Date: November 13, 2015

To: ABAG Executive Board
From: Cynthia Kroll, Chief Economist, ABAG
Subj: Preliminary Regional Forecast Numbers, November 19, 2015

This memo describes ABAG's preliminary proposal for the updated regional forecast numbers for Plan Bay Area 2040. The memo first presents the context and methods. Next we present the preliminary updated projections (referred to here as ABAG 2017p) and compare these to the previous Plan Bay Area 2013 projections. Appendix A describes the broader range of projections considered and explains the choice of the ABAG 2017p set of projections.

**Context**

ABAG's Projections are being updated as part of the minor update to Plan Bay Area. The update recognizes changing information on economic conditions and population growth in the region over the past five years and also applies new tools.

*How Does the 2010-2015 Surge in Growth Change the Outlook?*

There are two possible interpretations of the last 5 years:

1) The region grows through cycles of innovation. During periods when innovation is surging, employment and compensation also surge, as it has in the past 5 years. This surge slows when either a) other broader factors in the economy lead to a slowdown in investment (as with the financial crisis) or b) when the industry reaches the state of more standardized production or operations (in the case of services), at which time a substantial share of growth occurs outside the region. Under this interpretation, the growth surge is temporary and is expected to slow.

2) Analysts like Moretti have described differential growth across regions based on the region's capacity for knowledge-based activities. Regions with strong education and knowledge resources continue to grow, while those with a less educated population and greater concentration of employment in sectors outside the knowledge base stagnate or decline. Because the Bay Area is a knowledge based region, we should expect it to continue to be part of this faster growing segment of the national landscape.

The recommended set of projections assumes a combination of the two, but leans more heavily on explanation (1). The region has a competitive advantage in knowledge based industries, but the surge over the past 5 years is part of an innovation wave, and will not continue at this pace on a steady basis going forward. In fact, in the selected projection, regional employment grows slightly more slowly than the US as a whole for some periods following 2015.

*What Is the "Right" Projection?*

The "right" projection is shaped by the goals of *Plan Bay Area 2040*. We are seeking a "realistic" set of numbers, meaning a projection that could reasonably occur given feasible relaxation of our most

constraining limitations. At the same time, *Plan Bay Area* is aspirational and intentional, prescribing policies to help overcome barriers and allow housing, household, population and job growth.

**The Forecasting Process**

ABAG used a suite of tools and in-house analytic models to develop a range of projections for employment, population and household growth. Selection of a preliminary projection from this range relied on feedback from the Technical Advisory Committee (Appendix C) and consultation within senior and executive staff within the two regional agencies primarily responsible for *Plan Bay Area 2040*. Stephen Levy of the Center for Continuing Study of the California Economy (CCSCE) provided valuable input in shaping our process, including extensive review of the REMI model, which with his assistance became a tool for exploring a range of projections. [1] For the preliminary proposed projection, ABAG then estimated the change in commute level and a regional housing control total.

*Employment*
ABAG adjusted the REMI version 1.7.2 model, customized for the Bay Area, to analyze a range of employment levels for the Bay Area between 2010 and 2040. ABAG staff modified the national and regional controls and created simulations to explore implications of alternative levels of employment growth. ABAG also used simple trend extrapolation techniques to provide an envelope of potential employment levels within which to evaluate alternatives generated using REMI.

*Population*
ABAG contracted with John Pitkin of Analysis and Forecasting, Inc., and Dowell Myers, of the University of Southern California, to adapt their population projection model to the Bay Area. ABAG conducted sensitivity tests on migration assumptions, using the Pitkin-Myers (P-M) model, and compared detailed results by age and ethnic distribution with REMI and California Department of Finance output. Because of the consistency of population characteristics between the P-M and REMI results, the ABAG preliminary proposed population projection is drawn from REMI so that the growth in population is then internally consistent with growth in employment. ABAG will continue to refer to P-M results for detailed understanding of changes in demographic factors.

*Households*
ABAG applied recent historic headship rates[2] by age and ethnicity to estimate households from the population projections. Recognizing the impacts of housing costs and cultural diversity on changing headship rates, ABAG produced an alternative household projection, used in ABAG 2017p, based on adjusted lower headship rates for seniors and young adults.

*Housing Units and In-Commute*
Consistent with the legal settlement with the Building Industry Association, ABAG's housing unit projection includes housing for all projected households plus the number of units that would be needed to house the increased number of workers estimated to commute into the region. The in-commute change is estimated in two different ways using REMI output for employment, "residence adjusted

[1] Despite our close work together on ABAG's models, ABAG's choice of preliminary proposed projection differs from the current CCSCE employment update completed for the region and City of San Jose, and the set of tools used by ABAG differ from the CCSCE projections process.
[2] A headship rate is the proportion of people in a specific age, gender and ethnic group who will head a household.

employment," and the labor force in 2010 and as projected in 2040.[3] After adjusting for workers per household, an in-commuter household number is added to the base for estimating the regional housing control total. The regional housing control total is the sum of the households estimated for the projected population plus households equivalent to the maximum estimated in-commute number, plus a 5 percent vacancy factor.

**Preliminary Proposed Employment, Population, Household and Housing Projections**

Table 1 shows ABAG's proposed revised projections for the Plan Bay Area 2040 update. Population projections for 2040 are 1.5 percent higher than the *Projections 2013* levels. Employment projections are 2.1 percent and household projections are 2.4 percent higher than *Projections 2013*. Employment projections reflect adjusted baseline estimates from 2010 and strengthening competitiveness demonstrated between 2010 and 2015, but also the understanding that the region has witnessed fluctuating employment levels over time. Although employment growth is very strong now, it can equally level off or dip in the future. Household projections reflect the higher population estimate, the results of a revised estimation approach compared to Projections 2013 as well as simulations of changing household formation in response to housing prices.

