-basic employment should be assigned to the Socioeconomic Analysis Zones where large tracts of residential development exist and where population growth has occurred.

POPTAC Recommendation:

- Use the method as described above for assigning non basic employment to large tracts of residential land.

4.7 Buildout Population and Housing Variables

- The MAG socioeconomic models require a buildout population, housing and households to identify the population and housing potential in an area for its modeling process.
- The buildout analysis was performed for minimum, target and maximum densities as described in the accompanying paper (Paper 1), “Buildout Procedure for Population and Housing Variables.”

See also, attached paper (Paper 1) on Buildout Procedure for Population and Housing Variables

POPTAC Recommendation:

- Use the method for projecting and cumulating buildout population and housing data to SAZ2007 as identified in the accompanying paper (Paper 1), “Buildout Procedure for Population and Housing Variables” for target population and housing.

4.8 Buildout Employment Variables

- The MAG socioeconomic models require a buildout employment by land use sector to identify the employment potential in an area for its modeling process.
- The buildout analysis was performed for minimum, target and maximum densities as described in the accompanying paper (Paper 2), “Buildout Procedure for Employment Variables.”

See also, attached paper (Paper 2) on Buildout Procedure for Employment Variables

POPTAC Recommendation:

- Use the method for projecting and cumulating buildout employment data to SAZ2007 as identified in the accompanying paper (Paper 2), “Buildout Procedure for Employment Variables” for target employment.

4.9 Vacancy and Occupancy Rates

- Census Survey 2005 provided data on total occupancy rates for all housing units by jurisdiction only.
- Occupancy rates by unit type by SAZ are needed by the socioeconomic models.
- Occupancy rates will be derived in part from the 2000 Census by dividing the total number of occupied housing units (by unit type single family or multi-family) by the total number of housing units (by unit type).
- Total housing units (by unit type) and total occupied housing units (by unit type) by block will be allocated to SAZ, which in turn will be summed to Regional Analysis Zones and Municipal Planning Areas.

- When there is not enough information at the SAZ zone level for projecting occupancy rates, the next level of geography (RAZ) is used.
- When there is not enough information at the RAZ zone level for projecting occupancy rates, the next level of geography (MPA) is used.
- The sum of occupied housing units by jurisdiction are made consistent with Census Survey 2005 results by adjusting the SAZ level occupancy rates.
- MAG member agencies will be asked for input to identify areas where changes in occupancy rates are expected over time.

POPTAC Recommendation:

- Use the method described above to develop occupancy rates consistent with Census Survey 2005 for single family and multi-family units by SAZ2007.
- Maintain the derived occupancy rates over time with necessary modifications, as identified by MAG member agencies.

4.10 Persons per Household

- Census Survey 2005 provided data on persons per household for all housing units by jurisdiction only.
- Persons per household by unit type by SAZ are needed by the socioeconomic models.
- Persons per household will be derived in part from the 2000 Census by dividing the total population in households (by unit type single family or multi-family) by the total number of occupied housing units (by unit type).
- Population in households (by unit type) and total occupied housing units (by unit type) by block will be allocated to SAZ, which in turn will be summed to Regional Analysis Zones and Municipal Planning Areas.
- When there is not enough information at the SAZ zone level for projecting persons per household, the next level of geography (RAZ) is used.
- When there is not enough information at the RAZ zone level for projecting persons per household, the next level of geography (MPA) is used.
- The sum of population in households by jurisdiction is made consistent with Census Survey 2005 results by adjusting the SAZ level persons per household.
- MAG member agencies will be asked for input to identify areas where changes in persons per household are expected over time.

POPTAC Recommendation:

- Use the method described above to develop persons per household consistent with Census Survey 2005 for single family and multi-family units by SAZ2007.
- Maintain the derived persons per household rates over time with necessary modifications, as identified by MAG member agencies.

4.11 Multiple Use Definitions by Geographic Location

- The MAG projections are consistent with member agency General Plans and Planned Area Developments.
- Many of these plans, however, have areas defined as multiple use areas that can generate various types and densities of housing or employment.

- In order to use these designations in socioeconomic modeling, the multiple use categories must ultimately be converted to one or more of the standard land use categories.
- The MAG socioeconomic models have been enhanced to accommodate such multiple use categories. The models are flexible enough to allow for each individual area to have different proportions of standard land use categories.
- Default categories are consistent with past local multiple use development but can be modified, area by area, by the member agencies.
- The default categories and areas are defined in the accompanying papers: Paper 1, “Buildout Procedure for Population and Housing Variables” and Paper 2, “Buildout Procedure for Employment Variables.”

See also, attached Paper 1 on Buildout Procedure for Population and Housing Variables and Paper 2 on Buildout Procedure for Employment Variables.

POPTAC Recommendation:

- Accept default land use proportions by area category, which may be modified by individual member agencies.
- Accept default land use proportions by MPA, which may be modified by individual member agencies.
- Maintain all land use proportions over time, unless modified by individual member agencies.

4.12 Single Family / Multi-family Split for Maricopa County by Time

- The MAG projections are consistent with member agency General Plans and Planned Area Developments.
- The data is then used in MAG transportation models to project future transportation behavior.
- The current version of the model requires long-term projections of the distribution of future housing units into single family and multifamily types.
- MAG socioeconomic models can determine the distribution of housing provided a county-wide control total is known.
- Census 2000 and Residential Completions from April 1, 2000 to June 30, 2005 data provide unit type information for the 2005 Base.
- This is consistent with the split identified for 2005 in attached Paper 3 on Single Family / Multi-family Split.
- General Plans give good future projections of land for single family and multi-family units.
- A split between single family and multi-family units over time at the county-level should be identified.

See also, attached paper (Paper 3) on Single Family / Multi-family Split.

POPTAC Recommendation:

- Use single family/multi-family split over time as identified in the accompanying paper (Paper 3), “Single Family / Multi-family Split.”

4.13 Cluster Size, Floor Area Ratios (FAR) and Employment Density

- The MAG transportation models require employment projections by 5 land use types, namely, Retail, Office, Public, Industrial, and Other.
- Cluster Size represents the average parcel size of employment land use.
- FAR represents the ratio of the square footage of the building to the square footage of the parcel of land.
- Employment Density represents the floor space required by employees. This is calculated as Employees per 1000 square feet of floor space.
- The MAG models convert a parcel of land to the square feet of employment space and then to the number of employees on that parcel. This requires an understanding of average employment areas.
- Cluster Size, FAR and Employment Density differ for each non-residential land use type.
- Although there appear to be no adequate surveys and methods for projecting Cluster Size for Employment over time, it is likely that Cluster Size, FAR and Employment Density will not change appreciably over time.

See also, attached paper (Paper 4) on Cluster Size, FAR and Employment Density

POPTAC Recommendation:

- Accept the Cluster Size, FAR and Employment Density values by land use type as identified in Table 1 of the accompanying paper (Paper 4), “Cluster Size, FAR and Employment Density.”
- Maintain Cluster Size, FAR and Employment Density values over time for the employment projections.

4.14 Residential Development Density, Cluster Size and Velocity Curves

- In developing SAZ population projections, the MAG socioeconomic models project residential dwelling units from parcels identified for residential uses in the General Plans or areas anticipated to be residential in the Development database. Households and Population by SAZ are subsequently calculated from the dwelling unit projections.
- Three General Plan Residential Density figures (dwelling units/acre) have been collected from the member agencies. These include the minimum, maximum and target residential density anticipated for each residential land use type in the General Plan. The models use Target Density as the base for new residential growth. The Maximum density set by the MPA caps the residential density. These densities may be changed, polygon-by-polygon by the member agencies if desired.
- Areas covered by the Development database have the number of dwelling units being built/planned and thus do not need to use the densities identified in the General Plan.
- Cluster Size represents the average parcel size of residential land use.
- Residential Density and Cluster Size differ for each residential land use type.
- Although there appear to be no adequate surveys or methods for projecting Density and Cluster Size for residential uses over time, it is likely that Residential Density and Cluster Size will not change appreciably over time.

- Development Velocity Curves represent the life cycle of residential development projects. These are used to estimate the development trends of residential units coming into the market.
- The Development Velocity Curves are based upon an analysis of the life cycles of all completed projects in Maricopa County over the 1979 to 1999 time period.
- The size of the development project (total number of units to be built) decides the development Velocity Curve to be used for the particular project. The percent of built units constructed is used as an indicator of the stage the development project is on the Velocity Curve. The total number of units built during a five-year time period shall not exceed the number indicated by the velocity curve by more than 10%.

See also, attached papers (Papers 5 & 6) on Residential Cluster Size and Residential Velocity Curves

POPTAC Recommendation:

- Accept the residential density methodology as identified above.
- Accept the Cluster Size and Development Velocity Curves as identified in Table 1 of the accompanying paper (Paper 5), “Residential Cluster Sizes” and Figure 1 of the accompanying paper (Paper 6), “Residential Development Velocity Curves” respectively.
- Maintain the Residential Density, Cluster Size and Velocity Curve values over time for population projections.

4.15 Group Quarters

- All residents not living in households are classified as living in group quarters. Population in group quarters is a part of the socioeconomic projections required by MAG transportation models.
- Methods for projecting the different components of population in group quarters (military quarters, prisons and jails, college dormitories, nursing homes, and other group quarters) have been identified by MAG Consultants as part of the GIS and Database Enhancement Project produced in 2000.
- The group quarter population by SAZ shall be based upon the results of the 2005 Census Survey and the group quarter inventory prepared for the full count prior to the 2005 Census Survey.
- The group quarters projections are calculated as follows:
 - Military quarters = held constant at the current population of Luke Air Force base.
 - Prisons and jails = 1.128 percent of the Maricopa County population age 20 through 44.
 - College dormitories = 8.951 percent of the Maricopa County population age 18 to 19.
 - Nursing homes = 5.433 percent of the Maricopa County population age 75 or older.
 - Other group quarters = 0.417 percent of the entire Maricopa County population.

POPTAC Recommendation:

- Use the methodology for group quarter population as identified above.

4.16 Households by Age of Householder and Housing Units by Age of Unit

- The MAG transportation models require projections for the age of the head of householder by Socioeconomic Analysis Zone (SAZ).
- If such data is not available, the MAG transportation models require projections for the number of housing units in each SAZ by four categories of housing unit age (less than 10, 10 to 19, 20 to 29, and 30 or more years old).
- A survey of the large-population Metropolitan Planning Organizations revealed that forecasts of the age of head of householder are not common. Possible projection methods for age of head of householder will be reviewed in the next update of MAG socioeconomic models.
- Building age data from Maricopa County Assessors Residential Master database was analyzed to identify units for demolition.
- The current MAG methodology for calculating housing unit age - ages the existing housing stock, adds the change in residential construction projected by SAM-IM, and rebuilds demolished units.

POPTAC Recommendation:

- Use the method as described above for calculating housing units by age of unit in each SAZ by four age categories.

4.17 Households by Income

- The MAG transportation models require projections for the number of households in each SAZ by five income quintiles.
- The data for 2000 was collected as part of the Census long form and was aggregated to RAZs and SAZs as the base dataset for households by income group.
- The current MAG methodology projects households by income groups by RAZ using Metropilus, the latest version of DRAM/EMPAL. The projected change in income distribution is assigned to each SAZ within the RAZ using the base year income distribution, future development characteristics, and the age of existing development.

POPTAC Recommendation:

- Use the method as described above for calculating households in each SAZ by five income quintiles.

4.18 Seasonal Population

- Seasonal population is defined as residents of the area for two weeks to six months and is a part of the socioeconomic projections required by the MAG transportation models.
- An inventory of mobile home parks and RV parks was created to gather information on location and characteristics of the parks, expansion plans, as well as the number and types of residents during peak and low seasons.

