2017 Provisional Population Projections for Virginia

Input/Challenges from Data Users and Responses from the Demographics Research Group

March 3, 2017
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Department of Social Services

Input submitted by the state agency and response from the Demographics Research Group
Meredith,

I have no questions or concerns about your methodology. The input comments from the localities were informative, and you provided a reasonable response to their concerns and questions. The attached “Understanding Population Projections”, particularly the last paragraph regarding error around the estimates, is very helpful to readers.

Just a suggestion: It may be helpful to users to also see your data inputs -- the 2000 Census total, 2010 Census total and the 2015 estimate -- in columns to the left of your 2020-2040 projections in the output (Excel or PDF) tables.

I'm looking forward to getting the projections by race/ethnicity, 5-year age group, and sex. When will these projections be released?

Thank you for the work that your organization put into this!

--Gail Jennings
How nice to hear from you – and how kind of you to respond.

We appreciate your suggestion regarding the inclusion of input data. We are working on that right now, and should have said data on the website today.

Assuming we are able to finalize these control total projections by the end of March (including time to secure approval of DPB), we should be in a position to release the detailed projections by the end of June.

Let us know if we can help you in any way.

Warm regards,

Meredith
City of Virginia Beach

Input and attachment submitted by the City and response from the Demographics Research Group
Follow up on VA Beach with Paul Harris – 13 Feb 2017 phone conversation

- He asked if our methodology document mentioned the top-down approach with the raking of the state-control total in November/December 2016 version, because he apparently missed it. I confirmed that the document is essentially the same, except the updates being dropping the references and the Hamilton Perry mention in the introduction (which will be relevant in the later stages).
- He commented on the numbers being different from his Compound annual growth rates (in attached excel sheet) but understood our consistent methodology.
- I specifically asked if he had alternative suggestions, and he declined, saying he just wanted to discuss the percentage change numbers.

From: Paul Harris [mailto:PHarris@vbgov.com]
Sent: Friday, February 10, 2017 11:06 AM
To: Sen, Shonel (ss4xr) <ss4xr@eservices.virginia.edu>
Subject: RE: Hi...Few Questions about Pop Projections...

Hi Shonel, great...how about 2-2:30; I wont need that long; by the way, did the methodology change from the original...the state control part? I don’t seem to remember that component, but have my original material in the office, and viewed again on line....could be faulty memory on my part....I mainly thought, for the 2030 and 2040, that exponential growth rate from 2000-2015 was applied to the 2020 estimates to obtain 2030 and so forth for 2040. I obviously may be completely confused. I have attached a spreadsheet that shows population projections based on compound annual growth rates, no exponential—but these produce nearly the same results, and the implied compound annual growth rates from the WCC projections. I think it is easy to follow, but we can discuss on Monday...and so much appreciate it....what I am seeking to understand is the declining growth rate from 2020-2030 and 2030-2040...I understand as a pop base becomes larger, it would seem reasonable for the methodology (statistical, non-case study) to assume a declining rate of growth....just need to understand....thanks so much, Shonel.

Paul R. Harris
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Department of Budget and Management Services
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Phone (office): 757-385-8234
Fax: 757-385-1857
Email: pharris@vbgov.com
Good morning Paul

I did get your voicemail, and will be glad to discuss the numbers with you. I have a couple of 30-min windows on Monday between 11-11.30 am or 2-2.30 pm. Please let me know which one of these works better for you.

Sincerely,
Shonel

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Shonel Sen, Ph.D.
Research and Policy Analyst
Demographics Research Group | Weldon Cooper Center for Public Service | University of Virginia
2400 Old Ivy Rd, Charlottesville, VA | 434.982.5861 | shonel.sen@virginia.edu

Hi Shonel, hope have been doing well….now that you have released the projections, I was hoping I could chat with you; I am off tomorrow and Monday, but can try to call you; I do have plans parts of both days, but hopefully we can connect...thanks!
City of Virginia Beach

Population Estimates and Projections

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimate</th>
<th>Growth Rate</th>
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<tbody>
<tr>
<td>2000</td>
<td>425,257</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>437,994</td>
<td>0.30%</td>
</tr>
<tr>
<td>2011</td>
<td>441,246</td>
<td>0.74%</td>
</tr>
<tr>
<td>2012</td>
<td>447,489</td>
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<tr>
<td>2013</td>
<td>449,628</td>
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</tr>
<tr>
<td>2014</td>
<td>451,672</td>
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</tr>
<tr>
<td>2015</td>
<td>453,500</td>
<td>0.40%</td>
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Intervals (Years) for Computing Compound Annual Growth Rates

<table>
<thead>
<tr>
<th>Years</th>
<th>4/1/2000</th>
<th>7/1/2015</th>
<th>CAGR</th>
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<tbody>
<tr>
<td>April 1, 2000 to July 1, 2015</td>
<td>4/1/2000</td>
<td>7/1/2015</td>
<td>0.4223%</td>
</tr>
<tr>
<td>April 1, 2010 to July 1, 2015</td>
<td>4/1/2010</td>
<td>7/1/2015</td>
<td>0.6646%</td>
</tr>
<tr>
<td>July 1, 2015 to April 1, 2020</td>
<td>7/1/2010</td>
<td>4/1/2015</td>
<td>0.45%</td>
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Compound Annual Growth Rates (CAGR)

<table>
<thead>
<tr>
<th>Years</th>
<th>4/1/2000</th>
<th>7/1/2015</th>
<th>CAGR</th>
</tr>
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</tr>
<tr>
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<td>4/1/2010</td>
<td>7/1/2015</td>
<td>0.6646%</td>
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Population Projections Based on CAGR

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimate</th>
<th>CAGR</th>
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</thead>
<tbody>
<tr>
<td>2020</td>
<td>467,996</td>
<td>CAGR from 10-15</td>
</tr>
<tr>
<td>2030</td>
<td>488,141</td>
<td>CAGR from 00-15</td>
</tr>
<tr>
<td>2040</td>
<td>509,153</td>
<td>CAGR from 00-16</td>
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</table>

WCC Population Projections (with calculated CAGRs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimate</th>
<th>CAGR from 2015 to 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>467,134</td>
<td>0.6251%</td>
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<tr>
<td>2030</td>
<td>482,578</td>
<td>0.3258%</td>
</tr>
<tr>
<td>2040</td>
<td>491,054</td>
<td>0.1743%</td>
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Fairfax County

Input and attachments submitted by the County and response from the Demographics Research Group
Dear Dr. Cai,

Thank you for giving us the opportunity to review and comment on your most recent projections. Your draft projections for Fairfax County are very close to our in-house projections. Our most recent population forecast are the following:

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
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<tbody>
<tr>
<td>2020</td>
<td>1,156,852</td>
</tr>
<tr>
<td>2030</td>
<td>1,256,916</td>
</tr>
<tr>
<td>2040</td>
<td>1,355,736</td>
</tr>
</tbody>
</table>

All are within about +/- 1 percent of your projections.

I also want to thank you for taking the time to speak with the demographers from Northern Virginia jurisdictions in December. It was very useful to hear everyone’s comments, concerns and suggestions about estimates and forecasts from Weldon Cooper Center. I was especially pleased to hear about the opportunity to share information and methodology. I am attaching Fairfax County’s brief description of our methodology, which will give you a general overview of how we estimate and forecast housing units, households and population. Our estimates and forecasts are as of January 1 for the respective year.

In addition to the methodology, we want to give some information on how we use administrative data to validate our estimates and forecasts over time. We use the following administrative data as described below:

- Fairfax Water: Water/sewer consumption by type of housing units to see trends in average household size
- School enrollment data to validate household size and how our estimates compare with American Community Survey age data
- IRS exemptions and total population trends
- On an annual basis we look at our past accuracy of our forecast. Our five year housing unit forecast fall within +/- 0.5 percent accuracy.

Future Trends

- Most future growth will occur on already developed parcels increasing the density. This will result in growth occurring more slowly and most of the growth will be in multifamily style housing.
- Much of the land being developed allows for a large range of potential uses.
- Our current 2045 forecast do not reflect build-out for our Comprehensive Plan.

I am looking forward to working you and if you have any questions or would like additional information please let me know. I can be reached at (703) 324-4516.

Sincerely yours,

Fatima Khaja
Senior Economic and Statistical Analyst
Economic, Demographic and Statistical Research Unit
12000 Government Center Parkway
Fairfax, Virginia 22035
(703) 324-4516
http://www.fairfaxcounty.gov/government/about/data/
Appendix A

Housing Units, Households and Population Estimate and Forecast Methodology

Housing Units Estimates

The real estate tax assessment files as of January 1 of the current year provide the foundation from which the current counts of housing units are estimated. In addition to the number of units located on a property, housing attributes, such as the type of unit, age of the structure, percent complete, condition of the structure, assessed value, sales value, existing land use and zoning, and access to utilities, are obtained from the real estate tax assessment files for each property. Because only habitable housing units are included, certain conditions must be met in order for a housing unit to be included in the current inventory.