**Table 1: ABAG Projections 2017p for Plan Bay Area Update**

| Projection Element | 2010 Base (millions) | 2040 Level (millions) | 2040 Change (millions) | 2010-40 Percent Change | Reasoning |
|---|---|---|---|---|---|
| Employment | 3.411 | 4.601 | 1.190 | 34.9% | Region maintains a long term advantage relative to the US. The 2010 to 2015 growth is not an indicator of stable long term trends but of a boom period that will slow. The region grows faster than the US for the full 2010-2040 period, but will grow more slowly than the US for some period following 2015. |
| Population | 7.151 | 9.443 | 2.292 | 32.1% | A certain base population growth will occur whatever the economic trends. Migration levels will reflect projected employment growth. Population follows employment growth to grow slightly faster than in Projections 2013. |
| Households | 2.608 | 3.387 | 0.778 | 29.8% | Household growth follows population growth, but income and housing price factors can increase household size. Retired population demographic and behavioral changes may also affect household formation. |
| Households related to in-commute change | 0.097 | * | 0.025 | * | Calculated from REMI data on total regional employment, residence adjusted employment, and labor force projections. See Appendix B for a description of the estimation method. |
| Housing Units | 2.784 | 3.592 | 0.808 | 29.0% | Estimated from households plus the in-commute household equivalent, with a 5% vacancy increment added to account for rental and homeowner turnover and seasonal homes. |

Housing unit projections are 4.2 percent higher than in *Plan Bay Area 2013* for two reasons. First, household projections are higher, based on higher population and a more detailed understanding of

[3] The in-commute calculation is described in Appendix B and in more detail in a forthcoming white paper.

demographic change. For example, while an increasing share of immigrant households might be expected to lead to an overall increase in household sizes, the ageing of the population over time pushes forcefully in the other direction. Second, the net increase in in-commuting is added to the household base. The increment of change in housing is also higher because *Plan Bay Area 2013* used a one-time vacancy discount due to the recession which is not used here.

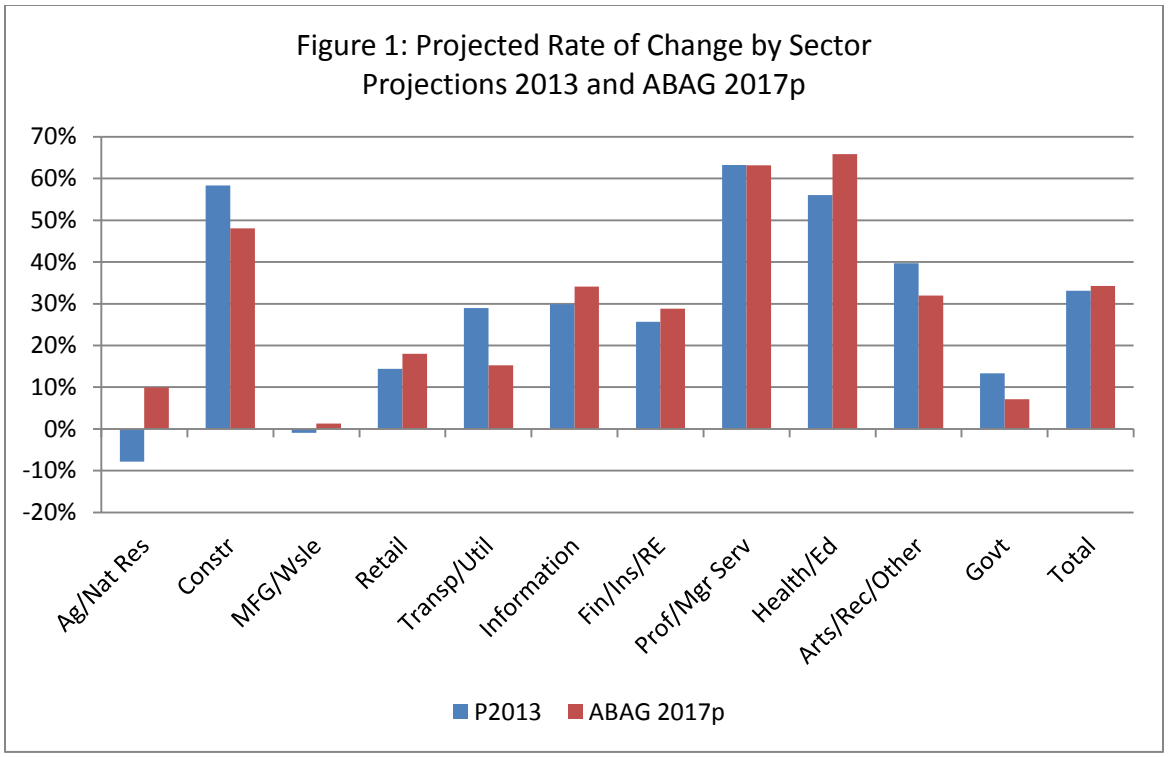
ABAG 2017p reflects an economy that continues to grow, but where the volatility of its key growth sectors and the maturing of the population lead to a fluctuation of competitive advantage. Overall, the region has a larger share of the US economy in 2040 than it does in 2010. However, looking forward from 2015, after the boom of the past five years (when recovery from a recession mixed with new industry expansion), the region's employment growth drops to a rate slower than nationwide employment growth for the 2015 to 2020 period, at which point the region once again may grow slightly faster than the nation. Population and housing still experience some of the constraints that have affected regional growth over the past two decades, but the projected rate of household and population growth is more consistent with a region that is developing land use policy to house all of its residents compared to slower growth of the past decade and a half. As such, the projections do assume a changing policy landscape relative to 10 years ago.