- The inventory of mobile home and RV parks was last reviewed and updated by MAG member agencies in December 2006.
- Seasonal residents are divided into two categories for projections, namely those residing in RV and mobile home parks and those residing in permanent housing units.
- The RV and mobile home parks component of seasonal population projection by SAZ is based on existing inventory and known expansion plans.
- The permanent housing component of seasonal population is based on the ratio of 2000 “non-park mobile home” seasonal housing units by SAZ to the 2000 total housing units by SAZ.
- This ratio is assumed to be constant over time since no evidence is available on which to quantify any systematic change.
- Seasonal population is projected by multiplying the seasonal units with the 2000 estimate of seasonal persons per household. This estimate of seasonal persons per households is held constant over time.
- The seasonal population used for MAG Transportation models is the average of the high season and the low season projections.
- When there is not enough information at the SAZ zone level for projecting permanent housing component of seasonal population, the next level of geography (RAZ) is used.
- When there is not enough information at the RAZ zone level for projecting permanent housing component of seasonal population, the next level of geography (MPA) is used.

POPTAC Recommendation:

- Accept the seasonal population projection methodology as identified above.

4.19 Transient Population

- Transient population, defined as residents of the area for two weeks or less, is a part of the socioeconomic projections required by MAG transportation models.
- To estimate transient population, an inventory of hotels, motels, and resorts was created to gather information on their location, number of rooms, occupancy, expansion plans and information on new facilities.
- The inventory of hotels/motels was last reviewed and updated by MAG member agencies in December 2006.
- Transient population numbers for winter and summer seasons by SAZ were derived from the inventory and its corresponding data.
- Separate methodologies were developed to produce projections of the transient population traveling to the Phoenix area for business reasons and the transient population coming for non-business reasons.
- Current data on visitor statistics was obtained from the Arizona Office of Tourism and the Greater Phoenix Convention & Visitors Bureau Statistical Reports
- Transient population projections at the county-level are distributed to SAZ zone level using the existing Hotel/Motel room share by SAZ, augmented by known future plans.
- The transient population used for MAG Transportation models is the average of the high and low transient population projections.

POPTAC Recommendation:

- Accept the transient population projection methodology as described.

4.20 Age Restricted Communities

- MAG transportation models require SAZs to have identifiers for Age Restricted Areas.
- A survey of the existing age restricted communities was conducted and a GIS coverage of the communities was created.
- All developments are reviewed with member agencies to identify additional age restricted communities.
- SAZs with fifty percent or more of their residential land area under communities with deed restrictions on age of residents are flagged as Age Restricted SAZs.

POPTAC Recommendation:

- Accept the method as described for identifying Age Restricted SAZs.

4.21 Post Secondary Enrollment

- Post secondary enrollment projections are a component of socioeconomic projections required by the MAG transportation models.
- An inventory of post high school institutions was created to gather information on their location, current enrollment, expansion plans, and projected enrollment.
- Post high school institutions were classified into three categories for this analysis: community colleges, public universities (ASU), and private colleges.
- This dataset was updated in 2006 with a phone and internet survey of post secondary education providers to gather information on current enrollment and expansion plans.
- The updated inventory of Post High School institutions was reviewed by MAG member agencies in December 2006.
- Participation rates for the three institution types were calculated using data from 2000 Census and age cohort data on enrollment by campus.
- Using county age-by-year distribution of population from Arizona Department of Economic Security (AZDES) and average participation rates by institution type the total enrollment for each institution type was calculated.
- Allocate the projected enrollment to individual campus based on known future expansion plans, capacity, and institutional projections if available.

POPTAC Recommendation:

- Use the post secondary enrollment projection methodology as identified above.

5. THE MAG REVIEW PROCESS

Preparation for the socioeconomic modeling needed to produce MAG projections has been very extensive. MAG staff reviewed each step of the process. In addition, the MAG Population Technical Advisory Committee (POPTAC) and MAG POPTAC Ad Hoc Subcommittee reviewed all data and GIS coverages, recommended specific assumptions to be incorporated into the models, and reviewed the results of the data modeling efforts. Figure 5-1 depicts the socioeconomic data and modeling review process.

After a 16-month review of base data, GIS coverages and assumptions, the MAG POPTAC reviewed the implications of the data collection efforts, in particular the base year 2005 population and employment and the buildout population and employment. Following a review of the base and buildout population and employment, test model runs were performed for the early projection years, and MAG POPTAC reviewed and commented on these runs. The input received on these test runs were used to develop a more refined draft.

In early 2007 three draft runs were performed. Comments on each of the drafts were solicited from member agency staff and incorporated into revisions as necessary. During this period to ensure an opportunity for thorough review, MAG staff met with member agencies 27 times, conducted 2 workshops, and made 21 presentations to MAG committees. and other local agencies. Groups such as the MAG Planners Stakeholders were kept informed of the progress of the projections process and encouraged to participate in the review process.

In addition to conveying the draft projections to member agencies through traditional means (spreadsheets and hard copy reports) MAG, if requested, also provided the POPTAC with thematic maps depicting the projections series. GIS data was also provided to POPTAC members as needed.

5.1 MAG Staff

MAG staff is charged with preparing subregional population projections by Municipal Planning Area, Regional Analysis Zone and smaller areas known as Socioeconomic Analysis Zones (SAZs). Staff also provides support to the Chairs of the MAG Population Technical Advisory Committee, and Ad Hoc Subcommittee, disseminates information to POPTAC members and representatives of member agencies on socioeconomic information, manages consultant contracts and represents the interests of MAG on the State Population Technical Advisory Committee.

5.2 MAG POPTAC

The MAG Population Technical Advisory Committee was created to provide technical input in the development of socioeconomic information for the region, including, Census socioeconomic databases, GIS coverages, resident population estimates, and socioeconomic projections. The MAG POPTAC was also designated by the MAG

Regional Council as the lead committee for coordinating preparations for the Census in Maricopa County.

The Committee is comprised of representatives of MAG's 25 cities and towns, three Indian Communities and Maricopa County. However, because of limited staff resources, some member agencies have chosen not to send an official representative to the meetings.

The MAG POPTAC meetings are held generally held on a monthly basis. Members may participate in the meetings either by attending in person, or via audio or videoconference. An agenda, minutes and attachments for the MAG POPTAC are generally sent out in electronic format via e-mail a week prior to the meeting. The meeting agenda and minutes are also posted on the MAG Website at <http://www.mag.maricopa.gov> under MAG POPTAC.

5.3 MAG POPTAC Ad Hoc Subcommittee

The MAG POPTAC Ad Hoc Subcommittee was created to provide more in depth input on the development of socioeconomic information and to make technical recommendations to the members of the MAG POPTAC. Membership on the Subcommittee is open to all MAG member agencies, but generally the participants include the largest MAG member agencies with the greatest technical resources. This includes Phoenix, Mesa, Glendale, Scottsdale, Maricopa County, Tempe and Peoria. The MAG POPTAC Ad Hoc Subcommittee generally meets just prior to the scheduled meeting of the MAG POPTAC.

5.4 MAG Management Committee

The MAG Management Committee is comprised of the highest administrative officials of each of the member agencies as well as the Regional Public Transportation Authority and Arizona Department of Transportation. Recommendations made by the MAG POPTAC on estimates and projections are forwarded to members of the Management Committee for consideration. The Management Committee will review the proposed estimates and projections and make a recommendation to the Regional Council for their approval. The Management Committee generally meets monthly. Meeting agendas and minutes are posted on the MAG Website.

5.5 MAG Regional Council

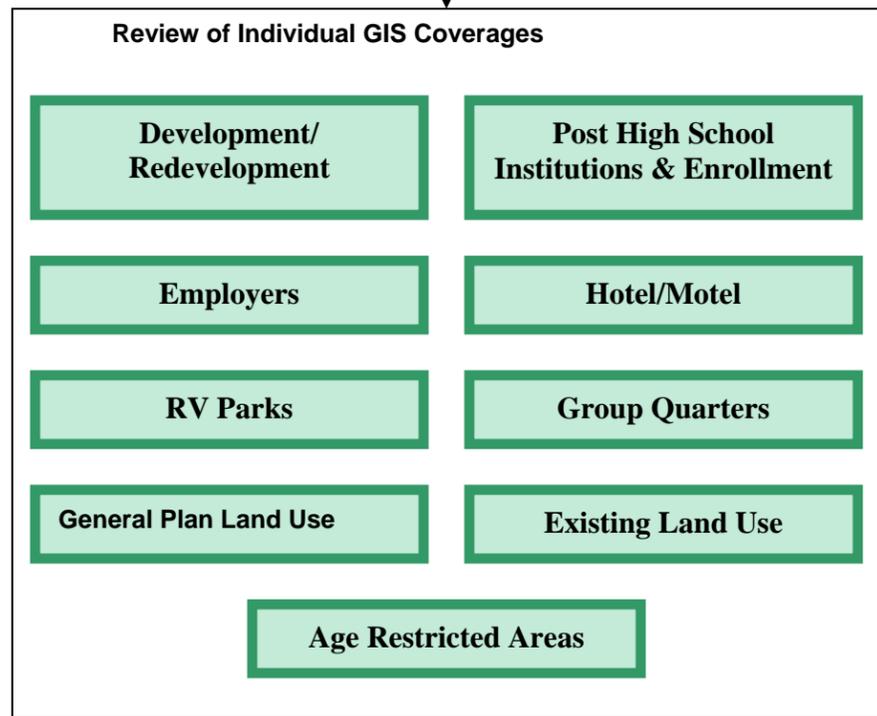
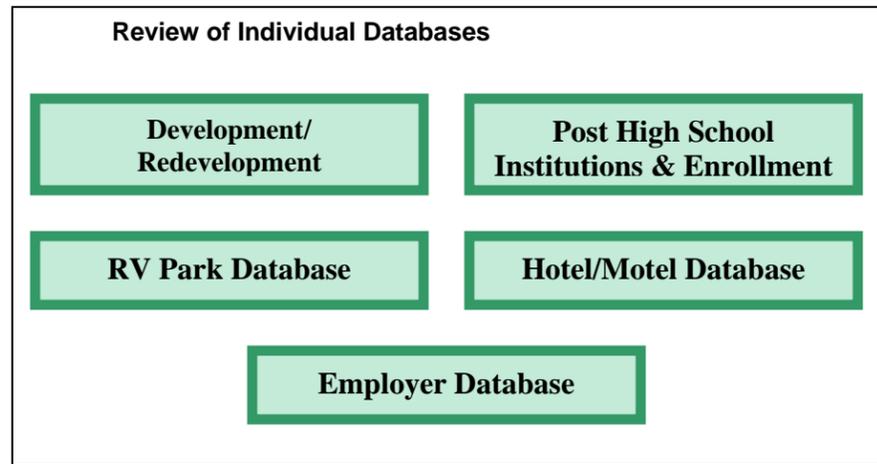
The MAG Regional Council is comprised of the elected official of each of MAG's member agencies as well as representatives from the Arizona Department of Transportation and the Citizens Transportation Oversight Committee. The elected official is usually a Mayor, but may be a Councilmember. The Regional Council establishes MAG policy and direction and must approve MAG socioeconomic estimates and projections before they can be considered officially approved by MAG. The Regional Council generally meets monthly. Meeting agendas and minutes are posted on the MAG Website.