Conditions for inclusion in the Housing Unit inventory include the following:

- Existing land use designates that the property contains a housing unit with residential use.
- Number of housing units on a property is consistent with existing land use.
- Housing unit has sufficient assessed value to indicate an adequate structure on the property.
- Housing unit is hooked up to utilities (i.e., water, sewer, gas, electric) and/or access to well and/or septic tank.
- Building permits and inspections data indicate sufficient completeness of construction of housing units.

In some cases, a property has an existing land use designation of vacant land with a dilapidated residential structure. Many of these housing units are old structures in very poor condition but some are still used. The criteria used to determine if a dilapidated structure is a habitable housing unit are 1) the owner’s mailing address is the same as the property address and/or 2) the housing unit is hooked up to utilities (i.e., water, sewer, electric, gas). Units meeting these criteria are brought into the current inventory. There are very few housing units in this category.
Based on the current land use, housing units are categorized as one of the following eight categories:

- Single Family Detached Units (single-family and mobile home)
- Single Family Attached Units (duplexes, townhouses and multiplexes)
- Multifamily Units (garden/low-rise, mid-rise, high-rise)

The multifamily units of 1 to 4 stories are usually considered garden style or low-rise structures, 5 to 8 stories are mid-rise structures, and 9 or more stories are high-rise structures. The housing unit estimates include both rental and owned units and housing units on Fort Belvoir but not George Mason University. The housing units on Fort Belvoir and George Mason University are not part of the county’s real estate assessment database. Fort Belvoir has provided us the information that allows us to capture the type and location of their units. Similar information will be incorporated in the future years. Also, continuing care and assisted living units are part of the housing unit inventory. They are classified in a similar manner to multifamily units.

**Households Estimates**

Current households estimates are derived as of January 1 of each year. A household is an occupied housing unit. It includes all the people who occupy that unit as their usual place of residence. The information used to determine housing occupancy rates by housing type and geography comes from water utility accounts serving Fairfax County residents, U.S. Census Bureau survey data and Fairfax County surveys of rental housing complexes. Water consumption and sewer usage is analyzed using water accounts information for housing units with individual meters. Occupancy is determined when water/sewer consumption is above a certain level. The unit is deemed vacant if there is very low consumption, zero consumption or no utilities connected. The occupancy rates are applied and calculated based on unit type and sub-geographies of the county. For homes that use both septic tanks and well water, occupancy rates cannot be determined using the data from water utility accounts. These housing units are assumed to have the same occupancy rates as other similar units within the same geographical area.

Many multifamily housing structures do not have units with individual water/sewer meters. The occupancy rates for these multifamily units are derived from the annual Fairfax County surveys of rental housing complexes containing five or more units. These surveys include information for both privately owned rental complexes and subsidized rental complexes. The occupancy rates derived from the rental complexes are applied to unmetered rental and non-rental multifamily units by sub-geographies of the county. Occupancy data from U.S. Census Bureau survey results for Fairfax County are analyzed and compared to the occupancy rates derived from the water accounts and rental housing complexes to help validate the resulting occupancy rate assumptions.
**Population Estimates**

Total population estimates are derived as of January 1 of each year. The total population estimate is a combination of household population (persons living in housing units) and group quarters population. Household population estimates are developed by applying household size factors and variances to occupied housing units (households). Household sizes differ by the type of housing unit and where the housing unit is located. The household size assumptions are based on the most recent U.S. Census Bureau survey data. Historical and current data and their variances are analyzed to discern developing patterns and trends.

Group quarters population are those persons who reside in institutions (correctional facilities, nursing homes) and non-institutional facilities (college dormitories, military barracks and adult group homes). Group quarters population for each land parcel where these facilities are located is added to the household population to obtain the total population estimate. The group quarters populations for Fort Belvoir, Fairfax County adult and juvenile detention centers, pre-release centers, nursing homes, George Mason University dormitories, and other group facilities, are obtained directly from these institutions. Institutional and group quarters population is included in all geographies.

**Housing Units, Household and Population Forecasting Methodology**

**Housing Unit Forecasts**

The forecasts of housing units in Fairfax County are based on planned residential land uses and densities, vacant and underutilized residential planned land, and residential units at various stages in the process of being developed (in the “development pipeline”). Both short-term and long-term forecasts are produced, each with different methods, with long-term forecasts building upon the short-term figures. All housing unit forecasts reflect projections as of January 1 of each year.
Short-Term Forecasts

The short-term housing unit forecast horizon is five years into the future. Active residential development is the primary influence on short-term forecasts. Fairfax County’s short-term forecasting method assumes that housing units in the “development pipeline” are expected to be built before units which may be planned at some future time that are not presently in that process. Furthermore, housing units in the process of being developed are expected to be completed according to their stage within the process as of January 1 of the current report year. The general stages considered are:

1) units under construction;
2) units with building permits issued but not started;
3) units shown on an approved development plan;
4) units shown on a development plan under review;
5) units shown on a development plan proffered as a condition to a rezoning approval; and
6) units shown on a proposed development plan submitted with a rezoning application under review.

The past five years of “development pipeline” data along with assumption data on how likely and quickly housing units will be built are used to forecast short-term housing unit growth. The “development pipeline” data is analyzed and linked by parcel (location) across the records contained in the three “development pipeline” databases to ensure that housing units are not double counted or missed. The complexities of connecting the “development pipeline” data by parcel include:

- Housing units can enter the “development pipeline” at any stage – rezoning, development plan or building permit.
- Rezoning and/or development plan housing units may move to the next stage of the “development pipeline” in sections when they are part of a larger submission.
- Rezoning applications can be associated with multiple development plans and a development plan can be associated with multiple rezoning applications.
- Some housing units in the “development pipeline” may be replacement units for already existing units, thus, not adding to additional future units.

To address the complexities of tracking and linking housing units through the “development pipeline,” several decision tree methodologies are incorporated into the short-term forecasting model.
Rezonings: Parcel identification numbers and the rezoning application numbers are used as the primary means of tracking information through the rezoning processes. Land use and zoning district information contained in a zoning application allow a determination of housing unit type to be made. If a land parcel is involved in more than one rezoning over the past five years, only the most recent rezoning application is selected to be included in the analysis. No housing unit numbers are typically associated with proposed rezoning applications but the number of housing units associated with the rezoning is usually included in the data for an approved rezoning. For rezoning applications without housing unit numbers, an estimate is developed based on the proposed zoning and the land area associated with the application. Housing units are counted in the rezoning stage of the pipeline only if there are no development plans associated with the rezoning. If a development plan(s) is associated with the rezoning, the number of housing units in the development plan(s) are removed from the number of housing units associated with the approved rezoning. Most linkages between rezoning applications and development plans can be made through tracking IDs in the relational databases for these two applications. The relationship between rezonings and development plans is many to many; that is, a single or multiple rezonings may be associated with one or several development plans.

Development Plans: Parcel identification numbers and the development plan application numbers are used as the primary means of tracking information through the development plan stage. However, parcel identification numbers associated with development plans may or may not be the same as the parcel identification numbers listed for associated rezonings or building permits. This occurs because land parcels are often consolidated and/or subdivided during the development plan stage of the “development pipeline” process. The development plan status information is used to assign whether the plan is submitted or approved and land use and zoning information is used to assign housing unit type. Housing units are counted in the development plan stage only if there are no building permits associated with the parcels in the development plan. If building permits are associated with the development plan, those housing units are assumed to have moved to the next stage of the “development pipeline” and are no longer reflected in the development plan stage. Unfortunately, connecting building permits to development plans is not always a straightforward process because sometimes the parcel identification numbers reflected in the development plans are different than those associated with the permits. To make the association between development plans and building permits, historical parcel information tracking parent-child relationships and spatial location information are used. The relationship between development plans and building permits are one to many.
Building Permits: Parcel identification numbers and building permit application numbers are used as the primary fields for tracking housing units through the building permit stage. The permit application number is used to link building permits to its inspections. The parcel identification number associated with a building permit may or may not be a current parcel identification number and may or may not match the parcel identification numbers in the associated development plan. This makes linking development plans and building permits difficult. Therefore if a link is not found between a building permit and a development plan, historical parcel identification numbers linked by parent-child relationships are used to find associations. Housing units in the building permit stage of development also are checked against housing units in the current inventory to determine if the units are already captured in the current inventory. This occurs when the housing units under construction are replacement units or are complete enough to already be captured in the current inventory (80 percent complete). A housing unit in the building permit stage is considered “under construction” if any inspections are associated with the building permit.

Likelihood of Development Assumptions: Not every prospective housing unit in the “development pipeline” will be built and actually become a housing unit. Thus, assumptions are made about the likelihood of housing units in each development stage becoming future housing units. These likelihood assumptions are developed using statistical analyses of the historical proportions of “development pipeline” housing units that are eventually built.