**Additional Details on the Proposed Preliminary Projections**

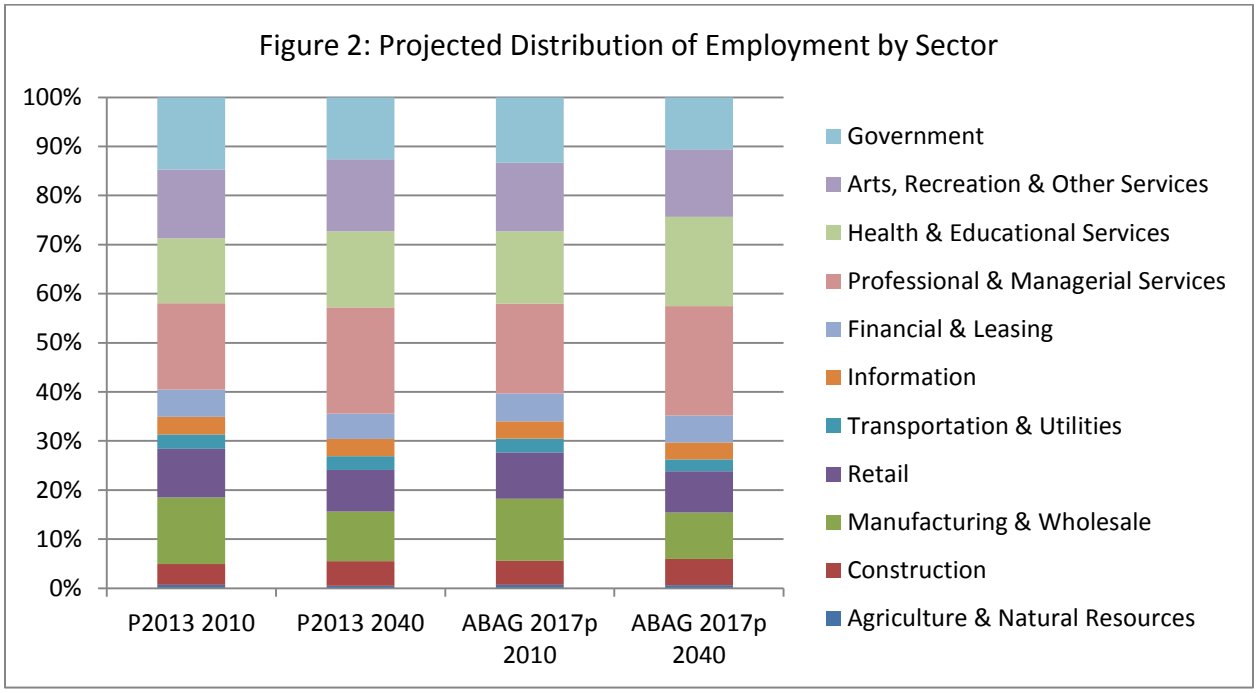
*Employment*

Figures 1 and 2 show sectoral detail for the ABAG 2017p projection, compared to *Projections 2013*. Between 2011, when *Projections 2013* was analyzed, and 2014 and 2015, when much of the analysis for the current projection took place, employment definitions changed slightly. Both *Projections 2013* and the current projection are based on employment by place of work as measured by the Bureau of Labor Statistics and the Employment Development Department, combined with Self-Employment estimates as measured by the Employment Development Department and the US Census Bureau. Between the two periods, EDD and BLS updated their definitions of some sectors and added some types of employees (specifically household workers) to their estimates. The 2010 base is therefore slightly different between the two series.

While both projections are based on BLS US forecasts, ABAG 2017p uses a more recent forecast than *Projections 2013*, and includes some additional adjustments (see Appendix A). Taking these differences into account, there are sectoral differences in the way the region grows. ABAG 2017p predicts higher rates of growth (more than 2 percentage points difference) for agriculture, manufacturing, retail, information, finance and leasing, and health and education services, and lower growth rates for construction, transportation and utilities, arts and recreation and government (Figure 1). As a result, ABAG 2017p has higher shares of jobs in health and education and a smaller share of jobs in government compared to the earlier *Projections 2013*. (See Figure 2).




Source: ABAG *Projections 2013* and ABAG analysis using modified REMI 1.7.2 .



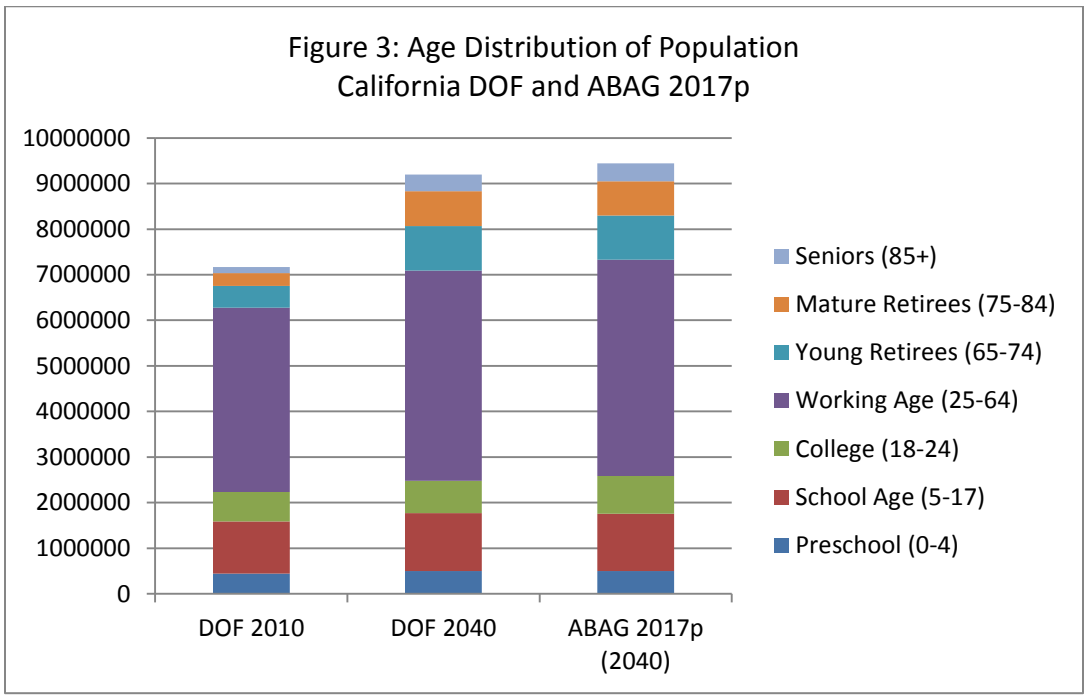

Source: ABAG *Projections 2013* and ABAG analysis using modified REMI 1.7.2 .