5.6 State Population Technical Advisory Committee

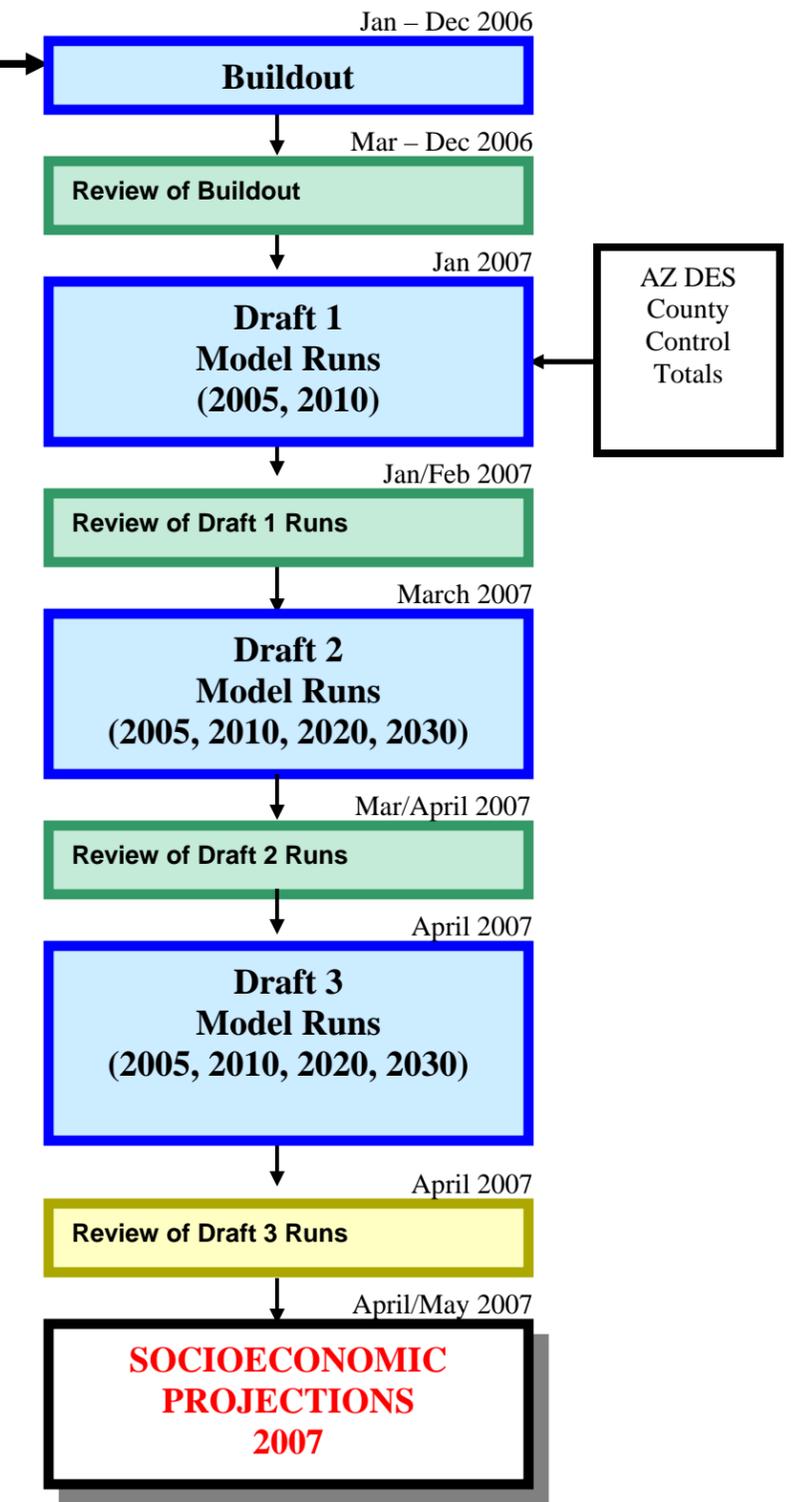
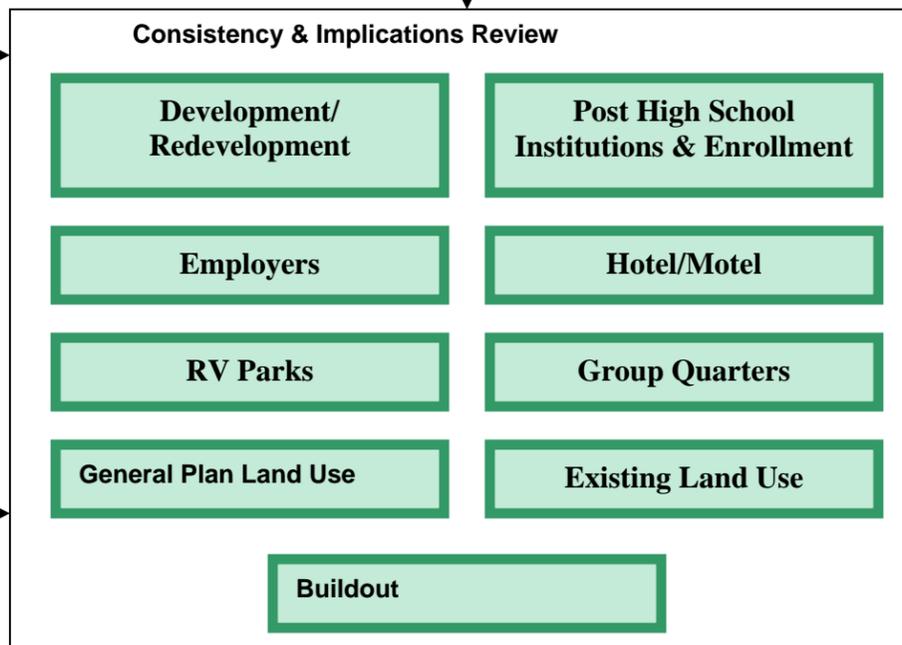
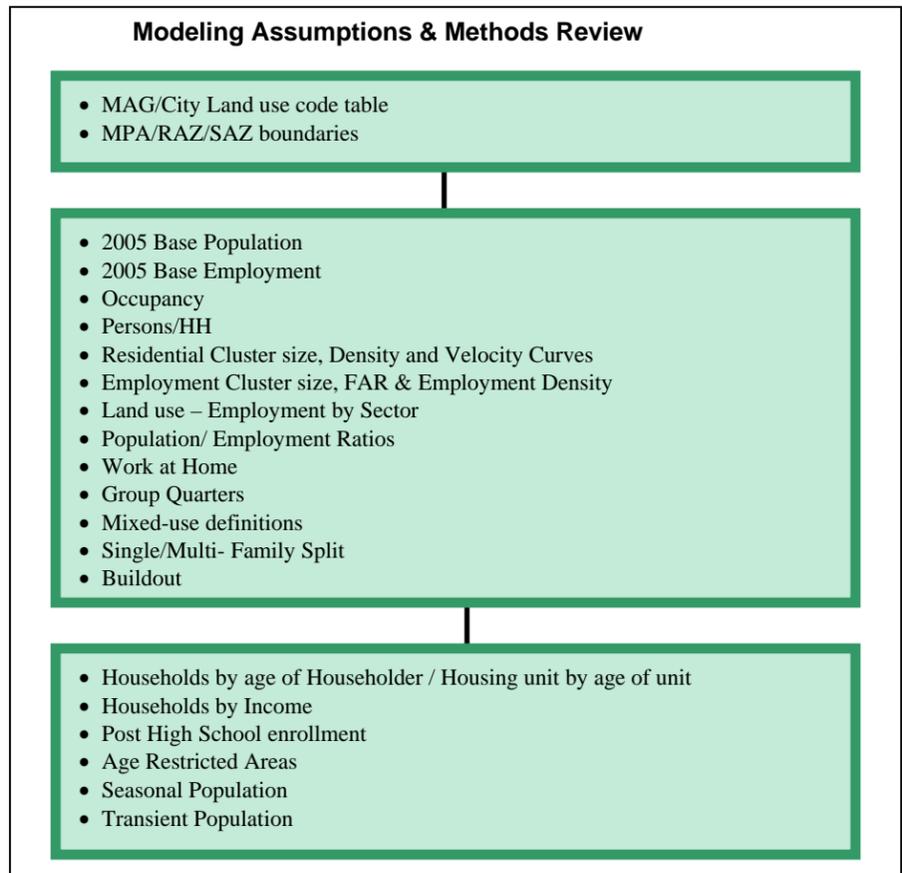
The State Population Technical Advisory Committee was originally established in 1977 by a Governor's Executive Order to review and approve the official population projections for Arizona. In 1988, the Executive Order was revised. The revisions resulted in changes in the Committee membership, expansion of the committee's responsibilities to include both population estimates and projections, and a review and advisory recommendation on both population estimates and projections to the DES Director.

In 1995, the Executive Order was revised to the current version, Executive Order 95-2. The current Executive Order also changed the frequency of the preparation of official projections from an annual schedule to twice per decade: once after the Decennial Census and once after the mid-decade census. Meetings are held approximately six to eight times per year.

Preparation for Socioeconomic Modeling (December 2005 – March 2007) **Socioeconomic Modeling (January 2006 – May 2007)**

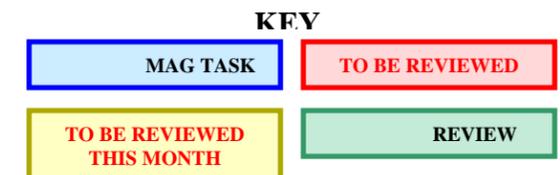


CENSUS 2000 & CENSUS SURVEY 2005



SOCIOECONOMIC DATA & MODELING REVIEW PROCESS

FOR PREPARATION OF 2007 SCOCIOECONOMIC PROJECTIONS BY THE MARICOPA ASSOCIATION OF GOVERNMENTS



6. NOTES AND CAVEATS FOR 2007 PROJECTIONS

The 2007 Projections have been prepared with the following notes and caveats:

1. The projections by Municipal Planning Area (MPA) and Regional Analysis Zone (RAZ) were prepared to be consistent with the September 1, 2005 Census Survey and have been prepared for July 1st of the years 2010, 2020, and 2030.
2. The population projections are for resident population only and do not include nonresident seasonal or transient population.
3. The projections are required to use the latest Census as the base. The 2005 Census Survey was released in June 2006. Subsequent to the release, DES prepared a new set of Maricopa County projections consistent with the 2005 Census Survey. These new projections were recommended for approval by the MAG Population Technical Advisory Committee (POPTAC) in October 2006 and the Management Committee in November 2006. The projections were approved by the Regional Council in December 2006.
4. The projections include the Maricopa County portion of Peoria, Queen Creek and the Gila River Indian Community only. Although Apache Junction is a MAG member agency, only 275 of its residents are within Maricopa County. Because almost all of its population lies within Pinal County, no projections have been included in this report.
5. The projections were based upon each MAG member agency's latest version of its future land use plan. Where jurisdictions have not yet adopted their land use plan, or have amendments to their plan, changes may result in and require changes to the projections.
6. The databases and assumptions upon which the projections are based have been reviewed by MAG member agencies, revised by MAG staff based on input received and approved by members of the MAG POPTAC.
7. The projections are based upon previous review and local insight by members of the MAG POPTAC.
8. The "other" employment category includes work-at-home and construction employment. Because construction employment follows development, employment projections may show declines in future years.
9. The projections should be used with caution. They are subject to change as a result of fluctuation in economic and development conditions, local development policies and updated data.

PAPER 1

BUILDOUT PROCEDURE FOR POPULATION AND HOUSING VARIABLES

PURPOSE

To prepare minimum, target and maximum buildout numbers by Socioeconomic Analysis Zone for population and housing variables to be used to evaluate the population and housing potential for the next set of socioeconomic projections.