Timing of Development Assumptions: Housing units in the “development pipeline” may take less than a year to more than 10 years to be completed. Therefore, assumptions about how quickly housing units will progress through the “development pipeline” are made. These timing assumptions are based on statistical analyses that track how quickly housing units move to completion from each stage of the “development pipeline.” The statistical analyses provide average lengths of time, medians and deciles.

Long-Term Forecasts

The long-term housing unit forecast horizon is beyond five years in the future. Several types of assumptions are developed to produce long-term housing unit forecasts – planned land capacity assumptions, density range assumptions, site characteristics assumptions, and timing of development assumptions. The long-range housing unit forecasts are developed for a 30 year forecast period. For each land parcel, three housing unit forecast scenarios are produced – low, most likely and high forecasts. These scenarios are based on the range of density allowed in the Fairfax County Department of Planning and Zoning’s Comprehensive Plan for Fairfax County, Virginia, the proximity of the property to business and transportation hubs or other features, and parcel
characteristics that would make it more or less attractive for development. Only the most likely forecast scenarios are published in the annual *Demographic Reports*.

**Planned Land Capacity Assumptions:** After units in the development process are forecast to be completed, areas either reach buildout (no additional capacity exists for residential development according to planned land uses and exercising of plan option densities in the currently adopted *Comprehensive Plan*) or have additional capacity for residential development remaining on vacant or underutilized land. Land parcels located in plan option areas are treated differently then land parcels not contained in plan option areas. The additional capacity of land parcels not contained in plan option areas are analyzed individually. The additional capacity of land parcels contained in plan option areas are analyzed as a group across all parcels comprising the plan option area.

**Density Range Assumptions:** Unlike the other long-range forecast assumption categories, the density range assumptions only affect the most likely forecast scenarios and do not apply to parcels contained in plan option areas. Planned land uses associated with parcels provide a density range (i.e., 5 to 8 housing units per acre) rather than a specific density. Thus for the most likely forecast scenario, assumptions must be made about whether the parcel will be developed at the low, mid or high end of the planned land use density. These density range assumptions are developed by analyzing the proximity of the parcel to factors such as business and transportation hubs, sensitive watersheds, and sewers. Parcels near business and transportation hubs are most likely to be developed at the high end of the planned land use density; parcels in watersheds and that lack access to sewers are most likely to be developed at the low end of the planned land use density; whereas, other parcels are likely be developed at the middle of the planned land use density range.

**Site Characteristics Assumptions:** Site specific characteristics are used to modify the likelihood and capacity of development as indicated by the *Comprehensive Plan* and its options. The site characteristics considered include recent sales of vacant property; recent development activity; age of existing structures; resource protection areas; tax exempt status; small additional potential; and buildability factors such as flood plains, steepness of slope, accessibility, and lack of sewers on land that does not percolate. Within the model, separate and unique assumptions can be developed for each of these site factors.

**Timing of Development Assumptions:** Long-range forecast ‘timing of development assumptions’ are based on past trends and housing absorption rates. In addition, external events such as economic growth cycles are taken into account when developing these long-range ‘timing of development assumptions.’ Different ‘timing of development assumptions’ are applied to land parcels based on the site characteristics of the parcel.
Household Forecasts

Households are occupied housing units. Thus, household forecasts are derived from the housing unit forecasts and reflect projections as of January 1 of each year. Forecast households are calculated as the forecast number of housing units by type multiplied by a forecast occupancy rate. Occupancy rates are derived as the inverse of housing vacancy rates (i.e., occupancy rate = 1 – vacancy rate). Vacancy/occupancy rates are applied based on estimates by housing type and geographical area.

Vacancy and Occupancy Rate Assumptions: Current vacancy rate assumptions are developed using information from several sources. Estimated vacancy rates by housing type and geography are derived using data from the U.S. Census Bureau’s American Community Surveys, survey data collected on the county’s rental housing complexes, and an analysis of inactive water accounts. In the forecast years, vacancy/occupancy rates by type of housing unit are assumed to remain constant in Fairfax County. This is based on past trends in vacancy/occupancy rates, which have remained stable by housing unit type for the last 20 years. However as multifamily housing becomes a larger proportion of the total housing stock in the future, overall vacancy rates are expected to trend higher because multifamily housing typically has higher vacancy rates than single family detached and attached housing.

Population Forecasts

Total population is the sum of two components – household population and group quarters population. Two different methodologies are used to estimate and forecast household population and group quarters population. Household population is comprised of those persons who live in housing units. Group quarters population are those persons who live in institutions such as nursing homes, dormitories, military facilities, etc. The Fairfax County total population forecasts reflect projections as of January 1 of each year.
Household Population Methodology

Household population forecasts are derived from housing unit and household forecasts by housing unit type and geographic area. Forecasts of household population are calculated using the following methodology. The forecasts of the number of housing units by type are multiplied by occupancy rates and average household sizes. Both occupancy rates and average household sizes are assigned to these housing unit counts by housing type and geographic area.

*Occupancy Rate Assumptions:* Occupancy rate assumptions are developed using information from several sources. Estimated occupancy rates by housing type and geography are derived using data from the U.S. Census Bureau’s American Community Surveys, survey data collected on the county’s rental housing complexes, and an analysis of inactive water accounts. In the forecast years, occupancy rates by type of housing unit are assumed to remain constant in Fairfax County. This is based on past trends in occupancy rates, which have remained stable by housing unit type for the last 20 years. However as multifamily housing becomes a larger proportion of the total housing stock in the future, overall occupancy rates are expected to trend lower because multifamily housing typically has lower occupancy rates than single family detached and attached housing.

*Average Household Size Assumptions:* Household size assumptions are based primarily on the most recent U.S. Census Bureau data and Fairfax County surveys. Historical, current and forecast average household sizes and variances produced by the U.S. Census Bureau and Fairfax County surveys are analyzed to develop current and forecast average household sizes and variances by housing unit type and geography. The trends influencing average household sizes in Fairfax County include housing type, racial/ethnic diversity, and socioeconomic factors.

Household sizes tend to differ by the size and style of housing units. Fewer persons per unit typically live in multifamily housing than in single family detached and single family attached housing. As the mix of housing styles changes over time to include more multifamily housing, downward pressure is applied to the county’s overall average household size.

Households headed by racial and ethnic minorities in Fairfax County tend to have larger average household sizes than households with White heads of household. Since 1970, these minority households have become an increasingly larger proportion of all households. This trend has exerted upward pressure on Fairfax County’s overall average household size. However within each racial/ethnic group, household sizes generally have been slowly shrinking over time due to socioeconomic factors.
Socioeconomic trends that have tended to reduce average household sizes within households of all racial and ethnic groups include:

- Fewer conventional partnerships. More adults are remaining single whether or not they are parents and those who do marry often delay until they are older than past generations. In addition, better finances and fewer negative connotations have resulted in higher numbers of divorces.

- Fewer offspring. Greater economic and occupational choices for women have resulted in fewer children per family and delays in beginning families.

- More choices for older adults. Older adults have more alternatives that allow them to age independently and, thus, they are less likely to live with family as they age.

One socioeconomic trend recently has become strong enough to put noticeable upward pressure on household sizes in Fairfax County—economic stress. Economic stress often results in the doubling up of both family and nonfamily members. The primary sources of this economic stress are two-fold. This economic stress is coming from the current recession with its high unemployment and/or under-employment and is coming from the area's high housing costs (housing affordability).

**Group Quarters Population Methodology**

Group quarters population for each geographical area is added to the household population to obtain the total population estimate. The population of special institutions, such as Fort Belvoir, Fairfax County adult and juvenile detention centers, pre-release centers, nursing homes, George Mason University dormitories, and other group facilities, are obtained directly from these institutions. Institutional and group quarters population is included in all geographies.
<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>1,131,886</td>
<td>1,156,852</td>
<td>1,204,146</td>
<td>1,256,916</td>
<td>1,307,183</td>
<td>1,355,736</td>
<td>1,405,107</td>
</tr>
<tr>
<td>Housing Units</td>
<td>413,746</td>
<td>428,350</td>
<td>453,134</td>
<td>478,035</td>
<td>501,636</td>
<td>524,354</td>
<td>547,360</td>
</tr>
<tr>
<td>Households</td>
<td>402,362</td>
<td>413,305</td>
<td>434,506</td>
<td>458,290</td>
<td>480,994</td>
<td>502,902</td>
<td>525,094</td>
</tr>
</tbody>
</table>
From: Cai, Qian (qc6q) [mailto:qc6q@eservices.virginia.edu]
Sent: Wednesday, February 15, 2017 9:27 AM
To: Khaja, Fatima <Fatima.Khaja@fairfaxcounty.gov>
Subject: Re: Fairfax County Estimates and Projections

Dear Ms. Khaja,

Thank you for taking the time to provide such thoughtful and enlightening feedback. I am pleased to know that our two separate sets of projections, based on different methodologies, are so close. I am even more excited to learn about your sophisticated administrative data and estimates & projections methodology. Thank you for generously sharing the valuable information and knowledge with us.