*Population*

The projected population level is higher in ABAG 2017p compared to the most recent California Department of Finance (DOF) projection (shown also in Appendix A). This type of differential is to be

expected because of the timing and assumptions of the two projections. ABAG has projected a slightly higher employment number than the number ABAG made available to DOF at the time of the DOF analysis. In addition, DOF assumes a greater degree of land use constraints to the region's addition of population and households.

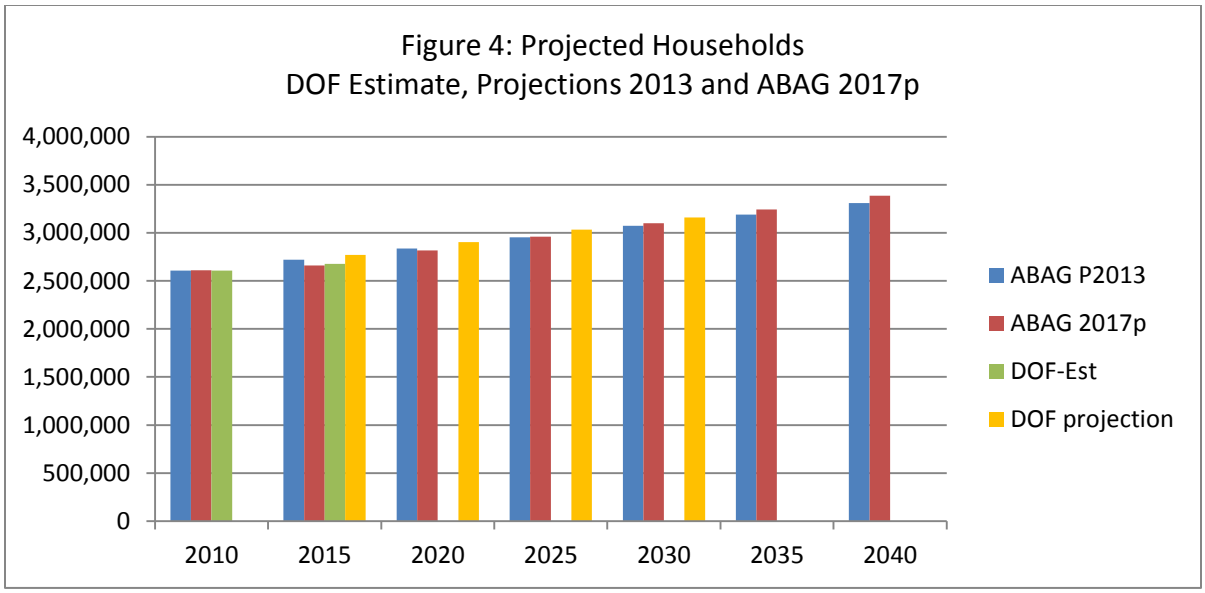
The demographic distribution from the two projections highlights this point, as shown in Figure 3. The number of seniors and children is quite similar in the two projections. The numbers of college aged and working aged adults is higher in ABAG 2017p, consistent with a higher employment level.

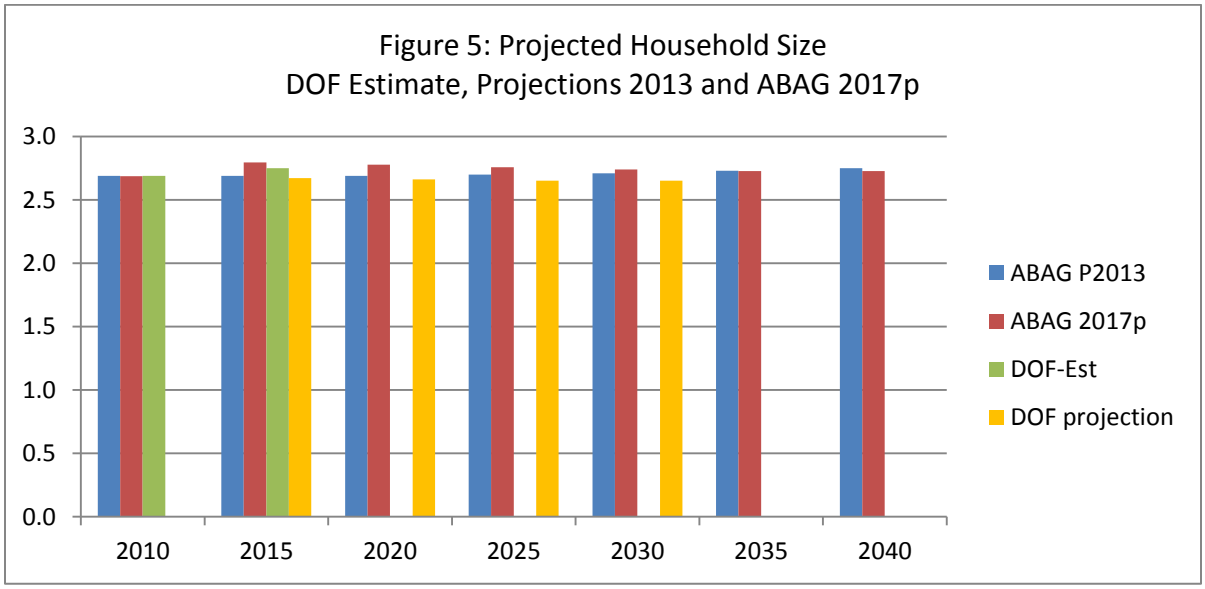



*Households*

ABAG 2017p household growth tracked actual household growth in the region through 2015 (see Figure 4). Overall, the region is projected to grow by almost 780,000 households, an additional 80,000 households in ABAG 2017p compared to *Projections 2013*.

Household size increases significantly in the first part of the forecast period, as housing construction lags population growth. In later years, household size drops back but remains above levels in 2010, consistent with the expectation embedded in the forecast that there are some long-term adjustments in household formation in response to housing costs and availability. ABAG's *Projections 2013* household size figures vary more regularly, and by 2040 were slightly higher than ABAG 2017p projected household size. The highly disaggregated household formation projection approach used in ABAG 2017p captures economic and demographic changes over time that first lead to rising household size (similar to what was actually estimated by DOF for 20150 and then to declining household size as the share of households headed by seniors increases.