BASE DATA

- Population: Census Survey 2005
- Residential Completions: April 1, 2000 to June 30, 2005, submitted and reviewed by MAG member agencies
- Existing Land use: Land use current as of January 2005, reviewed by MAG POPTAC
- Future Plans: Future Plans current as of 2006 or later, reviewed by MAG POPTAC
- Development Data: Year 2006 data current as 2006 or later, reviewed by MAG POPTAC
- SAZ system: SAZ2007

MODEL

SAM-IM version 3.1 was used for this buildout analysis. The analysis was conducted with a grid cell size of 220 feet on each side.

ASSUMPTIONS

Minimum, Target and Maximum Densities: In developing SAZ buildout projections, the MAG socioeconomic models project residential dwelling units from parcels identified as residential in the General Plans or areas anticipated to be residential in the Development database. Households and Population by SAZ are subsequently calculated from the dwelling unit projections.

Three General Plan Residential Density figures (dwelling units/acre) are collected from the member agencies, the minimum, maximum and target residential density anticipated for each residential land use type in the General Plan. Thus, three buildout scenarios may be generated for the Minimum, Target, and Maximum densities. These densities may be changed, polygon-by-polygon by the member agencies if desired.

Those areas covered by the Development database that have the number of dwelling units being built/planned and thus do not need to use the densities identified in the General Plan.

Net Density: The density figures mentioned above for the residential areas in the General Plans have been assumed to be indicating the Gross residential density. As part of the MAG GIS and Database Enhancement Project, Arizona State University collected information on the gross acres and net acres of different land use types. This buildout analysis uses the net residential density for General Plan residential areas. Net density adjustment is not required in areas

covered by the development areas since the total number of units is known. Table 1 indicates the gross and net acres by land use type used in the buildout analysis.

**TABLE 1
NET RESIDENTIAL DENSITY**

| LUCODE | Land Use | Description | Gross Acres | Net Acres |
|---------------|------------------------------------|---|--------------------|------------------|
| 110 | Rural Residential | <= 1/5 du per acre | 50 | 50 |
| 120 | Estate Residential | 1/5 du per acre to 1 du per acre | 46 | 46 |
| 130 | Large Lot Residential (SF) | 1 du per acre to 2 du per acre | 45 | 45 |
| 140 | Medium Lot Residential (SF) | 2-4 du per acre | 25 | 19 |
| 150 | Small Lot Residential (SF) | 4-6 du per acre | 20 | 15 |
| 160 | Very Small Lot Residential (SF) | >6 du per acre (includes mobile home parks) | 20 | 15 |
| 170 | Medium Density Residential (MF) | 5-10 du per acre | 26 | 20 |
| 180 | High Density Residential (MF) | 10-15 du per acre | 17 | 14 |
| 190 | Very High Density Residential (MF) | > 15 du per acre | 18 | 13 |

Source: Arizona State University, 2001
MAG GIS and Database Enhancement Project

Persons per Household: Persons per household was derived from the 2005 Census Survey by dividing the population in households by the number of occupied housing units. Total housing units, total occupied housing units and population in households was identified by Census block. These variables were then allocated to Socioeconomic Analysis Zones using the data from Census 2000, which was then adjusted to match the Census Survey 2005 results.

MAG derives persons per household at the lowest level of geography possible. For deriving a projection data set for the transportation models, MAG cumulates information to the Socioeconomic Analysis Zone (SAZ). For this purpose, persons per household are refined as follows:

- For SAZs where the existing development in 2005 is less than fifty percent of buildout, persons per household from the Regional Analysis Zone (RAZ) level will be utilized. This is essential since figures resulting from a sparsely developed SAZ may not adequately reflect future trends in the SAZ.
- Similarly, for RAZs where the existing development in 2005 is less than fifty percent of buildout, persons per household from the Municipal Planning Area (MPA) will be used.
- A maximum persons per household at buildout will be set at 5.0 persons per household.

It is important to note that the Census Bureau defines population as those people who are residents of the jurisdiction. If the individual reports himself/herself as usually housed elsewhere, the Census Bureau will not count the population at that unit and will designate the

unit as a vacant unit even though people reside in the unit. These individuals would be included in the MAG nonresident population projections.

Occupancy Rate: Buildout has been defined as the potential of the area. For buildout analysis use occupancy rate by SAZ developed for use in the projections series. This buildout is more indicative of the maximum for socioeconomic modeling.

Mixed Use : This buildout analysis is consistent with member agency General Plans and Planned Area Developments. Many of these plans, however, have areas defined as multiple use areas that can generate various types and densities of housing or employment. In order to use these designations in socioeconomic modeling, the multiple use categories must ultimately be converted to one or more of the standard land use categories. The MAG socioeconomic models have been enhanced to accommodate such multiple use categories. The MAG GIS and Database Enhancement Project has identified default categories for member agencies to use that are consistent with past local multiple use development.

Some of the factors found to have the strongest influence on the type of development were regional planning issues/factors that are not adequately delineated by MPA boundaries. For these areas, a set of recommended land use proportions were developed based on the proximity of a property to urban core areas (downtowns), railroads, freeways and airports. The criteria used for these assignments were: location within a developed downtown area (currently Phoenix, Mesa, Tempe, Scottsdale, Glendale, and Chandler); location within approximately one mile of a freeway; location within approximately one mile of a rail line; location within approximately two miles of a commercial airport. Table 2 indicates the mixed-use proportions used for the four areas in order of dominance.

A priority system is used for areas that fell within more than one of the location types. The location types were therefore evaluated in the following order:

- 1 - Downtown
- 2 - Proximity to Railroad Corridors
- 3 - Proximity to Airports
- 4 - Proximity to Freeways

For those areas that did not fall within one of the defined special areas, the recommended land use proportions by MPA and General Plan land use category were used. These recommendations were derived from base data from field surveys, discussions with city planners, and further modifications to improve reasonableness for areas with a lack of data. These recommendations were then reviewed and modified by MAG POPTAC. Table 3 indicates the results of this analysis.

TABLE 2
LAND USE PROPORTIONS BY AREA CATEGORY

| Area Category | Structure Code | Land Use | Acres | Percent of Area |
|---------------|-------------------|------------------|-------|--------------------|
| Downtown Area | AP | Multifamily | 3 | 18% |
| | OF | Office | 7 | 43% |
| | RH | Resort/Hotel | 1 | 6% |
| | RT | Retail | 5 | 33% |
| | | | 16 | 100% |
| Freeway Area | AP | Multifamily | 114 | 7% |
| | IN | Industrial | 873 | 54% |
| | OF | Office | 257 | 16% |
| | PB | Public buildings | 6 | 0% |
| | RH | Resort/Hotel | 44 | 3% |
| | RT | Retail | 309 | 19% |
| | | | 1,602 | 100% |
| Airport Area | AP | Multifamily | 9 | 1% |
| | IN | Industrial | 466 | 46% |
| | OF | Office | 452 | 45% |
| | RH | Resort/Hotel | 15 | 1% |
| | RT | Retail | 72 | 7% |
| | | | 1,014 | 100% |
| Railroad Area | IN | Industrial | 1,332 | 97% |
| | OF | Office | 17 | 1% |
| | PB | Public buildings | 20 | 1% |
| | RH | Resort/Hotel | 1 | 0% |
| | RT | Retail | 9 | 1% |
| | | | 1,379 | 100% |

Source: Applied Economics, 2001.

**TABLE 3
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|------------------------------|-------------------------|-------------------------------------|-----------------|-------------------|
| <u>Avondale</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Buckeye</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Carefree</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 30 |
| | | | Industrial | 60 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Cave Creek</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 30 |
| | | | Industrial | 60 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Chandler</u> | Business Park | Commercial/Office/ Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Employment | Multifamily | 10 |
| | | | Retail | 5 |
| | | | Office | 20 |
| | | | Industrial | 65 |
| <u>El Mirage</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Fountain Hills</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Gila Bend</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |

**TABLE 3
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|-------------------------------|-------------------------|------------------------------|--|----------------------|
| <u>Gila River</u> | Business Park | Business Park | Retail Office Industrial | 10 10 80 |
| | Mixed Use | Mixed Use | Multifamily Retail Office | 30 35 35 |
| <u>Gilbert</u> | Business Park | Business Park | Retail Office Industrial | 10 20 70 |
| | Business Park | Regional Commercial | Hotel Retail Office | 5 80 15 |
| | Mixed Use | Village Center | Multifamily Hotel Retail Office | 15 10 35 40 |
| <u>Glendale</u> | Business Park | Business Park | Retail Office Industrial | 5 15 80 |
| | Mixed Use | Mixed Use | Multifamily Retail Office | 20 35 45 |
| <u>Goodyear</u> | Business Park | Business Park | Retail Office Industrial | 10 20 70 |
| | Mixed Use | Mixed Use | Multifamily Retail Office | 20 35 45 |
| <u>Guadalupe</u> | Business Park | Commercial Mixed Use | Office Industrial Public | 15 80 5 |
| | Mixed Use | Mixed Use | Multifamily Retail Office | 35 40 25 |
| <u>Litchfield Park</u> | Business Park | Business Park | Retail Office Industrial | 10 20 70 |
| | Mixed Use | Mixed Use | Multifamily Retail Office | 20 35 45 |
| <u>Maricopa County</u> | Business Park | Business Park | Retail Office Industrial | 10 20 70 |
| | Mixed Use | Mixed Use | Multifamily Retail Office | 25 35 40 |

**TABLE 3
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|-------------------------------|-------------------------|------------------------------|-----------------|-------------------|
| <u>Mesa</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use/Employment | Multifamily | 20 |
| | | | Retail | 25 |
| | | | Office | 30 |
| | | | Industrial | 25 |
| <u>Paradise Valley</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 70 |
| | | | Industrial | 20 |
| | Mixed Use | Mixed Use | Multifamily | 10 |
| | | | Retail | 40 |
| | | | Office | 50 |
| <u>Peoria</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 15 |
| | | | Industrial | 75 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Phoenix</u> | Business Park | Commerce Park | Retail | 25 |
| | | | Office | 25 |
| | | | Industrial | 50 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Queen Creek</u> | Business Park | Employment - Type B | Office | 20 |
| | | | Industrial | 80 |
| | Mixed Use | Town Center | Multifamily | 15 |
| | | | Retail | 35 |
| | | | Office | 40 |
| | | | Public | 10 |
| <u>Scottsdale</u> | Business Park | General Employment (34) | Office | 25 |
| | | | Industrial | 75 |
| | Business Park | Minor Employment (33) | Office | 20 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |

**TABLE 3
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|--------------------------|-------------------------|------------------------------|-----------------|-------------------|
| <u>Surprise</u> | Business Park | Employment | Office | 50 |
| | | | Manufacturing | 38 |
| | | | Hotel | 12 |
| | Mixed Use | Mixed Use Gateway | Single Family | 5 |
| | | | Townhouse | 5 |
| | | | Multifamily | 20 |
| | | | Retail | 30 |
| | | | Office | 25 |
| | | | Industrial | 5 |
| | | | Public | 10 |
| | Mixed Use | Surprise Center | Single Family | 5 |
| | | | Townhouse | 5 |
| | | | Multifamily | 10 |
| | | | Retail | 30 |
| | | | Office | 40 |
| <u>Tempe</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 35 |
| | | | Retail | 35 |
| | | | Office | 30 |
| <u>Tolleson</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 35 |
| | | | Retail | 35 |
| | | | Office | 30 |
| <u>Wickenburg</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Mixed Use | 30 |
| | | | Retail | 45 |
| | | | Office | 25 |
| <u>Youngtown</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 35 |
| | | | Retail | 40 |
| | | | Office | 25 |

Source: Applied Economics, 2001.