We deeply appreciate the opportunity to work with local demographers, planners, and researchers, and hope over the time we will together build an extensive, strong network that enables more sharing of knowledge and concerns, more learning of data, methodology, and best practices. The conference call with the Northern Virginia Demographers Network last December was an excellent opportunity for us to see different perspectives and to inform the localities the purpose and parameters of our projections. I believe that more open conversations like this would further help us to do a better job in serving the Commonwealth by providing timely and high quality population data.

Thank you again for your comments and for your support.

Warm regards,
Qian

Qian Cai (pronounced “chien tsai”)
Director, Demographics Research Group
Weldon Cooper Center for Public Service
University of Virginia

Phone: 434-982-5581
Email: qian.cai@virginia.edu

www.coopercenter.org/demographics
City of Hampton

Challenge letter and accompanying documents submitted by the City and response from the Demographics Research Group
February 22, 2017

Qian Cai  
Director of Demographics Research Group  
University of Virginia  
Weldon Cooper Center for Public Service  
2400 Old Ivy Road  
Charlottesville, VA 22903

RE: Challenge to Provisional Total Projections

Dear Dr. Cai:

Thank you for allowing localities the opportunity to review and provide feedback on the Weldon Cooper Center's provisional population projections. We would like to confirm that the 2000 Census data point was used in calculating the population projections for 2030 and 2040. If it wasn't, we would like further clarification on how those two projections were calculated. If the 2000 Census data was used, the City of Hampton would like to challenge our locality's provisional total population projections for 2030 and 2040. After reading the provided documentation on methodology and input data, the City is challenging our projections based on the criteria that input data used in developing the projections is incorrect.

Our concern is with the 2000 Census population number of 146,437. When the 2000 Census was conducted for the City of Hampton, an anomaly was detected in the Census Tract containing Langley Air Force Base; the population appeared to grow by 155%, and 8,032 residents were found to be in "Military Disciplinary Barracks," up from 0 residents in 1990. An article from the Daily Press is attached that further elaborates the issue, and includes comment from the Weldon Cooper Center.

During that time, Hampton worked with Langley Air Force Base to determine the City's "correct" population figure for the year 2000. Langley provided the City with their 2000 population. Hampton took the difference between this population and the population anomaly stated by the Census to calculate a correct population of 138,325 for the entire City. This is just over 8,000 fewer people than are reported in the 2000 Census. Since that Census, Hampton has adopted the Weldon Cooper Population Projections for official City use.

Hampton is understandably concerned that this artificially high Census population number makes it appear that the City has experienced fairly significant population decline between 2000 and 2015, when in fact population has been stable over the last 10-15 years. Any consideration that can be given to resolving this issue would be greatly appreciated.

Sincerely,

Mary B. Bunting  
City Manager
Mystery "inmates" credited to Hampton

Census mistakenly inflates city's head count by 8,000.

By Marc Davis
The Virginian Pilot

HAMPTON — Does it feel less crowded around here? It should.

Hampton has 8,000 fewer people than you think.

To be precise, the Census Bureau thinks there are 8,032 inmates in an unspecified correctional facility at Langley Air Force Base. It says so in the Census 2000 results, and those inmates are counted in the city's official head count.

But the inmates really aren't there.

"We have no explanation," Hampton Planning Director Terry P. O'Neill said Thursday. "There are no major new facilities. Nobody at the Census Bureau, as of yet, can tell us or has gotten back to us."

The net result: Hampton probably doesn't have a population of 46,437, which is the official Census 2000 count. The true population is probably 38,405. For now, though — and maybe forever — the official population remains. Nobody is correcting it.

"As far as the Census Bureau is concerned, unless they find an error on their part, the number they have published will stand," O'Neill said. "And unless we have a statistical reason why that shouldn't be there, then that number will stand."

Census officials said Thursday they could not comment on the discrepancy.

Officially, according to the census, Hampton gained 12,644 people during the 1990s. But without the Langley inmates who seem to exist only on paper, Hampton really gained just 4,612 people.

To put that in perspective: Officially, Hampton grew faster than Virginia Beach during the 1990s. The Peninsula city showed 9 percent growth vs. the resort city's 8 percent growth.

But that's only on paper. Without the nonexistent inmates, Hampton actually grew just 3 percent during the decade — roughly the same as tiny Galax andWinchester.

Experts at the University of Virginia suspected something was wrong when the Census Bureau released new, total population figures in March 2001. "We were comparing our population estimates with the official numbers, and our estimates were way, way off," said Julia Martin, chief demographer at the Weldon Cooper Center for Public Service at U.Va. "It kind of annoyed and amused us.

Hampton officials, however, didn't suspect anything at the time. The new, official population number for Hampton fell within the city's own unofficial population estimate range.

Planners didn't realize something was wrong until last December, when more detailed figures emerged. "All the other census tracts seemed to fall within the range of the explainable," O'Neill said.

For the record: There are no inmates at Langley. There also is no jail. All Langley prisoners go to the brig at Norfolk Naval Station, which has only 136 prisoners.

Coincidentally, Langley does have about 3,600 active-duty men and women, but they probably were not miscounted as inmates. The census counts people where they live, and most Langley employees live off base. Langley has only 205 occupied houses on base, plus another 1,175 houses five miles away.

Hampton planners informed the City Council about the apparent error in February, but so far no one has adjusted the city's official head count.

And nobody knows — not at the Census Bureau, not at City Hall and not at Langley where the extra 8,000 people came from.

Capt. David May, a base spokesman, took the news well. "You can call us inmates if you like," he said Thursday, "but they do let us out from time to time."

Reach Marc Davis at 446- 2303 or mdavis@pilotonline.com
March 3, 2017

Mary Bunting
City Manager
City of Hampton
22 Lincoln Street
Hampton, VA 23669

Re: Challenge to Provisional Total Population Projections

Dear Ms. Bunting:

Thank you for your letter and the newspaper article regarding the 2000 Census count for the City of Hampton, which was used as part of the input data in the development of the 2030 and 2040 population projections.

The City of Hampton’s challenge to the 2030 and 2040 projections is that they are based, in part, on the 2000 Census count, which the City believes is inaccurate. We understand this concern, but we do not have the authority to adjust the official census count. Challenges to census counts must be submitted to the Census Bureau during the "Count Question Resolution" period to ensure all challenges to official counts follow a standard review process and that any adjustments to official counts are made solely by the Census Bureau.

Once again, thank you for sharing your concern with us, but we are not able to change the projections for the City of Hampton for 2030 and 2040. Please do not hesitate to contact me if you have further questions.

Sincerely,

Qian Cai
Director, Demographics Research Group
County of Arlington

Challenge letter and accompanying documents submitted by the County and response from the Demographics Research Group
February 23, 2017

Qian Cai  
University of Virginia  
Weldon Cooper Center for Public Service  
P.O. Box 400206  
Charlottesville, VA 22904

RE: Challenge to WCC Provisional Projections Released February 10, 2017

Dear Ms. Cai:

Thank you for the opportunity to review and comment on Weldon Cooper Center’s (WCC) *Provisional Total Projections by Locality* released on February 10, 2017. We appreciate that previous comments regarding Northern Virginia regional growth rates and share of the Commonwealth’s growth have been considered during this round of projections. However, we have found that the most recent projections for Arlington County greatly exceed our estimate and are not plausible.

This letter is an official challenge to the input data used to produce population projections for 2020, 2030, and 2040. The accuracy of the projections is dependent on the accuracy of input data from the 2000 Census, 2010 Census, and 2015 WCC Population Estimates. In particular, the WCC 2015 Population Estimates report Arlington’s population to be 234,678 and does not accurately reflect growth that has occurred between 2010 and 2015 as documented in Attachment 1: Arlington County’s Profile 2015.

As shown in Attachment 2: Arlington County Population Growth 1950-2040, Arlington has grown at a rate of approximately 1% annually since 1980. WCC estimates that between 2010 and 2015 a much larger annual growth rate of 2.6% occurred in the County, resulting in 27,000 new residents. During this same period, Arlington County estimates an approximate population increase of 9,100 residents, a difference of nearly 18,000 residents. WCC’s overestimation of Arlington’s population is due to the variables used in the estimate model, most notably the housing unit variable. Arlington County has prepared a more detailed review of WCC 2015 Population Estimates and the housing unit variable which can be found in Attachment 3: Review of WCC 2015 Population Estimates for Arlington County.

Arlington County is requesting WCC to reexamine the use of 2015 WCC Estimates in the population projection process. We also recommend that a margin of error be developed and
included for each locality’s estimate to better reflect actual population totals. This margin can be used to produce a range in the total population projections for the Commonwealth and for each locality.

In addition, over the last two years, Arlington County underwent an extensive evaluation through the Community Facilities Study that validated the County’s Population Estimates and Forecast. This study also produced population projection scenarios based on varying migration rates. This study confirms that Arlington’s 2020 population will not reach that projected by WCC. The projection scenario with high migration into the County projects Arlington’s 2020 population to be 232,200.