*Housing Units*

When additional in-commute households are taken into account, the growth in total housing unit demand between 2010 and 2040 is estimated at 808,000, almost 150,000 more housing units than the 660,000 additional units estimated in *Plan Bay Area 2013*. The 150,000 additional units comes from the larger number of households associated with the population projection, as well as the housing increment added to satisfy the legal settlement related to the in-commute. We estimate the growth in units as the difference between housing demand in 2040 and supply in 2010.

This larger number of units should be seen in the context of population and household demographics, which influence the types of units needed. The types of housing units to be added may differ from those added in the past, because of the population and household age groups that are growing. With much of the increase in households coming from populations 65 and older or from college-aged young adults,

the traditional suburban single-family home would not be the only way to meet the needs of a significant portion of the expanding population. The uptick in recent years of multi-family development in areas close to transit and services is consistent with an increasing diversity of housing needs and preferences. Housing policy will need to consider not only numbers of units but also types of units as well as services that could be needed to make efficient use of new and existing housing stock. Furthermore, changing use patterns of units (for example, sharing of space by over-housed seniors with other family members or tenants) or changing levels of movement into “group quarters” (for example some types of co-housing) could moderate the number of new units required.

## Appendix A
## Alternative Regional Projections

ABAG 2017p is one of many futures possible for the Bay Area. The levels projected in ABAG 2017p lie well within the range of different employment, population, household and housing increases that could occur over the next 25 years. This appendix discusses the range of possible futures analyzed and the process of selecting ABAG 2017p from these alternatives.

### Range of Regional Projections

Table 1 shows a range of possible futures identified in our analysis. The different projections come from a variety of sources. Population projections come from the Pitkin-Myers analysis, the California Department of Finance, *Plan Bay Area 2013*, and the ABAG analyses using REMI. Employment alternatives come from *Plan Bay Area 2013*, ABAG's analyses using the REMI tool, and ABAG's simple trend analysis.

Table A-1: Range of Projections of Bay Area Future Population, Employment and Households

| | Population | | | Employment | | | Households* | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2040 (2010 7,150,000) | Change from 2010^ | Change from 2015^ | 2040 (2010, 3,411,000) | Change from 2010^ | Change from 2015^ | 2040 (2010 2,608,000) | Change from 2010^ | Change from 2015^ |
| BASE | | 7,151,000 | 7,511,000 | | 3,411,000 | 4,011,000 | | 2,608,000 | 2,676,000 |
| P-M/ Trend Low[4],# | 8,996,000 | 25.8% (0.8%) | 19.8% (0.7%) | 3,843,000 | 12.7% (0.4%) | -4.2% (-0.2%) | 3,254,000 | 24.8% (0.7%) | 21.6% (0.8%) |
| DOF | 9,196,000 | 28.6% (0.8%) | 22.4% (0.8% | | | | | | |
| PBA 2013** | 9,299,000 | 30.0% (0.9%) | 23.8% (0.9%) | 4,505,000 | 33.1% (1.0%) | 12.3% (0.5%) | 3,308,000 | 26.8% (0.8%) | 23.6% (0.9%) |
| *ABAG 2017p* (REMI based, lower) | 9,443,000 | 32.1% (0.9%) | 25.7% (0.9%) | 4,601,000 | 34.9% (1.0%) | 14.7% (0.6%) | 3,387,000 | 29.9% (0.9%) | 26.6% (0.9%) |
| REMI M | 9,559,000 | 33.7% (1.0%) | 27.3% (1.0%) | 4,659,000 | 36.6% (1.0%) | 16.2% (0.6%) | 3,434,000 | 31.7% (0.9%) | 28.3% (1.0%) |
| REMI H | 9,994,000 | 39.8% (1.1%) | 33.1% (1.1%) | 4,945,000 | 45.0% (1.2%) | 23.3% (0.8%) | 3,632,960 | 39.3% (1.1%) | 35.8% (1.2%) |

Source: ABAG analysis using REMI, Pitkin-Myers Bay Area model, ABAG *Projections 2013*, California Department of Finance. # The employment trends in this row are NOT produced by the Pitkin-Myers modeling approach but we show them here as consistent with this level of population growth. * Lower headship rate is used to calculate households for ABAG 2017p and REMI M, historic headship rate for P-M and REMI H. PBA 2013 is the level published in *Projections 2013*. ^ First percentage in each cell is for the full period, percentage in parentheses is the annual rate. ** PBA 2013 employment definition is slightly different from other runs; change is calculated from the PBA 2013 base for 2010, but uses the same 2015 base as the other estimates.

[4] For the purpose of discussion, in this chart we pair the low Pitkin-Myers population projection with the lowest trend projection generated by the ABAG simple extrapolation approach. The P-M/Trend Low projection assumes a net outward trend in domestic migration at a level equivalent to that which occurred between 2000 and 2010. In contrast the REMI H projection assumes more than a decade of net positive in-migration to the region at a rate greater than the region has seen since the 1970s.

At the low end, a "no growth" economy would lead to population growth spurred by natural increase but tempered by continuing domestic out-migration (a net shift of people from the Bay Area to other parts of the region), still adding about 1.8 million people and over 700,000 households to the region. At the high end, the region would see strengthening advantage of the Bay Area economy relative to the US, continuing in-migration of skilled workers, and successful expansion of housing stock to the extent that prices show no further relative increases (compared to 2013). This would lead to a 45 percent increase in the number of jobs, relative to 2010 (about a 20 percent increase from 2015). To support this employment growth, population could grow to almost 10 million, with 1 million new households.