Maricopa Association of Governments GIS and Database Enhancement Project

METHOD

1. Use the SAZ allocation of housing units and population for July 1, 2005 as the base (existing) data.
2. If the land is not identified as a Planned Area Development, determine additional housing units and population from the General Plan. Calculate developable residential acres by land use category (*land use codes 100 – 199, 820 and 830*) by SAZ. For this scenario, acreage is considered developable residential if it meets all of the following criteria:
 - a) The 2005 land use was either agriculture or vacant.
 - b) The land use was not in a flood plain as defined by the MAG Desert Spaces Plan.
 - c) The General Plan land use was residential or mixed use - land use codes 100-199, 820 and 830. In the case of mixed use, apply the percentages identified previously.

Calculate additional housing units by land use category as developable residential acres * net density (minimum/target/maximum) for the residential category. Sum categorized residential housing units to obtain total additional housing units by SAZ.

3. If the area is identified as a Planned Area Development, then allocate the new residential units from the development database to the parcel. Apply the mixed-use proportions in cases where the development is mixed use. Sum categorized residential housing units to obtain total additional housing units by SAZ.
4. Using SAZ persons per occupied housing unit from the 2005 Census, calculate additional population by SAZ as total additional housing units * SAZ occupancy rate * SAZ persons per occupied unit.
5. Add additional housing units and population to the 2005 base housing units and population to obtain total buildout figures.
6. Although control totals for group quarter population will be generated for projection years, it is not possible to generate group quarter population control totals for buildout. Buildout population in group quarters by SAZ was determined by keeping the 2005 proportion of Group Quarter population to the resident population in households constant by SAZ except for:
 - a) Military: The population was held constant at base levels based upon recommendations from Arizona State University as part of the MAG GIS and Database Enhancement Project.
 - b) Prisons: The total group quarter population in prisons was determined by keeping the proportion of the prison population in 2000 to the total population in households constant by SAZ. This is constrained by the capacity of the land use acres of existing facilities.

PAPER 2

BUILDOUT PROCEDURE FOR EMPLOYMENT VARIABLES

PURPOSE

To prepare minimum, target and maximum buildout numbers by Socioeconomic Analysis Zone for employment variables to be used to evaluate the employment potential for the next set of socioeconomic projections.

BASE DATA

- Employment: Employment July 1, 2005 Base
- Existing Land use: Land use current as of Jan. 2005, reviewed by MAG POPTAC
- Future Plans: Future Plans current as of 2006 or later, reviewed by MAG POPTAC
- Development Data: Year 2006 data current as 2006 or later, reviewed by MAG POPTAC
- SAZ system: SAZ2007

MODEL

SAM-IM version 3.1 was used for this buildout analysis. The analysis was conducted with a Grid Cell size of 220 feet on each side.

ASSUMPTIONS

Employment Densities: In developing SAZ buildout projections, the MAG socioeconomic models project employment from parcels identified as employment-based in the General Plans or areas anticipated to be non-residential in the Development database.

As part of the GIS and Database Enhancement Project, Floor Area Ratios (FAR) and Employment Density (employees per 1000 square feet) factors were developed by Arizona State University (Table 1). Thus:

Total square feet of employment space = FAR * Area of polygon in square feet

Number of employees = Total square feet of employment space * Employees per 1000 square feet

Generally, areas covered by the Development database have the square feet of employment areas being built or planned. Thus to derive the employment only the Employees per 1000 square feet value need to be used. In cases where the planned square footage was not available, the FAR factors for the particular land use is used.

TABLE 1
FLOOR AREA RATIOS AND EMPLOYEES PER 1000 SQUARE FEET
2000

| DESCRIPTION | FAR | EMPLOYEES/1000 SQFT |
|---------------------------|------|---------------------|
| RETAIL | | |
| Neighborhood | 0.23 | 1.18 |
| Community | 0.23 | .72 |
| Regional | 0.27 | 1.24 |
| Strip | 0.25 | 1.30 |
| OFFICE | | |
| Small | 0.78 | 3.13 |
| Large | 3.36 | 3.08 |
| INDUSTRIAL | | |
| Warehouse | 0.37 | 2.54 |
| Manufacturing | 0.34 | 2.82 |
| PUBLIC | | |
| Schools | 0.21 | 1.21 |
| Government | 0.33 | 3.98 |
| HOTEL/MOTEL/RESORT | | |
| Hotel/motel | 0.70 | 0.68 |
| Resorts | 0.62 | 0.45 |

Net Acres: The figures mentioned above for the employment areas indicate the gross density. In order to determine employment, a net density figure must be derived. This is due to the fact that the MAG existing land use database includes non-developable land, such as roadways and right-of-ways. Therefore, an analysis was conducted to account for the percentage of the land use that is likely not to be developed in the future. The target future densities assumed this percentage continues in the future. The minimum densities assume the percentage is 25% higher in future development, and the maximum densities assume the percentage is only that area necessary for transportation needs. These results are shown in Table 2, which identifies net acres as a percentage of total acres for each of the major land use categories.

TABLE 2
NET ACRES AS PERCENT OF TOTAL ACRES
FOR MINIMUM, TARGET AND MAXIMUM EMPLOYMENT BUILDOUT

| Code | Definition | Minimum | Target | Maximum |
|------|------------------|---------|--------|---------|
| 200s | Commercial | 50% | 60% | 90% |
| 300s | Industrial | 50% | 60% | 90% |
| 400s | Office | 50% | 60% | 90% |
| 500s | General & Public | 60% | 70% | 95% |

Spatial Multiplier Factor: To understand the variation of employment density spatially, an analysis was conducted on the existing employment and land uses in the entire metro area, as well as the following:

- a. Downtowns – Phoenix, Tempe, Scottsdale, Mesa, Glendale, Chandler
- b. Freeway corridors – 1 mile buffer around the freeways
- c. Airports – 2 mile buffer around the airports
- d. Rail roads – 1 mile buffer around the railroads
- e. None of the above (all other areas)

Table 3 summarizes the findings of the analysis. It was found that more than 70% of the total employment is located within these identified areas. Also the density variation indicates that the employment density on Retail, Office and Public land uses in downtown areas is generally double than other areas.

TABLE 3
SPATIAL MULTIPLIER FACTORS
FOR EMPLOYMENT SECTORS

| Sector | Metro | Downtown | Freeway | Airport | Railroad | Other |
|------------|-------|----------|---------|---------|----------|-------|
| Retail | 1.0 | 2.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Office | 1.0 | 2.0 | 1.0 | 0.5 | 0.75 | 1.0 |
| Industrial | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 0.5 |
| Public | 1.0 | 2.0 | 1.0 | 0.5 | 0.75 | 1.0 |
| Other | 1.0 | 2.0 | 2.0 | 1.5 | 1.5 | 0.5 |

Mixed Use: This buildout analysis is consistent with member agency General Plans and Planned Area Developments. Many of these plans, however, have areas defined as multiple use areas that can generate various types and densities of housing or employment. In order to use these designations in socioeconomic modeling, the multiple use categories must ultimately be converted to one or more of the standard land use categories. The MAG socioeconomic models have been enhanced to accommodate such multiple use categories. The MAG GIS and Database Enhancement Project has identified default categories for member agencies to use that are consistent with past local multiple use development.

Some of the factors found to have the strongest influence on the type of development were regional planning issues/factors that are not adequately delineated by MPA boundaries. For these areas, a set of recommended land use proportions were developed based on the proximity of a property to urban core areas (downtowns), railroads, freeways and airports. The criteria used for these assignments were: location within a developed downtown area (currently Phoenix, Mesa, Tempe, and Scottsdale); location within approximately one mile of a freeway; location within approximately one mile of a rail line; location within approximately two miles of a commercial airport. Table 4 indicates the mixed-use proportions used for the four areas in order of dominance.

A priority system is used for areas that fell within more than one of the location types. The location types were therefore evaluated in the following order:

- 1 - Downtown
- 2 - Proximity to Railroad Corridors
- 3 - Proximity to Airports
- 4 - Proximity to Freeways

For those areas that did not fall within one of the defined special areas, the recommended land use proportions by MPA and General Plan land use category were used. These recommendations were derived from base data from field surveys, discussions with city planners, and further modifications to improve reasonableness for areas with a lack of data. Table 5 indicates the results of this analysis.

TABLE 4
LAND USE PROPORTIONS BY AREA CATEGORY

| Area Category | Structure Code | Land Use | Acres | Percent of Area |
|---------------|-------------------|------------------|-------|--------------------|
| Downtown Area | AP | Multifamily | 3 | 18% |
| | OF | Office | 7 | 43% |
| | RH | Resort/Hotel | 1 | 6% |
| | RT | Retail | 5 | 33% |
| | | | 16 | 100% |
| Freeway Area | AP | Multifamily | 114 | 7% |
| | IN | Industrial | 873 | 54% |
| | OF | Office | 257 | 16% |
| | PB | Public buildings | 6 | 0% |
| | RH | Resort/Hotel | 44 | 3% |
| | RT | Retail | 309 | 19% |
| | | | 1,602 | 100% |
| Airport Area | AP | Multifamily | 9 | 1% |
| | IN | Industrial | 466 | 46% |
| | OF | Office | 452 | 45% |
| | RH | Resort/Hotel | 15 | 1% |
| | RT | Retail | 72 | 7% |
| | | | 1,014 | 100% |
| Railroad Area | IN | Industrial | 1,332 | 97% |
| | OF | Office | 17 | 1% |
| | PB | Public buildings | 20 | 1% |
| | RH | Resort/Hotel | 1 | 0% |
| | RT | Retail | 9 | 1% |
| | | | 1,379 | 100% |

Source: Applied Economics, 2001.

**TABLE 5
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|------------------------------|-------------------------|-------------------------------------|-----------------|-------------------|
| <u>Avondale</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Buckeye</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Carefree</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 30 |
| | | | Industrial | 60 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Cave Creek</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 30 |
| | | | Industrial | 60 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Chandler</u> | Business Park | Commercial/Office/ Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Employment | Multifamily | 10 |
| | | | Retail | 5 |
| | | | Office | 20 |
| | | | Industrial | 65 |
| <u>El Mirage</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Fountain Hills</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |

**TABLE 5
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|-------------------------------|-------------------------|------------------------------|-----------------|-------------------|
| <u>Gila River</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |
| <u>Gilbert</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Business Park | Regional Commercial | Hotel | 5 |
| | | | Retail | 80 |
| | | | Office | 15 |
| | Mixed Use | Village Center | Multifamily | 15 |
| | | | Hotel | 10 |
| | | | Retail | 35 |
| | | | Office | 40 |
| <u>Glendale</u> | Business Park | Business Park | Retail | 5 |
| | | | Office | 15 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Goodyear</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Guadalupe</u> | Business Park | Commercial Mixed Use | Office | 15 |
| | | | Industrial | 80 |
| | | | Public | 5 |
| | Mixed Use | Mixed Use | Multifamily | 35 |
| | | | Retail | 40 |
| | | | Office | 25 |
| <u>Litchfield Park</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Maricopa County</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |

**TABLE 5
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|-------------------------------|-------------------------|------------------------------|-----------------|-------------------|
| <u>Mesa</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use/Employment | Multifamily | 20 |
| | | | Retail | 25 |
| | | | Office | 30 |
| | | | Industrial | 25 |
| <u>Paradise Valley</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 70 |
| | | | Industrial | 20 |
| | Mixed Use | Mixed Use | Multifamily | 10 |
| | | | Retail | 40 |
| | | | Office | 50 |
| <u>Peoria</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 15 |
| | | | Industrial | 75 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Phoenix</u> | Business Park | Commerce Park | Retail | 25 |
| | | | Office | 25 |
| | | | Industrial | 50 |
| | Mixed Use | Mixed Use | Multifamily | 20 |
| | | | Retail | 35 |
| | | | Office | 45 |
| <u>Queen Creek</u> | Business Park | Employment - Type B | Office | 20 |
| | | | Industrial | 80 |
| | Mixed Use | Town Center | Multifamily | 15 |
| | | | Retail | 35 |
| | | | Office | 40 |
| | | | Public | 10 |
| <u>Scottsdale</u> | Business Park | General Employment | Office | 25 |
| | | | Industrial | 75 |
| | Business Park | Minor Employment | Office | 20 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 30 |
| | | | Retail | 35 |
| | | | Office | 35 |

**TABLE 5
LAND USE PROPORTIONS BY MPA**

| MPA | Generic Category | General Plan Category | Land Use | Percentage |
|--------------------------|-------------------------|------------------------------|-----------------|-------------------|
| <u>Surprise</u> | Business Park | Employment | Office | 50 |
| | | | Manufacturing | 38 |
| | | | Hotel | 12 |
| | Mixed Use | Mixed Use Gateway | Single Family | 5 |
| | | | Townhouse | 5 |
| | | | Multifamily | 20 |
| | | | Retail | 30 |
| | | | Office | 25 |
| | | | Industrial | 5 |
| | | | Public | 10 |
| | Mixed Use | Surprise Center | Single Family | 5 |
| | | | Townhouse | 5 |
| | | | Multifamily | 10 |
| | | | Retail | 30 |
| | | | Office | 40 |
| | | | Public | 10 |
| <u>Tempe</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 35 |
| | | | Retail | 35 |
| | | | Office | 30 |
| <u>Tolleson</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Multifamily | 35 |
| | | | Retail | 35 |
| | | | Office | 30 |
| <u>Wickenburg</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 10 |
| | | | Industrial | 80 |
| | Mixed Use | Mixed Use | Mixed Use | 30 |
| | | | Retail | 45 |
| | | | Office | 25 |
| <u>Youngtown</u> | Business Park | Business Park | Retail | 10 |
| | | | Office | 20 |
| | | | Industrial | 70 |
| | Mixed Use | Mixed Use | Multifamily | 35 |
| | | | Retail | 40 |
| | | | Office | 25 |

Source: Applied Economics, 2001.

Maricopa Association of Governments GIS and Database Enhancement Project

METHOD

1. Use the SAZ allocation of July 1, 2005 employment by land use sector as the base (existing) data.
2. Determine additional employment from the General Plan and Development database. Calculate developable employment-based acres by land use category (*land use codes 200 - 830*) by SAZ. For these scenarios, acreage is considered developable for employment if it meets all of the following criteria:
 - c) The 2005 land use was either agriculture or vacant.
 - d) The land use was not in a flood plain as defined by the MAG Desert Spaces Plan.
 - e) The General Plan land use was employment use or mixed use - land use codes 200 – 830. In the case of mixed use, apply the percentages identified previously.

Calculate additional employment by land use category as developable employment use acres * net density factors (identified above) * Floor Area Ratio * Employment per 1000 square feet for the appropriate employment land use. Sum employment by sector by SAZ.

3. Add additional employment by sector to the 2005 base employment by sector to obtain total buildout figures.

PAPER 3

SINGLE FAMILY / MULTI-FAMILY SPLIT

The MAG projections are consistent with member agency General Plans and Planned Area Developments. The data is then used in MAG transportation models to project future transportation behavior. The latest version of the model requires long-term projections of the distribution of future housing units into single family and multifamily types. MAG socioeconomic models can determine the distribution of housing provided a county-wide control total is known. This paper recommends a split between single family and multi-family units over time.

Before beginning to explore how residential units may be split between single family and multifamily types in the future, it is useful to understand how this distribution has changed in the relatively recent past. In order to analyze past trends, housing inventory information from several previous Censuses were compiled, along with estimates for 2000.

The results of the data collection for the historic inventory breakdown by unit type are shown in Table 1, below. Over the past thirty years the total housing inventory in Maricopa County has increased by 281 percent, from about 317,000 housing units in 1970 to more than 1.2 million units in 2000. Despite this incredible increase in housing inventory, the overall change in the breakdown of housing units by type has changed relatively little. In 1970 nearly 80 percent of the inventory was comprised of single family units, compared with about 73 percent in 2000. While these figures reflect a modest decrease in the single family share of housing inventory, the decline has been relatively small compared with the amount of urbanization that has taken place.

TABLE 1
RESIDENTIAL INVENTORY BY UNIT TYPE
MARICOPA COUNTY: 1970 – 2000

| Year | Units | | Single Family Share | |
|------|---------------|--------------|---------------------|-------------------|
| | Single Family | Multi-family | Percent of Total | Percent of Change |
| 2000 | 883,380 | 325,122 | 73.10% | 78.48% |
| 1995 | 733,366 | 283,976 | 72.09% | 97.37% |
| 1990 | 669,781 | 282,260 | 70.35% | 60.60% |
| 1985 | 549,917 | 204,344 | 72.91% | 64.27% |
| 1980 | 450,591 | 149,135 | 75.13% | 69.74% |
| 1970 | 253,428 | 63,580 | 79.94% | |

Sources:

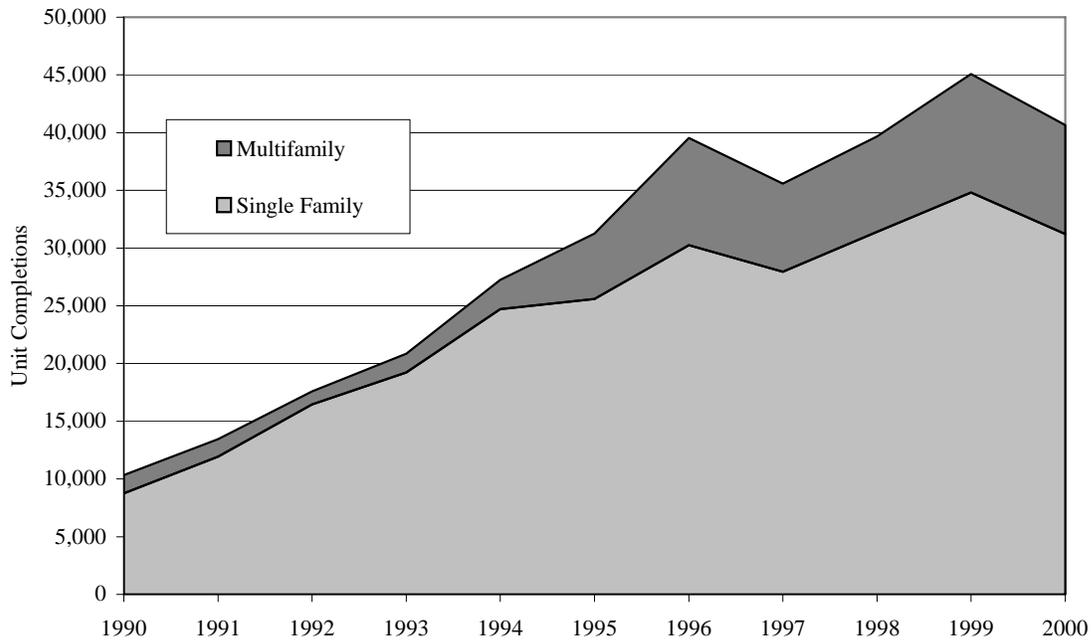
1970, 1980, 1990, 1995: U.S. Bureau of the Census.

1985: Estimate based on occupied units by type.

2000: Estimate based on 1995 Census plus building completions.

The current year estimate of housing units by type was based on 1995 Census inventory data, supplemented with MAG Building Permit Completion data for 1995 through 1999. The Building Permit Completion data supplied by MAG provided individual records of new single family and multifamily units, from 1990 through 2000. The total number of units by type by year is shown in Figure 1 below.

**FIGURE 1
UNIT TYPE BREAKDOWN OF RECENT HOUSING ADDITIONS**



Source: Maricopa Association of Governments, Building Permit Completions Database.

The housing unit completion information is added to the 1995 Census baseline housing unit information to estimate year 2000 housing inventory. This resulted in 733,366 single family units in 1995, representing 72.1% of the housing stock, 150,014 new units from 1995 to 1999, representing 78.5%, for a total of 883,380 units, or 73.1% of the total housing stock.

Based on the consistency of the 1995 Census unit-type split data with estimates developed based on existing land use data, and the reasonable and consistent share of single family units in the General Plan land use data, it is reasonable to construct a time-series for the breakdown of units by type by interpolating between the current (2000) and future (General Plan) levels. Table 2 shows the county-level results of performing this interpolation. Under that scenario, the single family share of housing inventory would fall from 73.1 percent currently, to 70.6 percent at 2050, a change of only 2.5 percent.

TABLE 2
SINGLE FAMILY SHARE OF INVENTORY BY
MARICOPA COUNTY: 1995 - 2050

| Year | Single Family Share of Inventory |
|-----------|----------------------------------|
| 1995 | 72.1% |
| 2000 | 73.1% |
| 2005 | 72.8% |
| 2010 | 72.6% |
| 2015 | 72.3% |
| 2020 | 72.1% |
| 2025 | 71.8% |
| 2030 | 71.6% |
| 2035 | 71.3% |
| 2040 | 71.1% |
| 2045 | 70.8% |
| 2050 | 70.6% |
| Build-out | 70.6% |

Sources:

1995: U.S. Bureau of the Census.

2000: Estimate based on 1995 Census plus building completions.

2005 - 2050: Projection based on General Plan Land Use interpolation.

PAPER 4

CLUSTER SIZE, FLOOR AREA RATIOS, AND EMPLOYMENT DENSITY

The MAG transportation models require projections of the number of employees in 5 different land use categories. The MAG socioeconomic models are land-use based and identify development by acres. It is therefore necessary to identify the number of acres in a typical development parcel (cluster size); the size of typical building on the parcel of land (floor area ratio) and the number of employees generated from the typical building (employees per 1000 square feet of building, or employment density). Table 1 presents the results of the most recent survey on cluster size, floor area ratio, employment density and compares the results to the previous survey in 1989.

Cluster Size: Cluster sizes are estimated in Table 1. Most cluster sizes have expanded due to larger buildings being built, especially in the retail sector. In the office sector, the cluster size grew more due to the concept of the phasing of new buildings. Phasing would allow the developer to buy a large parcel and build one building with a plan to add others as the market allows. The cluster size for the hotel/motel sector has declined because most of the present development has focused on the smaller motel with no amenities such as restaurants and conference centers. Thus, the buildings are smaller and the land need is less.

Floor Area Ratio (FAR): This concept represents the relationship between the structure and the land. Acquiring the land accounts for one of the largest costs associated with commercial development, frequently representing 25 to 30 percent of the final cost. Although the ratio measures the relation of the building to the land with a fairly typical ratio being about 25 percent, the building is not the only improvement on the land. The FAR does not include such land uses as the parking lot, landscaping, land use regulations creating open space between structures, and outlying structures such as PADs and parking structures in the determination of building square feet.

Table 1 indicates the Floor Area Ratios (FAR) for the various land use types and compares it to 1989 surveys. The greatest change was in large offices, which moved from 0.75 to 3.36. Some of this change is due to the fact that the larger buildings are frequently built on parking garages. But also, many of the sites examined for 1989 have added new buildings with no additional land. For example, there are now four buildings on the Esplanade site instead of two. The average FAR for a 1-story building is 0.40, .77 for 2-story building and 7.03 for 10 or more stories. Changing FARs represent differing intensity of land usage, which can be dictated by a wide-range of factors including market conditions, tenant requirements, land use regulations and market characteristics of the area.