Arlington welcomes further discussion with WCC on how to continually improve demographic estimates and projections and data sharing throughout the Commonwealth.

We look forward to continue working with you on this projections process and on future projects.

Sincerely,

[Signature]

Robert J. Duffy, AICP
Planning Director
Arlington County, VA

CC:
Meredith Gunter, Interim Director, Weldon Cooper Center
Dan Timberlake, Director, Virginia Department of Planning and Budget
Mark Schwartz, County Manager, Arlington County, VA
Gabriela Acurio, Deputy County Manager, Arlington County, VA
Steve Cover, CPHD Director, Arlington County, VA
Kris Krider, UDR Supervisor, Arlington County, VA
Patricia Carroll, Legislative Liaison, Arlington County, VA

Attachment 1: Arlington County’s Profile 2015
Attachment 2: Arlington County Population Growth 1950-2040
HISTORY
+ Arlington is an urban county of about 26 square miles located directly across the Potomac River from Washington DC. No incorporated towns or cities lie within Arlington’s boundaries.
+ Originally part of the area surveyed for the nation’s capital, the portion of the District on the west bank of the Potomac River was returned to the Commonwealth of Virginia by the U.S. Congress in 1846. This area was known as Alexandria City and Alexandria County until 1920 when the county portion was renamed Arlington County.

DEMOGRAPHICS
+ As of January 1, 2015, Arlington had an estimated population of 216,700, reflecting an increase of 4.4% since 2010. On average, Arlington’s population has grown at about 1% per year since 2000.
+ Arlington County population estimates are based on housing unit counts and residential construction activity, which is closely monitored for changes and reported quarterly through development tracking reports. The U.S. Census Bureau also produces estimates at the county level that are higher due in part to the population migration methodology utilized by the U.S. Census Bureau. Historically, Arlington County’s estimates are closer than the Census Bureau’s estimates to the actual Decennial Census counts.
+ Arlington’s population is forecast to grow to 283,000 persons by 2040.
+ As one of the most densely populated jurisdictions in the country, Arlington continues to support nationally recognized smart growth principles with transit oriented development, concentrating density around transit stations. As of January 1, 2015, Arlington had a population density of 8,399 persons per square mile.
+ Arlington Public Schools children who speak 88 languages and hail from 111 countries reflect the diversity of the County.
+ Arlington County is the most educated county in the Nation. In 2013, 71.7% of adults age 25 and older had a bachelor’s degree or higher and 37.4% had a graduate or professional degree.

COMMUNITY
+ Arlington residents are actively involved in the community with 61 registered civic and citizen associations, 45 active County Board Commissions, and 178 community service organizations.

EMPLOYMENT
+ As of January 1, 2015, Arlington had an estimated 221,700 at-place employees. Government employees make up 24.2% of Arlington’s labor force.
+ Arlington’s top 5 private employers are Deloitte, Accenture, Virginia Hospital Center, SAIC/Leidos, and Marriott International.
+ Arlington has the lowest unemployment rate in the region at 3.4%
+ Jobs in Arlington are forecast to grow to 301,300 jobs by 2040.

DEVELOPMENT
+ Arlington has more private office space than the downtowns of Los Angeles, Dallas, Denver, Seattle, or Atlanta. Arlington continues to grow with the addition of new development. In 2014, 1,539 residential units were completed.

TRANSPORTATION
+ Arlington residents and workers have a range of options for work and personal trips, and are served by 11 Metrorail station, 13 ART bus routes, 70 Capital Bikeshare stations, and 86 miles of bicycle routes and jogging trails.
+ The Pentagon Metrorail station has the highest volume of activity with over 30,000 combined station entries and exits for an average weekday.
POPULATION AND EMPLOYMENT FORECASTS

Source: Preliminary Round 8.4 Forecast
Submitted to MWCOG January 2015, Pending Approval
Prepared by: CPHD, Planning Division.

ARLINGTON IN THE DC METRO AREA

Source: Preliminary Round 8.4 Forecast
Submitted to MWCOG January 2015, Pending Approval
Prepared by: CPHD, Planning Division.
### POPULATION

January 1, 2015 Population (Planning Division Estimate) 216,700  
2010 Population (U.S. Census Bureau Decennial Census) 207,627  
2000 Population (U.S. Census Bureau Decennial Census) 189,453

### AGE DISTRIBUTION

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>January 2015*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5</td>
<td>10,397</td>
<td>11,782</td>
<td>13,000</td>
</tr>
<tr>
<td>5 - 19</td>
<td>24,016</td>
<td>23,455</td>
<td>26,100</td>
</tr>
<tr>
<td>20 - 24</td>
<td>16,535</td>
<td>17,704</td>
<td>18,300</td>
</tr>
<tr>
<td>25 - 34</td>
<td>47,675</td>
<td>57,402</td>
<td>60,800</td>
</tr>
<tr>
<td>35 - 44</td>
<td>32,664</td>
<td>32,868</td>
<td>35,500</td>
</tr>
<tr>
<td>45 - 64</td>
<td>40,404</td>
<td>46,362</td>
<td>47,800</td>
</tr>
<tr>
<td>65 - 84</td>
<td>15,244</td>
<td>15,239</td>
<td>17,000</td>
</tr>
<tr>
<td>85 and Over</td>
<td>2,518</td>
<td>2,815</td>
<td>2,700</td>
</tr>
<tr>
<td>Total Population</td>
<td>189,453</td>
<td>207,627</td>
<td>216,700</td>
</tr>
</tbody>
</table>

### RACE AND HISPANIC/LATINO ORIGIN

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic/Latino</td>
<td>154,185</td>
<td>176,245</td>
<td>84.9%</td>
</tr>
<tr>
<td>White</td>
<td>114,489</td>
<td>132,961</td>
<td>64.0%</td>
</tr>
<tr>
<td>Black/African-American</td>
<td>17,244</td>
<td>17,088</td>
<td>8.2%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>16,346</td>
<td>19,895</td>
<td>9.6%</td>
</tr>
<tr>
<td>Other/Multi-Racial</td>
<td>6,106</td>
<td>6,301</td>
<td>3.0%</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>35,268</td>
<td>31,382</td>
<td>15.1%</td>
</tr>
<tr>
<td>Total Population</td>
<td>189,453</td>
<td>207,627</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau - Census 2000 SF1: P004; 2010 Decennial Census 2010 SF1: P5; Arlington Planning Division estimates, January 2015 Update;  
*Due to change in methodology, estimated age is not comparable to previous years.

### HOUSEHOLDS

January 1, 2015 Households (Planning Division Estimate) 102,100  
2010 Households (U.S. Census Bureau Decennial Census) 98,050  
2000 Households (U.S. Census Bureau Decennial Census) 86,352

### HOUSEHOLD SIZE

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>2013 ACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Person</td>
<td>35,216</td>
<td>40,516</td>
<td>37,256</td>
</tr>
<tr>
<td>2 Persons</td>
<td>27,419</td>
<td>31,738</td>
<td>30,962</td>
</tr>
<tr>
<td>3 Persons</td>
<td>10,432</td>
<td>11,633</td>
<td>11,602</td>
</tr>
<tr>
<td>4 Persons</td>
<td>7,559</td>
<td>8,793</td>
<td>8,978</td>
</tr>
<tr>
<td>5+ Persons</td>
<td>5,726</td>
<td>5,370</td>
<td>4,666</td>
</tr>
<tr>
<td>Total Households</td>
<td>86,352</td>
<td>98,050</td>
<td>94,454</td>
</tr>
</tbody>
</table>

Average Household Size 2.15  


### HOUSEHOLD COMPOSITION

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>2013 ACS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Households</td>
<td>39,322</td>
<td>41,607</td>
<td>41,512</td>
</tr>
<tr>
<td>With own children under 18 years</td>
<td>16,625</td>
<td>17,853</td>
<td>19,320</td>
</tr>
<tr>
<td>Married-couple families</td>
<td>12,800</td>
<td>14,228</td>
<td>14,876</td>
</tr>
<tr>
<td>Male householder, no wife families</td>
<td>2,945</td>
<td>2,758</td>
<td>3,346</td>
</tr>
<tr>
<td>Female householder, no husband families</td>
<td>880</td>
<td>867</td>
<td>1,098</td>
</tr>
<tr>
<td>Without children under 18 years</td>
<td>22,697</td>
<td>23,754</td>
<td>24,192</td>
</tr>
<tr>
<td>Nonfamily Households</td>
<td>47,030</td>
<td>56,443</td>
<td>50,942</td>
</tr>
<tr>
<td>Total Households</td>
<td>86,352</td>
<td>98,050</td>
<td>94,454</td>
</tr>
</tbody>
</table>

ACS = American Community Survey. Estimates represent 2009-2013. Survey administered to 6.6% of population
HOUSING UNITS

January 1, 2015 Housing Units (Planning Division Estimate) 110,300
2010 Housing Units (U.S. Census Bureau) 105,404
2000 Housing Units (U.S. Census Bureau) 90,426

TYPE OF HOUSING UNIT (2000 and 2015)

<table>
<thead>
<tr>
<th>Type</th>
<th>2000</th>
<th>January 1, 2015*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family, detached</td>
<td>27,668</td>
<td>28,500</td>
</tr>
<tr>
<td>Single-family, attached</td>
<td>10,284</td>
<td>11,000</td>
</tr>
<tr>
<td>Multi-family (3+ units)</td>
<td>52,373</td>
<td>70,700</td>
</tr>
<tr>
<td>Other</td>
<td>101</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total Housing Units</strong></td>
<td><strong>90,426</strong></td>
<td><strong>110,300</strong></td>
</tr>
</tbody>
</table>

*Figures may not sum due to rounding.