The three middle level numbers (*Projections 2013*, ABAG 2017p (originally a REMI version), or REMI M) all offer a realistic perspective on likely migration and building activity. Considerations in choosing among these three alternatives include:

- ABAG historic population and household projections have been on target or slightly high. Employment projections have been lower than the highest (temporary) peaks but otherwise well above trend. *Projections 2013* was consistent with long term trends in all three components. ABAG 2017P is consistent the original employment projection provided by CCSCE in 2012 before adjusted downward because of housing constraints. REMI M is higher for all three components compared to ABAG 2017P and *Projections 2013*.
- Consistency with long term trends (as in *Projections 2013*) also means accepting "business as usual" for housing production and growth in in-commuting. This makes it more difficult to meet the requirements of SB 375. Projecting housing production consistent with demand growth due to population change would strengthen the region's ability to meet the goals of SB 375. ABAG 2017P and REMI M do this compared to *Projections 2013*.
- The long-term employment projections do not take into account cyclical events, but the greatest uncertainty is in the employment level. We are confident the recent surge in employment growth will moderate but are much less certain as to the degree of moderation. In proposing ABAG 2017P we take an incremental approach to the forecast, as explained in the next bullet point.
- Plan Bay Area 2040 is a minor update. The ABAG 2017P projections raise employment, population, and household projections modestly relative to the *Projections 2013* level. The higher housing projection reflects the region's aspiration to provide units for all of the population. This higher housing level will point to the need to address land use policy to expand the region's housing production. Should the next four years show continued strong growth, and should housing respond in a way that meets growing needs, then the outlook for stronger long-term employment growth within the region (rather than relocation of expanding activities forced by constraints) would improve and would be addressed in the next forecast.

**Further Considerations in Selecting an Alternative**

There is no single "right" projection. There is uncertainty going forward on all aspects of the projections. Some key uncertainties include:

- Economic uncertainties
    - Where is the Bay Area in the economic cycle? This influences where the trend can be expected to go.
    - Is the region's economy on a long-term path of strengthening relative to the nation, or will it continue to have innovative surges followed by flat periods or employment downturns as the new innovative source transforms to a mature sector. This affects the overall rate of growth.

    - When the next downturn comes, will the Bay Area weather it well, or will it lead the nation downward, as it has done in the past 3 cycles? This will affect our expectations for average growth rates.
    - How will employment shift among our key high wage and low wage sectors?
- Demographic uncertainties
    - Will growing job opportunities continue to draw new residents to the region? To what degree will this flow counterbalance the outflows of those who cannot afford the region's high living costs?
    - How will tempering of job growth affect future migration in and out of the region?
    - Will the millennials (also the echo boomers) still be in the region in 25 years, or will they move to other geographic areas as they form families?
    - Will seniors stay in their under-occupied single family homes, move to smaller units or group settings, double up with children or grandchildren, or leave the region?
    - How will labor force skills change over time—will new in-migrants and immigrants continue to be highly educated, and will this counterbalance any challenges in educating the region's home-grown diverse labor force?
- Household and housing uncertainties
    - Will changes in land use policy, development fees, and financing availability help expand future housing production?
    - Will family and non-family groupings form larger households to make living in the region more "affordable" under existing constraints?
    - Will cultural trends toward assimilation continue, diluting the tendency of immigrant households to have multigenerational households, or will even native-born third-generation and higher households begin to adopt multigenerational living situations for cultural or cost reasons?

**Assumptions in Alternative Projections**

The range of projections shown in Tables A-1 and A-2 are a small sample of the many different results generated from our projections process. Table A-2 outlines the different assumptions underlying each set of projections, including:

- The driving forces at the national level
- The level of residential and nonresidential investment
- The rate of growth of housing prices
- The level of regional competitiveness
- The role of demographic change and household formation assumptions

The preliminary proposed employment projection (ABAG 2017p) is a projection generated using the REMI modeling tool after some major adjustments. Adjustments include: (1) National employment growth occurs by sector as projected by the Bureau of Labor Statistics, with a moderation in the pace of growth following 2022 consistent with slower growth in the US labor force. (2) Further adjustments at the national level to Health and Education and Information sectors to reflect more realistic trends relative to other sectors (Health and Education was escalating too rapidly, Information dropping too broadly). (3) Adjustments at the regional level to constrained residential and nonresidential investment from expanding exponentially (adjusting for a model flaw). (4) Increasing production costs in some sectors as the region competes to retain and attract skilled labor in its fastest growing industries. Adjustments (1) through (3) are shared across a number of alternative projections produced by ABAG

(only some of which are shown here). In some of our alternative projection simulations we also adjusted relative housing prices to a level more reflective of current conditions. This adjustment is not included in the ABAG 2017p projection.

**Table A-2: Underlying Assumptions of Different Projections**

| | **Migration** | **US Growth** | **Construction Investment** | **Sector Adjustments** | **Households and Housing** | **Labor Force Characteristics** |
|---|---|---|---|---|---|---|
| P-M Low/ Low trend employment projection# | Rate equivalent to 2000-2010, domestic net negative | Low trend based only on regional growth, no US assumptions. | NA | Paired with low trend based on *region's* trough to trough historic rate of growth | Historic household formation rates by demographic group | NA |
| DOF | Projections 2013 equivalent | NA | Land use controls remain tight | NA | From DOF | NA |
| Projections 2013 | Not estimated | BLS 2008-2018 series, updated by CCSCE | NA | Shift share adjusted manually | NA | Total matches employment demand; demographic details from DOF. |
| *ABAG 2017p* (REMI based) | Net domestic economic migration positive through 2020, then negative to 2037; negative net retirement migration, increased | BLS 2012-2022 projection, rates dropped after 2022. | Residential and non-residential investment capped to peak historic level | Modified Health and Education, Information trends at US level. | Adjusted household formation rates (see text) | Production costs rise in key South and West Bay sectors. Labor force participation increases in younger age groups. |
| REMI M | Net domestic economic migration positive through 2020, then negative; negative net retirement migration | BLS 2012-2022 projection, rates dropped after 2022. | Residential and non-residential investment capped to peak historic level | Modified Health and Education at the US level | Adjusted household formation rates; higher relative housing price. | NA |
| REMI H | Net domestic economic migration positive except small negative 2029-2033 | BLS 2012-2022 projection, rates dropped after 2022. | NA | NA | NA | NA |

NA: Not addressed or not adjusted in forecast # The low employment trend was NOT produced by the Pitkin-Myers modeling approach but we discuss this employment trend as consistent with this low population growth level.