Employment Density: In a very competitive economic environment, most companies are trying to improve the “bottom-line” by increasing the productivity of employees and space utilization. In order to enhance employee productivity, there is a greater use of technology and work scheduling. Thus, in the retail market the employment density has decreased, while in the office building market and the industrial market the employment density has increased. Table 1 indicates the employment per 1000 square feet that have been identified by the consultant for 2000.

FACTORS INFLUENCING CHANGE

FARs and employment densities are changing as firms work to gain efficiencies to improve their profitability. The following identify some of the forces that are changing the structure of commercial development.

Work schedule. Until the last ten years, it was fairly typical that most people worked 8 to 5 Monday thru Friday. In order to better serve customers and/or reduce personnel costs, companies are moving to different work schedules such as extended hours (6 AM to midnight for the entire week) or a 24/7 schedule. Thus, a company might employ three hundred people but they are spread through the week and over the day. For example, a typical Walgreens drug store employs 25 people at each store but a 24-hour drug store has nearly 40 people. Another example is the U.S. Air reservations center in Tempe. The employment density is 18.7 people per 1,000 square feet due to the 24/7 schedules and the use of part-time people.

Part time versus full time. In the past, most jobs were full-time (typically 40 hours with benefits). Now more jobs are considered part time (under 20 hours with limited benefits) and can be found in most areas of employment, especially retailing and services. For example, only 4-6 people in a Walgreens out of a total workforce of 25-40 people are full-time and practically all of the 250 people at a Wal-Mart are part-time. The use of part-time people is frequently associated with changing concepts of the work schedule.

Services offered. The number of people employed at a site can be greatly influenced by the services being offered. For example, a grocery store typically employs fewer than 100 people but if a pharmacy is added then typically 6 people are added to the employment base. The number of services being offered also may increase the size of the store. Fry's stores frequently have pharmacies and banks and so are larger than Bashas, which frequently do not offer these services

Work location. People used to go to a site to work. Now, there are more options such as work-at-home, at the employer's site or at a client's site. Many supermarkets had on-site butchers, but now many are working from a central site and transporting the cut meat to the site. This reduces the number and expense of on-site butchers. It is also difficult to identify the true employee density for such operations as delivery or construction workers.

Use of technology. Technology has a tremendous impact on location. For example, many grocery stores are introducing self-checkouts to reduce the number and/or hours worked of human checkers. The most typical use of technology is the increasing ability to work at home and communicate with the office site and/or clients.

Land use management. Many cities are implementing regulations that will influence FARs and employee densities. For example, cities are recommending more mixed-use projects that will draw residential and commercial usages to a single site.

Land usage. The drive to heighten efficiencies increases FARs as developers try to make the greatest economical use of a site. More and more stores are trying to combine uses. For example, Wal-Mart superstores combine a supermarket with a discount operation; developers are making more use of PADs where a restaurant such as McDonalds can share the land with the

shopping center. Thus, FARS may continue to increase but not at the rate evident in the last few years. Further, tenants will try to enhance the efficiency of their space to ensure that most of the space is allocated to revenue generation. For example, the inclusion of a bank within a grocery store gains both market attraction (both uses bring customers) and space efficiencies.

Economy. Prior to the 2001 economic downturn, several firm such as Wells Fargo, American Express, and Charles Schwab were considering the development of corporate campuses, similar to the USAA campus in north Phoenix, which is over 700 acres. The idea of such a campus is to bring all workers to a single location with a set of office buildings and other features such as restaurants, day-care, and recreation facilities. The purpose was to create a corporate identity and a desirable place that would attract the needed skilled workers. However, as the economy slowed, many of the plans were shelved, and whether the concept will come back is largely unknown.

Table 1
FAR, Employment densities and Cluster
1989 and 2000

| Description | 1989 | | 1989 | | 2000 | |
|---------------------------|----------|-------------------------|----------------------|----------|-------------------------|----------------------|
| | 1989 FAR | Employees per 1000 SqFt | Cluster Size (Acres) | 2000 FAR | Employees per 1000 SqFt | Cluster Size (Acres) |
| RETAIL | | | | | | |
| Neighborhood | 0.23 | 1.43 | 16 | 0.23 | 1.18 | 21 |
| Community | 0.23 | 1.84 | 48 | 0.23 | .72 | 49 |
| Regional | 0.25 | 2.26 | 92 | 0.27 | 1.24 | 144 |
| Strip | 0.23 | 1.86 | 4 | 0.25 | 1.30 | 5 |
| OFFICE | | | | | | |
| Small | 0.25 | 3.21 | 1.3 | 0.78 | 3.13 | 4.9 |
| Large | 0.75 | 2.50 | 3.3 | 3.36 | 3.08 | 4.8 |
| INDUSTRIAL | | | | | | |
| Warehouse | 0.27 | 1.37 | 2.1 | 0.37 | 2.54 | 2.8 |
| Manufacturing | 0.27 | 2.23 | 6.1 | 0.34 | 2.82 | 10.7 |
| PUBLIC | | | | | | |
| Schools | 0.25 | 1.44 | 8.3 | 0.21 | 1.21 | 20.3 |
| Government | 0.25 | 2.50 | NA | 0.33 | 3.98 | NA |
| HOTEL/MOTEL/RESORT | | | | | | |
| Hotel/motel | 0.25 | 2.61 | 6.2 | 0.70 | 0.68 | 3.9 |
| Resorts | 0.25 | 1.96 | 18 | 0.62 | 0.45 | NA |

NA=sample too small—data not available

PAPER 5

RESIDENTIAL CLUSTER SIZES

Introduction

In analyzing subdivisions, the average size of subdivisions prior to 1985 was 280 lots. Since then, the average subdivision size has steadily declined from 129 during the 1985-89 time period to 103 lots in the 1990-94 time period to the current 98 lots. There are many reasons for the decline in size. Now, most subdivisions are part of a master planned community, which might encompass thousands of lots such as McDowell Mountain Ranch. Further, many subdivisions within a community might be started at the same time by different builders and for different market segments. Thus, the smaller size allows builders to adjudge market acceptance of specific plans. Land costs within a master planned community can be quite high in order to sustain the front costs of the amenity features such as lakes, golf courses and jogging trails. Thus, to keep capital costs low relative to expected returns, a builder might buy smaller parcels.

An additional reason is the local homebuilding industry has become dominated by national builders such as Pulte and KB Homes. These companies are basically production builders. They need to sustain a level of construction to support their corporate infrastructure and capital needs. Thus, they tend to build at all times, even in weak markets, with the idea of being able to attract a buyer through attractive financing, pricing arrangements or other marketing concessions. Given the large scale of these companies, local speculative products do not typically represent a large share of their national production. But to minimize risk, national builders do keep their current exposure low by building small subdivisions, which allow them to more quickly adjust to changing market conditions. Thus there is really no reason to expect a sudden increase in subdivision sizes above the typical 100-lot subdivision.

The average lot size has not changed appreciably, with the average being 7,475 square feet for pre-1985; 7,525 for 1985-89; 7,984 for 1990-94; and 7,690 currently. The difference in that range of sizes appears to have become greater with more subdivisions moving into the 5,500 sq.ft. range or lower with cluster style housing. Thus, many builders, in order to maintain affordability of housing with higher land prices, are trying to get more homes in a subdivision by lowering lot sizes.

Based on average lot sizes, the typical subdivision has allocated 16 acres (net acres) for housing. The issue then becomes how much is being allocated for other uses such as streets and open space. Typically, about 25 percent of a subdivision is allocated for streets and other public access, although some subdivisions are allocating another 10 to 15 percent for public open space such as trails and/or parks. This is especially evident where subdivisions are using a small lot concept.

Larger lots, with 2 units or fewer per acre, do not have a decrease in acres for usable acres. Similarly, the highest density units typically have about three acres of non-developable space.

Based on an analysis of the development database and the Greater Phoenix Housing Study, Table 1 details the cluster sizes by residential land use type.

Table 1
Residential Cluster Sizes

| Land Use Code | Density | Gross Acres | Net Acres* |
|------------------------------------|---------------------|--------------------|-------------------|
| Rural Residential (Limited Sample) | Under 1 DU/Acre | 50 | 50 |
| Estate Residential | DU/Acre | 46 | 46 |
| Large Lot Residential | 1-2 DU/Acre | 45 | 45 |
| Medium Lot Residential | 2-4 DU/Acre | 25 | 19 |
| Small Lot Residential | 4-6 DU/Acre | 20 | 15 |
| Medium Density Residential | 4-10 DU/ Acre | 26 | 20 |
| High Density Residential | 10-15 DU/Acre | 17 | 14 |
| Very High Density Residential | More than 15DU/Acre | 18 | 13 |

*Net acres based on the assumption that the proposed subdivision would lose a certain percentage of its gross acreage for streets right-of ways, etc.

PAPER 6

RESIDENTIAL DEVELOPMENT VELOCITY CURVES

Introduction

In forecasting residential activity, it is important to understand the development trends of units that come to market. Typically, growth is fairly slow in the beginning of a project. But beyond a certain point the growth accelerates until it reaches another point where it begins to decrease as it approaches buildout. Hence the curve typically takes on an “S” shape and is frequently referred to as Life Cycle Analysis.

A typical life cycle of a small area can be described as an “S-Curve” indicating that development of an area will start slowly, speeds up velocity and stops when all homes are absorbed. Based on an analysis of the Greater Phoenix Housing Study (The Meyers Group, Landiscor), a series of S-curves were developed and are presented in FIGURE 1. Subdivision sales activity is analyzed over the 1979 to 1999 time period.

Factors impacting Development Velocity:

Size of Subdivisions: On the metropolitan (Metro) level, over 90 percent of starts were sold by the end of year 5. Except for the 500+ housing units subdivisions, most subdivisions approached sell-out by the end of year 6. Most of the activity occurred in the first few years with the remaining activity being focused on probably less desirable lots and models. The 500+ projects tend to be very consistent over time with half of the project being started by the end of year 7. This scale of projects has always been relatively rare in the area and typically associated with active adult communities such as Sun City or Sun Lakes. Currently, most active adult communities are smaller subdivisions within master planned communities.