INCOME

ARLINGTON

2015 Median Household Income $106,400
2015 Per Capita Income $85,900
Source: Arlington County Planning Division 2015 estimates.

2014 Effective Buying Income $9.85 Billion
Source: ESRI

WASHINGTON METROPOLITAN AREA

2015 Median Family Income for Family of Four $109,200

EDUCATION

PUBLIC SCHOOLS ENROLLMENT (September 2014)

<table>
<thead>
<tr>
<th>No. of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary School (PreK - 5) 13,445</td>
</tr>
<tr>
<td>Middle/High School (6 - 12) 11,084</td>
</tr>
<tr>
<td>Stratford Program 31</td>
</tr>
<tr>
<td>Total (PreK - 12) 24,529</td>
</tr>
</tbody>
</table>

Expenditures per Pupil (Fiscal Year 2015) $19,040
High School Graduates Continuing Their Education 87%
Source: Arlington County Public Schools.

EDUCATIONAL ATTAINMENT

Population Age 25 and Older (2013)

- Less than 9th Grade: 4%
- 9th to 12th Grade, no diploma: 3%
- High School Graduate (includes equivalency): 9%
- Some College: 9%
- Bachelor’s Degree: 34%
- Graduate or Professional Degree: 37%

Source: U.S. Census Bureau, 2013 American Community Survey (B15003).

POPULATION MIGRATION - INFLOW (2012)

<table>
<thead>
<tr>
<th>Source of Migration</th>
<th>No. of People</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>From other parts of VA</td>
<td>2,853</td>
<td>9.5%</td>
</tr>
<tr>
<td>From other parts of MD</td>
<td>930</td>
<td>3.1%</td>
</tr>
<tr>
<td>From other states</td>
<td>11,092</td>
<td>37.1%</td>
</tr>
<tr>
<td>From other countries</td>
<td>4,031</td>
<td>13.5%</td>
</tr>
<tr>
<td><strong>TOTAL POPULATION INFLOW</strong></td>
<td><strong>29,911</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Due to change in source, migration estimates are not comparable to previous Profile issues.

Source: U.S. Census Bureau, 2008-2012 American Community Survey 5-Year Estimates.
## LABOR FORCE & UNEMPLOYMENT

Civilian Labor Force (2014) ........................................... 139,843  
Unemployment Rate (2014) ........................................... 3.4%

### AT-PLACE EMPLOYMENT (January 2015)*

**TOTAL AT-PLACE EMPLOYMENT** ........................................... 221,700**
- Wage and Salary Jobs ........................................... 217,200  
- Self-Employed ........................................................... 4,500

**AT-PLACE JOBS BY INDUSTRY**

<table>
<thead>
<tr>
<th>Industry</th>
<th>Jobs</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>4,200</td>
<td>1.9%</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>10,600</td>
<td>4.8%</td>
</tr>
<tr>
<td>Transportation and Warehousing</td>
<td>9,700</td>
<td>4.4%</td>
</tr>
<tr>
<td>Information</td>
<td>5,900</td>
<td>2.7%</td>
</tr>
<tr>
<td>Finance and Insurance</td>
<td>6,700</td>
<td>3.0%</td>
</tr>
<tr>
<td>Real Estate and Rental/Leasing</td>
<td>8,300</td>
<td>3.7%</td>
</tr>
<tr>
<td>Professional and Technical Services</td>
<td>47,700</td>
<td>21.5%</td>
</tr>
<tr>
<td>Hospitality and Food Services</td>
<td>17,000</td>
<td>7.7%</td>
</tr>
<tr>
<td>Other Services</td>
<td>50,900</td>
<td>23.0%</td>
</tr>
<tr>
<td>Government</td>
<td>53,600</td>
<td>24.2%</td>
</tr>
<tr>
<td>All Other</td>
<td>7,100</td>
<td>3.2%</td>
</tr>
<tr>
<td><strong>Total Jobs</strong></td>
<td>221,700</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

*At-place employment refers to jobs located in Arlington.

**Employment estimate reflects 4th Quarter 2014 office vacancy rates, which are higher than average due to the impacts of BRAC and sequestration. Due to change in methodology, estimated 2014 and 2015 employment is not comparable to previous years.

Source: Arlington County Planning Division January 2015 estimates.

## GRADUATE PROGRAMS, COLLEGES AND UNIVERSITIES

### 2014-2015 ENROLLMENT

<table>
<thead>
<tr>
<th>Institution</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marymount University</td>
<td>3,441</td>
</tr>
<tr>
<td>George Mason University</td>
<td>2,443</td>
</tr>
<tr>
<td>Art Institute of Washington*</td>
<td>1,499</td>
</tr>
<tr>
<td>DeVry University*</td>
<td>1,328</td>
</tr>
<tr>
<td>Argosy University*</td>
<td>925</td>
</tr>
<tr>
<td>George Washington University</td>
<td>832</td>
</tr>
<tr>
<td>Westwood College *</td>
<td>371</td>
</tr>
<tr>
<td>Chamberlain College of Nursing-Virginia</td>
<td>364</td>
</tr>
<tr>
<td>Graham Webb International Academy of Hair*</td>
<td>160</td>
</tr>
</tbody>
</table>

*National Center for Education Statistics, Fall 2013.

Source: School or University, unless otherwise noted.
**TOP 10 PRIVATE EMPLOYERS**

<table>
<thead>
<tr>
<th>Company</th>
<th>Arlington Employees</th>
<th>January 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deloitte</td>
<td>5,000-9,999</td>
<td></td>
</tr>
<tr>
<td>Accenture</td>
<td>2,500-4,999</td>
<td></td>
</tr>
<tr>
<td>Virginia Hospital Center</td>
<td>1,500-2,499</td>
<td></td>
</tr>
<tr>
<td>Marriott International, Inc.</td>
<td>1,500-2,499</td>
<td></td>
</tr>
<tr>
<td>Booz Allen Hamilton</td>
<td>1,000-1,499</td>
<td></td>
</tr>
<tr>
<td>Corporate Executive Board</td>
<td>1,000-1,499</td>
<td></td>
</tr>
<tr>
<td>CACI</td>
<td>1,000-1,499</td>
<td></td>
</tr>
<tr>
<td>Lockheed Martin Corporation</td>
<td>600-999</td>
<td></td>
</tr>
<tr>
<td>BNA Bloomberg</td>
<td>600-999</td>
<td></td>
</tr>
<tr>
<td>Marymount University</td>
<td>600-999</td>
<td></td>
</tr>
</tbody>
</table>

**RESIDENTS WORKING IN OTHER JURISDICTIONS (2006-2010)**

- To Prince William Co., VA: 843
- To Loudoun Co., VA: 1,251
- To other places in VA: 2,613
- To other places in MD: 951
- To other states: 1,198

Source: U.S. Census Bureau 2006-2010 American Community Survey.

**RESIDENTS OF OTHER JURISDICTIONS WORKING IN ARLINGTON (2006-2010)**

- From Prince William Co., VA: 12,182
- From Loudoun Co., VA: 4,011
- From other places in VA: 10,366
- From other places in MD: 10,860
- From other states: 3,799

Source: U.S. Census Bureau 2006-2010 American Community Survey.
The following projects were approved by the Arlington County Board in 2014.