**Evaluating the Alternatives**

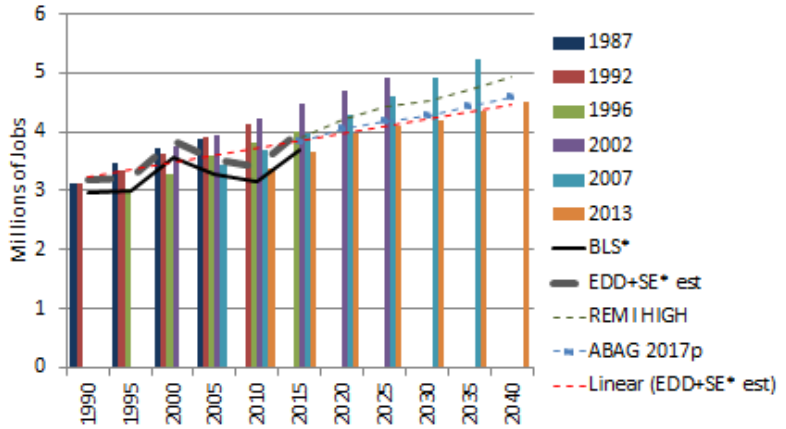
In selecting among the alternatives, ABAG staff consulted the technical advisory committee, ABAG senior management, MTC senior staff and management, and Stephen Levy of the Center for Continuing Study of the California Economy.

*Technical Advisory Committee and Consultant Role and Response*
Of ABAG's Regional Forecast Technical Advisory Committee's twelve members, ten provided feedback. Eight of the ten argued that the lower projections were most likely (P-M, DOF, Projections 2013 or an earlier REMI version similar to ABAG 2017p for population; Projections 2013, the REMI version close to ABAG 2017p or REMI M for employment; household estimates ranging from the original Projections 2013 to a REMI version lower than ABAG 2017p). Underlying arguments for this view were that housing would continue to be a constraint to population and labor force growth, while some felt infrastructure constraints, especially roads and transit, would add further limits on employment and household growth. The other two technical advisory committee members felt the high end was a better selection for planning purposes, arguing that the current surge in jobs could continue, although one of these two reviewers recognized that changes in land use policy would be needed to avoid a continuing pattern of displacement from such growth. Stephen Levy of CCSCE, who played a very helpful larger consulting role at the early stages of assessing and applying REMI, also argues for the higher employment level, saying this could be achieved with a population level closer to the mid-range (perhaps 9.6 million), due to higher labor force participation rates and lower birth rates.

*Projection Alternatives in Context*
We can compare the range of projections described above with those that have been done in the past.

Employment: Figure A-1 shows the history of selected ABAG employment projections, including *Projections 2013,* as well as ABAG 2017P and REMI H projections, and a straight continuation of the 1990 to 2010 trend.[5] *Projections 2013* is at the historic long-term trend, ABAG 2017P is only slightly above the line, while REMI H is about 9 percent above ABAG 2017P, but still trending below the highest employment forecasts from *Projections 2002* and *Projections 2007*.

Figure A-1: Past and Alternative Future Employment Projections

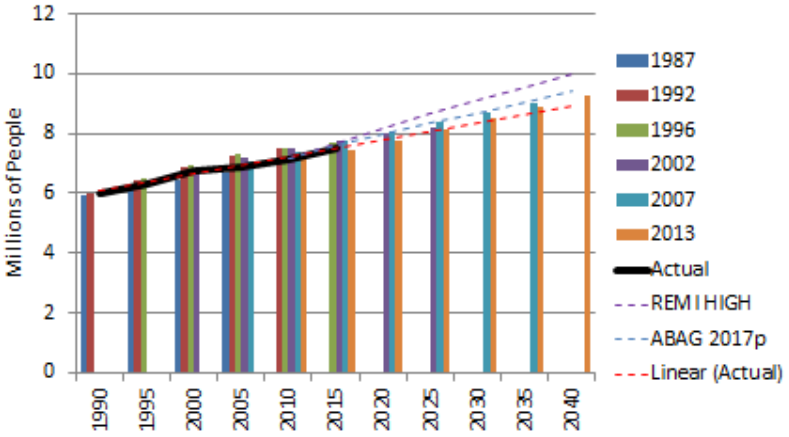



Source: ABAG from earlier Projections series and California Employment Development Department.
* BLS totals are lower than ABAG totals—do not include proprietors and self employed.
2015 date is actually October 2014.

[5] This differs from our highest trend extrapolation, which assumes a continuation of 1990 to 2010 growth rates applied to every sector in every county. In contrast, the trend line shown here is based on an extrapolation of the overall regionwide employment level.

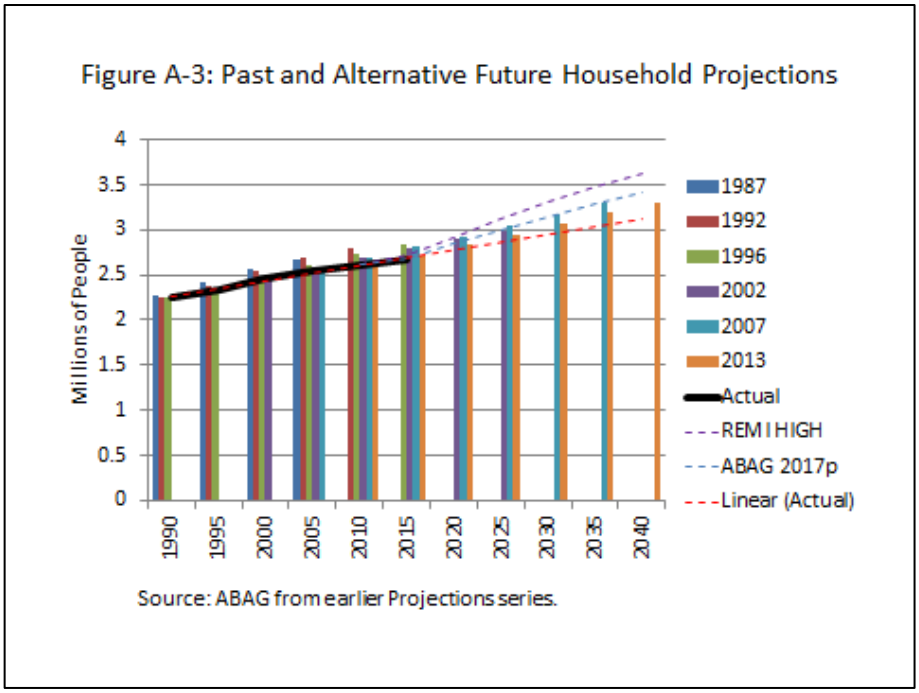
Population: Comparing population projections, *Projections 2013* closely tracks historic trends, ending slightly above the trend level in 2040. ABAG 2017P gives a total about 1.5 percent above the *Projections 2013* level, while REMI H is above *Projections 2013* by 7.5 percent and more than ten percent above the trend level in 2040. REMI H quickly jumps above all historic projection levels, while ABAG 2017P tracks the *Projections 2007* levels.