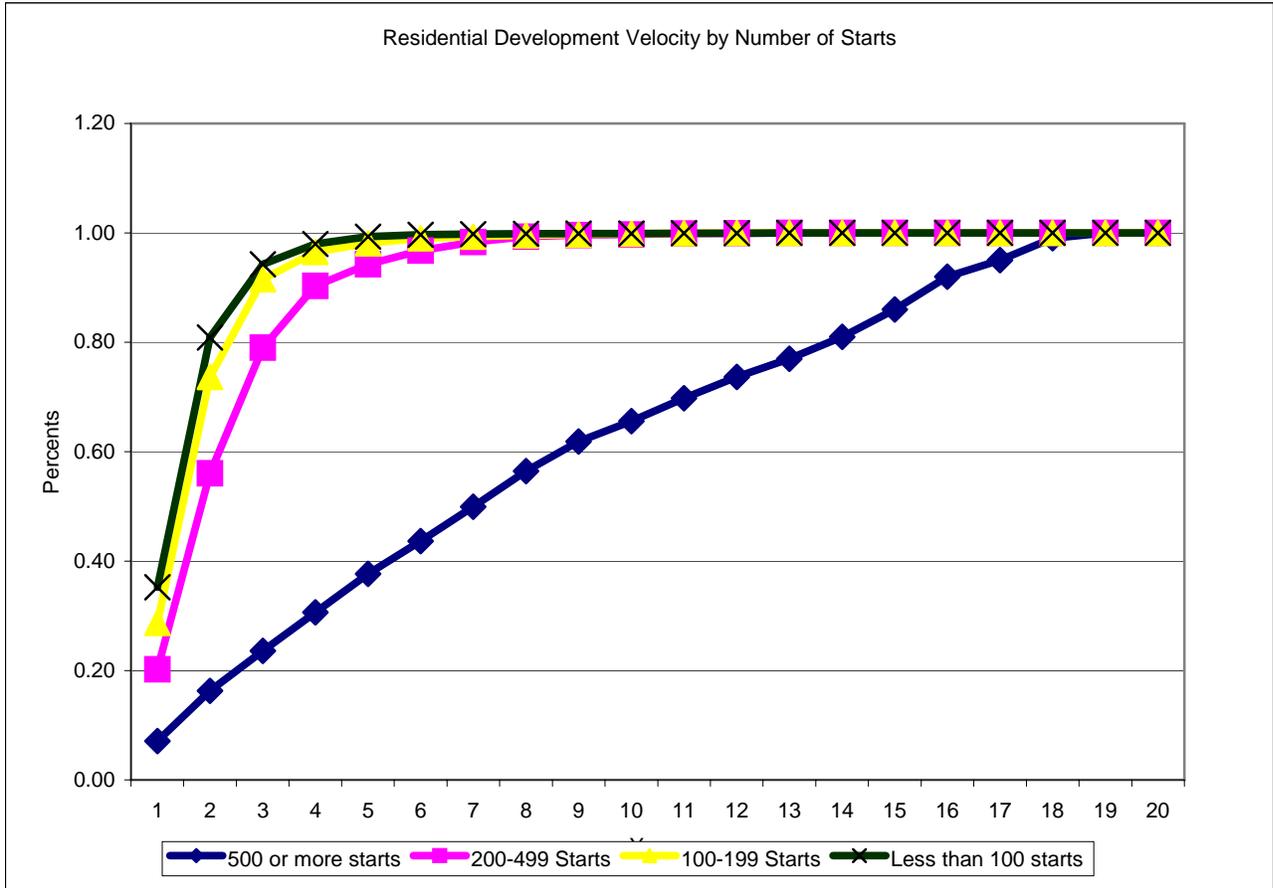
Time Dimension: The time dimension seems to show the greatest differences. In the 1980s, subdivisions tended to take longer time to sell out with nearly 20 percent of the lots remaining by year 12. The 1995-1999 time period is much quicker with a subdivision typically being sold out by the end of year 4. There are probably two key reasons for the difference. In the 1980s, subdivisions tended to be larger, which historically have longer sell-out periods. The other is the robust housing market of the 1990s, with low interest rates that drove sales at record paces.

Lot Size: Another dimension of sales activity is lot size. Basically, as lots get larger, which could well denote more expensive homes, the sales rate slows. This is especially evident in the early years, but all categories of lot sizes have over 90 percent of the homes sold at the end of year 4.

Market Conditions: Although the health of the housing market seems to be important, it is still true that the vast majority of developments sell out within five years and have less than 200 units.

Based on the analysis of the above parameters, it is recommended that the development velocity associated with 100-199 starts be used for projects with up to 200 units. FIGURE 1 details the velocity curves for various sized developments.

FIGURE 1: RESIDENTIAL VELOCITY CURVES



PAPER 7

GLOSSARY OF TERMS

Absorption: The amount of undeveloped land that is developed during a given period of time.

Area: The total size (land and water) of a specified geographical unit, usually in square miles or acres.

Average Annual Household Income: Total money received in a calendar year by all household members 15 years old and over.

Base Population: Population base for the current estimate, usually the last Decennial Census or a special census or census survey taken since then.

Birth Rate (crude): The number of births in a calendar year divided by the mid-year total population (B/P x 1000).

Census Transportation Planning Package: A special tabulation of a Census of the population for Maricopa County by the Traffic Analysis Zone system.

Cohort: A group of persons with a common characteristic such as age group.

Cohort Survivors: Number of survivors at the end of a specific period as the cohort passes through time (ages).

Components of Population Change: Births, deaths, in-migration and out-migration.

Comprehensive Plan: A planning document that is developed for an area that provides guidelines and policy statements for the direction, character, magnitude and timing of development that is expected to take place.

Construction Employment: Non land use based employment associated with construction sites across the region. This employment is included in the other employment category. Because construction employment follows development, employment projections may show declines in future years.

Council of Governments (COG): A public organization encompassing a multi-jurisdictional regional community. A COG serves the local governments and the citizens in the region by dealing with issues and needs that cross city, town, county and even state boundaries.

Death Rate (crude): The number of deaths in a calendar year divided by the mid-year total population (D/P x 1000).

Demography: The study of characteristics of human population, size, growth, density, distribution, and vital statistics.

Developed Employment-Related Area: The amount of developed employment-related land in an area based on current comprehensive plans of jurisdictions, input from the local planning community and knowledge about the area.

Developed Residential Area: The amount of developed residential land in an area based on current comprehensive plans of jurisdictions, input from the local planning community and knowledge about the area.

Employment: The total number of jobs of persons receiving wage or salary to work in a given industry or occupation. This measure of employment only includes persons over the age of 16 and does not include working within the home without outside wage or volunteering. An employee works in the designated weekly time period at least one hour.

Employment Concentration: Measures the average employment density within a given radius, usually a 1-mile radius. This helps in smoothing out differences in geographies and identifying underlying spatial patterns in the data.

Employment Density: Derived by dividing total employment within an area by the size of the area in square miles.

Employment Saturation: The percentage of total employment capacity that is developed based upon the buildout densities.

Estimate: Indirect measure of the number of persons inhabiting a specific geographic area for a current or past time period. Actual data sensitive to changes in the population are used to derive the numbers. The data are incorporated into various formulas to produce estimates of population change or components of this change.

Fertility: Index relating the number of births to the number of women of childbearing age normally 15-44 years old: $(B/P (15-44) \times 1000)$.

General Plan: An official document containing goals and objectives for future development and policies designed to reach these goals and objectives. Sometimes called "comprehensive plan."

Group Quarters: A group quarters is a place where people live or stay other than the usual house, apartment, or mobile home. Two general types of group quarters are recognized: institutional (for example, nursing homes, mental hospitals or wards, hospitals or wards for chronically ill patients, hospices, and prison wards) and noninstitutional (for example, college or university dormitories, military barracks, group homes, shelters, missions, and flophouses). Group quarters may have housing units on the premises for staff or guests.

Industrial Employment: Employment located on industrial land use.

Job/Housing Balance: The ratio of the number of jobs to the number of housing units in a geographical area.

Jobs Per 100 People: The number of jobs for every 100 people in a geographical area.

Land Use Controls: Regulations governing how land is to be used in order to implement the

General Plan. The major controls are subdivision regulation and zoning.

Land Use Planning: Urban planning that focuses on physical development.

Large-Firm Employment: That employment associated with firms employing 100 or more persons at one site.

Municipality: A political unit incorporated as a city or town.

Municipal Planning Area (MPA): An MPA represents the area of planning concern for a municipality and is based upon its anticipated future corporate limits.

Natural Change: The number of births minus deaths during a specific period. If there is an excess of births over deaths, the change is called natural increase; if deaths are larger, it is referred to as natural decrease.

Net Migration: The net effect of persons moving into an area (in-migration) minus persons moving out of the area (out-migration).

Nonresident: Any person whose principal place of residence is not within Maricopa County.

North American Industry Classification System (NAICS): An industry classification system that groups establishments into industries based on the activities in which they are principally engaged.

Occupied Housing Unit: A housing unit is considered occupied if a resident person or persons are living in it or if the occupant is only away from the unit temporarily, e.g., away on vacation.

Occupancy Rate: The number of occupied housing units divided by the total number of housing units in a geographical area.

Open Space: Land or water free of urban development, including land or water used for the production of food or fiber or for the conservation of natural or scenic resources.

Plat: A map or a subdivision.

Population Concentration: Measures the average population density within a given radius, usually a one mile radius. This helps in smoothing out differences in geographies and identifying underlying spatial patterns in the data.

Population in Households: The population in occupied housing units.

Persons Per Occupied Unit: The total population residing in occupied housing units divided by the total occupied housing units.

Population Saturation: The percentage of total population capacity that is developed, based upon the buildout densities.

Projection: Numerical outcome of a set of assumptions (based on past trends) relating to future trends. The numbers are conditional upon these assumptions being fulfilled.

Public Employment: Employment located on land designated as public use.

Regional Analysis Zone (RAZ): An area within an MPA. RAZs can be either coterminous with or may be aggregated to form an MPA.

Resident: a resident of a geographical area is a person who reports that his or her regular place of residence is within that geographical area.

Resident Housing Unit Density: The total number of resident housing units in a geographic area divided by area in square miles.

Resident Population Density: The total resident population in a geographic area divided by area in square miles.

Retail Employment: Employment that is located on retail land use.

Sample Survey: Scientifically designed sampling to obtain characteristics of the population.

Saturation Ratio: The ratio of total developed land to total developable land.

Seasonal Population: The number of nonresidents who reside within the area at certain times of the year for more than two weeks.

Socioeconomic Analysis Zone (SAZ): Represents subareas within a Regional Analysis Zone and is the smallest geographic unit for which variables are forecast for socioeconomic planning purposes.

Subdivision: The division of a parcel of land into two or more lots for the purposes of sale or development. The former single piece as a whole is then known as a subdivision. Subdivisions may be residential or commercial.

Symptomatic Indicators: Data series that are reflective of population change; can be used in developing current population estimates.

Top-down Allocation: An allocation procedure that begins at the highest level of geography and then allocates the variables to the next level of geography. The totals developed at each level serve as control totals for the allocation to the next level. For example, allocation of population from county-level to the RAZ level, then from the RAZ level to the SAZ level represents top-down allocation.

Total Nonresident Population: The combination of seasonal and transient populations.

Total Resident Housing Units: The combination of occupied and vacant resident housing units.

Total Resident Population: Includes those residents living in housing units and group quarters.

Traffic Analysis Zone (TAZ): Represents a subarea within a Regional Analysis Zone and is the smallest geographic unit for which variables are forecast for transportation planning purposes.

Transient Population: The number of nonresidents that reside in the area for less than two weeks, often in hotel, motel, or RV housing units.

Travel Time: The time, in minutes, that it takes to travel from one point to another. The travel times represent peak-hour traffic conditions.

Undevelopable Area: The amount of undevelopable land in an area based on the analysis of land use information and planning documents from the various jurisdictions. Undevelopable area includes land in flood plains, land covered with water, land with slopes or other topographic features that make development not feasible, and areas that have been designated for parks and other open space use.

Undeveloped Employment-Related Area: The amount of undeveloped employment related land in an area based on current comprehensive plans of jurisdictions, input from the local planning community, and knowledge about the area.

Undeveloped Residential Area: The amount of undeveloped residential land in an area based on current comprehensive plans of jurisdictions, input from the local planning community, and knowledge about the area.

Vacancy Rate: The ratio of the total number of vacant housing units divided by the total number of housing units.

Vacant Housing Unit: A unit in which no resident lives.

Vital Statistics: Births and deaths data reported by either place of residence or occurrence.

Zip Codes: Administrative entities of the U.S. Postal Service which generally do not coincide with the Census Bureau's geographic or political areas, and change according to postal requirements. Most zip codes do not have specific boundaries, and their implied boundaries do not necessarily follow clearly identifiable physical features.

Zoning: The division of a city or county into districts for the purpose of regulating the use of land, the size of structures, and the density of population. Accomplished through the passage of a zoning ordinance.