**BALLSTON**
- Marymount University (SP#64) - 165,204 s.f. office, 3,000 s.f. retail and 267 residential units
- The Springs (SP#430) - 5,630 s.f. office and 104 residential units

**CLARENDON**
- 10th Street Flats (UCMUD) - 4,704 s.f. office, 3,660 s.f. retail and 104 residential units

**COLUMBIA PIKE**
- 4707 Columbia Pike (FBC) - 8,000 s.f. retail and 73 residential units

**COURTHOUSE**
- 2401 Wilson Blvd (SP#404) - 1,280 s.f. office and 161 hotel rooms
- URD associated with SP#404 - 4 residential units

**CRYSTAL CITY**
- WeLive (Crystal Plaza VI Conversion) - 5,848 s.f. retail and 252 residential units

**ROSSLYN**
- 1401 Wilson Blvd (SP#429) - 513,004 s.f. office, 55,540 s.f. retail and 274 residential units

**OTHER AREAS**
- McKinley Elementary School Addition (UP) - 32,250 s.f. other
- Honeysuckle Hills (URD) - 3 residential units

**TOTAL DEVELOPMENT APPROVED BY THE ARLINGTON COUNTY BOARD IN 2014:**
- 688,542 s.f. office GFA
- 77,328 s.f. retail GFA
- 32,250 s.f. other GFA
- 1,121 residential units
- 161 hotel rooms

Quarterly reports on 2014 development are available from the Arlington County web site: [www.arlingtonva.us](http://www.arlingtonva.us).
SUMMARY OF NET NEW RESIDENTIAL CONSTRUCTION

RESIDENTIAL UNITS

<table>
<thead>
<tr>
<th></th>
<th>Rosslyn- Ballston Corridor</th>
<th>Jefferson Davis Corridor</th>
<th>Metro Corridors Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-1960</td>
<td>4,958</td>
<td>514</td>
<td>5,472</td>
</tr>
<tr>
<td>1960 - 1969</td>
<td>1,263</td>
<td>3,613</td>
<td>4,876</td>
</tr>
<tr>
<td>1970 - 1979</td>
<td>378</td>
<td>2,167</td>
<td>2,545</td>
</tr>
<tr>
<td>1980 - 1989</td>
<td>8,524</td>
<td>2,014</td>
<td>10,538</td>
</tr>
<tr>
<td>1990 - 1999</td>
<td>6,179</td>
<td>684</td>
<td>6,863</td>
</tr>
<tr>
<td>2000 - 2009</td>
<td>7,773</td>
<td>3,835</td>
<td>11,608</td>
</tr>
<tr>
<td>2010 - January 1, 2015</td>
<td>2,291</td>
<td>484</td>
<td>1,816</td>
</tr>
<tr>
<td><strong>Total Net New Units</strong></td>
<td><strong>31,366</strong></td>
<td><strong>13,311</strong></td>
<td><strong>44,677</strong></td>
</tr>
</tbody>
</table>

Under Construction

(as of January 1, 2015)

|                    | 945                       | 1,110                     | 2,055                 |

Source: Arlington County Planning Division

HOUSING

HOUSING UNIT ESTIMATES AND FORECASTS BY METRO STATION AREA

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosslyn</td>
<td>6,212</td>
<td>7,260</td>
<td>8,700</td>
<td>10,300</td>
<td>12,100</td>
</tr>
<tr>
<td>Courthouse</td>
<td>6,048</td>
<td>7,307</td>
<td>8,100</td>
<td>8,700</td>
<td>8,800</td>
</tr>
<tr>
<td>Clarendon</td>
<td>680</td>
<td>2,754</td>
<td>3,600</td>
<td>4,200</td>
<td>4,600</td>
</tr>
<tr>
<td>Virginia Square</td>
<td>1,435</td>
<td>3,659</td>
<td>4,500</td>
<td>4,800</td>
<td>5,300</td>
</tr>
<tr>
<td>Ballston</td>
<td>6,744</td>
<td>7,689</td>
<td>8,700</td>
<td>10,200</td>
<td>10,400</td>
</tr>
<tr>
<td>Pentagon City</td>
<td>3,433</td>
<td>5,127</td>
<td>6,200</td>
<td>7,600</td>
<td>8,200</td>
</tr>
<tr>
<td>Crystal City</td>
<td>5,427</td>
<td>7,924</td>
<td>8,900</td>
<td>11,000</td>
<td>14,400</td>
</tr>
<tr>
<td><strong>Arlington</strong></td>
<td><strong>90,842</strong></td>
<td><strong>105,404</strong></td>
<td><strong>116,700</strong></td>
<td><strong>129,400</strong></td>
<td><strong>140,400</strong></td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau 2000 Census, 2010 Census and Preliminary Round 8.4 Cooperative Forecasts (To be approved by MWCOG July 2015)

AVERAGE ASSESSED VALUE (2015) - $579,800

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Family Detached House</td>
<td>$790,600</td>
</tr>
<tr>
<td>Single-Family Attached House, Townhouse</td>
<td>$707,900</td>
</tr>
<tr>
<td>Condominium Townhouse</td>
<td>$581,000</td>
</tr>
<tr>
<td>Condos</td>
<td>$380,000</td>
</tr>
<tr>
<td>Cooperatives</td>
<td>$162,200</td>
</tr>
</tbody>
</table>

Percent change in average assessment (2014-2015) +4.9 %

Source: Arlington County Department of Real Estate Assessments as of Feb 19, 2015.

AVERAGE RENT (2014) - $1,834 per month

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>$1,313</td>
</tr>
<tr>
<td>One Bedroom</td>
<td>$1,678</td>
</tr>
<tr>
<td>Two Bedroom</td>
<td>$2,114</td>
</tr>
<tr>
<td>Three Bedroom</td>
<td>$2,671</td>
</tr>
</tbody>
</table>

Percent change in average rent (2013-2014) -5.0%

Rental vacancy rate 3.8%

Source: Arlington County, CHPD, Housing Division

MAJOR RETAIL FACILITIES

<table>
<thead>
<tr>
<th></th>
<th>No. of stores</th>
<th>Sq. Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fashion Centre at Pentagon City</td>
<td>162</td>
<td>1,109,300</td>
</tr>
<tr>
<td>Crystal City*</td>
<td>171</td>
<td>715,153</td>
</tr>
<tr>
<td>Ballston Common Mall</td>
<td>129</td>
<td>581,000</td>
</tr>
<tr>
<td>Pentagon Centre</td>
<td>10</td>
<td>331,900</td>
</tr>
<tr>
<td>Clarendon Market Commons**</td>
<td>36</td>
<td>300,827</td>
</tr>
<tr>
<td>Pentagon Row</td>
<td>52</td>
<td>296,000</td>
</tr>
<tr>
<td>Village at Shirlington</td>
<td>56</td>
<td>214,000</td>
</tr>
<tr>
<td>Lee Harrison Shopping Center</td>
<td>34</td>
<td>114,200</td>
</tr>
</tbody>
</table>

Source: Arlington Economic Development.

2015 Tax Base

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>48%</td>
</tr>
<tr>
<td>Residential</td>
<td>52%</td>
</tr>
</tbody>
</table>

Source: Arlington County Department of Real Estate Assessments.

Affordable Housing (2015*)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total CAFs</td>
<td>6,945 units</td>
</tr>
</tbody>
</table>

Committed affordable rental units are placed under agreements to remain affordable for 30 to 60 year terms, or are non-profit owned.

* As of January 1, 2015

Source: Arlington County, CHPD, Housing Division

Total Taxable Sales (2014)

$3.18 billion

Source: Virginia Department of Taxation

* Includes only retail on the east side of Jefferson Davis Highway

** Includes the Market Common Clarendon, the Market Common Clarendon II, and the Market Place
**METRORAIL**

Average Weekday Station Activity (2014)

<table>
<thead>
<tr>
<th>Station</th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosslyn-Ballston</td>
<td>15,034</td>
<td>14,159</td>
</tr>
<tr>
<td>Rosslyn</td>
<td>7,479</td>
<td>7,245</td>
</tr>
<tr>
<td>Court House</td>
<td>4,582</td>
<td>4,927</td>
</tr>
<tr>
<td>Virginia Square</td>
<td>3,736</td>
<td>3,611</td>
</tr>
<tr>
<td>Ballston</td>
<td>11,398</td>
<td>11,298</td>
</tr>
<tr>
<td>East Falls Church</td>
<td>4,075</td>
<td>3,947</td>
</tr>
</tbody>
</table>

**Jefferson Davis**

<table>
<thead>
<tr>
<th>Station</th>
<th>Entry</th>
<th>Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arlington Cemetery</td>
<td>1,301</td>
<td>1,318</td>
</tr>
<tr>
<td>Pentagon</td>
<td>15,328</td>
<td>14,799</td>
</tr>
<tr>
<td>Pentagon City</td>
<td>14,758</td>
<td>14,425</td>
</tr>
<tr>
<td>Crystal City</td>
<td>11,750</td>
<td>11,537</td>
</tr>
<tr>
<td>Reagan National Airport</td>
<td>6,181</td>
<td>6,287</td>
</tr>
</tbody>
</table>

Source: Washington Metropolitan Area Transit Authority.