Figure A-2: Past and Alternative Future Population Projections




Source: ABAG from earlier Projections series and California Department of Finance.

Households: Figure 3 shows earlier household projections, as well as ABAG 2017P and REMI H projections and the trend line. *Projections 2013* was about 5 percent above the extrapolated trend line. ABAG 2017P is 2.4 percent above the *Projections 2013* level, while REMI H is 10 percent above the *Projections 2013* level.




Using ABAG 2017p provides a modest change from employment and population projections that were the basis for *Projections 2013* while identifying potential housing demand at a higher level than was described in *Plan Bay Area 2013*. ABAG 2017p is well within the range of possible employment, population and household growth estimated by the variety of methods applied during the forecasting process.

*Interpreting and Using Projections*

For those who are concerned that a higher or lower set of numbers would be appropriate, there are a couple of key points to consider. First, in employment projections, because of the cyclicality of employment, there is no clear target to aim for, much less to hit. Certainly it is likely that employment at some point may be substantially higher than projected in ABAG 2017p sometime between 2015 and 2040. At the same time, it is quite conceivable that at some point in that period, employment will be lower than it is in 2015. The alternative applied here allows for continuing employment and population growth, without assuming a major long-term transformation in how the region grows relative to the state and nation.

Second, from a slower growth perspective, housing constraints could well keep population and household growth closer to the DOF projection or below. However, to meet the requirement that *Plan Bay Area 2040* address the needs of all of the population, the projection must consider the possibility that at least some of these constraints are overcome over the next 25 years. The projections are reestimated every four years and will take into account both changes in the strength of the economy and in the region's ability over time to create a more flexible approach to housing the population.

More detailed technical documentation of the projections process is currently in preparation and will be available for review.

## Appendix B
## In-Commute Estimation Method

ABAG used REMI output in two different ways to estimate the in-commute.

REMI output:

- Employment by Place of Work: Bureau of Economic Analysis (BEA) employment measure
- Residence Adjusted Employment: BEA defined jobs held by residents in the region
- Labor Force: Adults working or unemployed but looking for work

Method 1:

(1) In-commute = [Employment by Place of Work] – [Residence adjusted employment].

(2) Change in in-commute = [In-commute 2040] – [In- commute 2010].

(3) Employment count adjustment—Raw employment numbers in REMI are projected using the Bureau of Economic Analysis employment numbers, which overcount employment in sectors with extensive part-time and seasonal work. ABAG translates these jobs into Bureau of Labor Statistics and Self Employment estimates (equivalent to annual average across months) using a ratio technique applied at the sector level. This adjustment is made before estimating Households from In-Commuters.

(4) Households = (In-Commuters)/1.3

Method 2:

(1) Employed Labor Force=Labor Force * [1-unemployment rate]. Unemployment rate is actual in 2010 (10.3%) and assumed to be 5.5% in 2040.

(2) Employment count adjustment—as described in Method 1, REMI BEA employment by place of work is adjusted to a Bureau of Labor Statistics plus Self Employment equivalent using ratios applied at the sector level.

(3) In-commute = [Employment by Place of Work adjusted to BLS/SE definition]-[Employed Labor Force]

(4) Households = (In-Commuters)/1.3

Method 1 produces a low estimate of commuting but a moderate estimate of change in commuting. Method 2 produces a commuting estimate in 2010 close to actual measured levels by the US Bureau of the Census, but a much lower number by 2040. For the ABAG 2017p estimate, the results on in-commute change ranged from less than zero to 25,400. We apply the higher level of change to our commute household estimates to ensure meeting the legal settlement requirements.

## Appendix C
## Technical Advisory Committee and Consultants

**ABAG Regional Forecast Technical Advisory Committee, Plan Bay Area 2040**

Irena Asmundson, Chief Economist, California Department of Finance

Clint Daniels, Principal Analyst, SANDAG

Ted Egan, Chief Economist, Controller's Office of Economic Analysis, City of San Francisco

Robert Eyler, Professor of Economics and Director, Center for Regional Economic Analysis, Sonoma State University

Gordon Garry, Director of Research and Analysis, Sacramento Area Council of Governments

Tracy Grose, Bay Area Council Economic Institute

Subhro Guhathakurta, Professor, Georgia Tech University, Department of City and Regional Planning

Hans Johnson, Senior Fellow, Public Policy Institute of California

Jed Kolko, Chief Economist, Trulia

Walter Schwarm, Demographic Research Unit, California Department of Finance

Michael Teitz, UC Berkeley and PPIC, Retired

Daniel Van Dyke, Rosen Consulting Group

**Ex-Officio Members**

David Ory, Metropolitan Transportation Commission

Michael Reilly, Metropolitan Transportation Commission

Sean Randolph, Bay Area Council Economic Institute

**Consultants**

Stephen Levy, Center for Continuing Study of the California Economy

Dowell Myers, University of Southern California

John Pitkin, Analysis and Forecasting, Inc.

**ABAG Staff**

Cynthia Kroll, Chief Economist

Aksel Olsen, Regional Planner/Analyst

Hing Wong, Senior Regional Planner

Shijia Bobby Lu, Regional Planner