**Metrorail Weekday Boardings (May 1980 - May 2014)**

- **Rosslyn-Ballston Corridor**
- **Jefferson Davis Corridor**

**BICYCLE & PEDESTRIAN COUNTS (2014)**

<table>
<thead>
<tr>
<th>Location</th>
<th>Total</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four Mile Run</td>
<td>401,945</td>
<td>1,101</td>
</tr>
<tr>
<td>Curtis Bon Air</td>
<td>448,880</td>
<td>1,230</td>
</tr>
<tr>
<td>Curtis Rosslyn</td>
<td>511,650</td>
<td>1,402</td>
</tr>
<tr>
<td>Key Bridge East</td>
<td>1,305,498</td>
<td>3,577</td>
</tr>
<tr>
<td>Key Bridge West</td>
<td>567,927</td>
<td>1,581</td>
</tr>
<tr>
<td>Mount Vernon Trail (Airport)</td>
<td>704,845</td>
<td>1,931</td>
</tr>
<tr>
<td>WOD Bon Air East</td>
<td>581,457</td>
<td>1,593</td>
</tr>
<tr>
<td>WOD Bon Air West</td>
<td>617,097</td>
<td>1,691</td>
</tr>
<tr>
<td>WOD Columbia Pike</td>
<td>453,027</td>
<td>1,245</td>
</tr>
<tr>
<td>WOD East Falls Church</td>
<td>472,639</td>
<td>1,295</td>
</tr>
</tbody>
</table>

**BIKESHARE (FY 2014)**

- **Capital BikeShare**
  - Arlington Miles Ridden: 378,694
  - Average Trip Length (miles): 1.97
  - Average Trip Duration (minutes): 16
  - Arlington Stations: 70


**AIR (2014)**

<table>
<thead>
<tr>
<th>Airport</th>
<th>Distance From Arlington</th>
<th>Passenger Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ronald Reagan Washington National Airport</td>
<td>In Arlington</td>
<td>20,810,387</td>
</tr>
<tr>
<td>Washington Dulles International Airport</td>
<td>25 Miles</td>
<td>21,572,233</td>
</tr>
<tr>
<td>Baltimore/Washington International Thurgood Marshall Airport</td>
<td>34 Miles</td>
<td>22,312,676</td>
</tr>
</tbody>
</table>

Source: Metropolitan Washington Airports Authority; Baltimore-Washington International Airport.
COMMUNITY FACILITIES

<table>
<thead>
<tr>
<th>Service</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Libraries</td>
<td>8</td>
</tr>
<tr>
<td>County Parks</td>
<td>149</td>
</tr>
<tr>
<td>Northern Virginia Regional Parks</td>
<td>3</td>
</tr>
<tr>
<td>Community Centers</td>
<td>14</td>
</tr>
<tr>
<td>Nature Centers</td>
<td>3</td>
</tr>
<tr>
<td>Bicycle Routes and Jogging Trails</td>
<td>86 Miles</td>
</tr>
<tr>
<td>Fire Stations</td>
<td>10</td>
</tr>
<tr>
<td>Senior Centers</td>
<td>6</td>
</tr>
<tr>
<td>Athletic Fields</td>
<td>138</td>
</tr>
<tr>
<td>Synthetic Fields</td>
<td>12</td>
</tr>
<tr>
<td>Tennis and Basketball Courts</td>
<td>152</td>
</tr>
</tbody>
</table>

ARLINGTON HISTORIC DISTRICTS

Total Districts ................................................. 36
Oldest Building .............. Ball-Sellers House (1760)
Newest Building .......... Dan Kain Building (1946)

Districts Added in 2014
Benjamin Elliott’s Coal Trestle (1926)
Broadview(1881)

CULTURAL ATTRACTIONS

ARTS AND MUSIC
Arlington Children’s Chorus | Arlington Philharmonic Association | Arlingtonones Barbershop Chorus | IBIS A Chamber
Music Society | Lee Arts Center | Levine School of Music | Metropolitan Chorus | National Chamber Ensemble | Opera

DANCE
Ballet NOVA | Bowen McCauley Dance | Carmen de Vicente Spanish Dance Academy | Centro Cultural Peru | Dance Asia | Dominion Stage | El Tayrona | Indian Dance Educators Association | Jane Franklin Dance | Los Quetzales
Mexican Dance Ensemble | Tinkus Tiataco USA | Alma Boliviana

CENTERS AND ORGANIZATIONS
“Old Guard” Museum | Arlington Artists’ Alliance | Arlington Arts Center | Arlington Historical Society Museum | Bangladesh Center for Community Dev. Inc. | Cambodian American Heritage | Columbia Pike Artist Studios | Drug Enforcement Agency Museum | Fort C.F. Smith | Halau O’Aulani | ProBolivian Committee | Vietnamese Cultural Society

THEATERS
American Century Theatre | Arlington Players | Artsisphere | Charter Theatre Company/ First Draft | Dominion Stage | Educational Theatre Company | Encore Stage & Studio | Gunston Arts Center | Peter’s Alley Theater Company | Rosslyn Spectrum | Signature Theatre | Synetic Family Theatre | Teatro de la Luna | Theatre on the Run | Thomas Jefferson Community Theater | Washington Shakespeare Company

MAJOR MEMORIALS

CPHD Publications

2010 Census Highlights Report
2010 Census Metro Station Profiles
Annual Development Highlights
Annual Rent and Vacancy Rate Report
Ballston Sector Plan
Clarendon Sector Plan
Columbia Pike Initiative - A Revitalization Plan (2005)
Columbia Pike Neighborhood Area Plan
Comprehensive Plan and 5-Year Review Court House Sector Plan Addendum
Crystal City Sector Plan
Demographic Trends in the Planning Corridors
Development in the Metro Corridors
East Clarendon - Special Coordinated Mixed Use District Plan
East Falls Church Area Plan
Fort Myer Heights North Plan
General Land Use Plan

LAND AREA & DENSITY

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Area</td>
<td>25.8 square miles (16,512 acres)</td>
</tr>
<tr>
<td>County Open Space</td>
<td>1,190 acres</td>
</tr>
<tr>
<td>Federal Land</td>
<td>1,150 acres</td>
</tr>
<tr>
<td>Population Density (2015)</td>
<td>8,399 persons/sq. mile</td>
</tr>
<tr>
<td>Elevation (Highest Point)</td>
<td>461 feet</td>
</tr>
</tbody>
</table>

HOTELS & MOTELS

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Hotels/Motels</td>
<td>45</td>
</tr>
<tr>
<td>Number of Rooms</td>
<td>10,857</td>
</tr>
<tr>
<td>Square Feet of Meeting Space</td>
<td>315,988</td>
</tr>
</tbody>
</table>

Source: Arlington Economic Development.
USEFUL WEB ADDRESSES AND PHONE NUMBERS

U.S. Census Bureau (general information)  
www.census.gov  
(301) 763-2422  
The U.S. Census Bureau collects and reports demographic and economic data for the nation, states, counties and cities

Arlington County Census Data  
www.arlingtonva.us/demographics/  
(703) 228-6000  
Information on enrollment, schools and programs, data, and PreK – 12 educational services for Arlington County families.

Arlington Public Schools  
www.apsva.us  
(703) 228-0808  
Visit the Arlington web site at: www.arlingtonva.us

Weldon Cooper Center for Public Service  
www.coopercenter.org  
(434) 982-5522  
Data and research on the Commonwealth of Virginia and Virginia counties and cities.

Virginia Employment Commission  
www.vec.state.va.us  
(804) 786-1485  
Labor market and employment data for the Commonwealth of Virginia and Virginia counties and cities.

Northern Virginia Regional Commission  
www.novaregion.org  
(703) 642-0700  
Information on demographics, transportation, environmental services and human services for Northern Virginia.

Metropolitan Washington Council of Governments  
www.mwco.g.org  
(202) 962-3200  
Population, housing, transportation, and health and human services information for the Washington DC region.

Visit the Arlington web site at:  
www.arlingtonva.us

Arlington County Government Frequently Called Numbers

County Manager’s Office  
(703) 228-3120

County Board Office  
(703) 228-3130

Department of Community Planning, Housing and Development

Planning Division  
(703) 228-3525
Zoning Office  
(703) 228-3883
Code Enforcement  
(703) 228-3232
Inspection Services  
(703) 228-3800
Housing Division  
(703) 228-3760
Housing Information Center  
(703) 228-3765
Neighborhood Services  
(703) 228-3830

Arlington Economic Development  
www.arlingtonvirginiausa.com  
(703) 228-0808

Visitors and Convention Services  
(800) 296-7996

Department of Environmental Services  
(703) 228-6570

Department of Parks and Recreation  
(703) 228-7529

Arlington County Public Library  
(703) 228-3348

The PROFILE is published annually by the Urban Design and Research Section of the Department of Community Planning, Housing and Development. For further information on the PROFILE and other demographic and development data and publications, please contact the Planning Division at (703) 228-3525 or CPHD@arlingtonva.us
Population Growth

Figure 1 below shows Arlington County’s population growth from 1950 to 2010 as reported by the U.S. Census Bureau. Since 1980, the County has continued to grow at a rate of approximately 1% annually. Arlington County’s most recent forecast, Round 9.0, shows its population will continue to grow at this same historic rate, reaching 278,100 persons by 2040.

Also included in Figure 1 are WCC’s population projections for Arlington County produced in 2012 and 2017. In 2012, WCC’s projected Arlington’s population would decline to 197,065 by 2040. In 2017, WCC’s projects Arlington’s population to increase by 51% by 2040.

Figure 1: Decennial Census 1950-2010, Arlington County Forecast Round 9.0, and Weldon Cooper Projections 2012 and 2017.

Arlington County Forecast Round 9.0:

Arlington County participates in the Metropolitan Washington Council of Governments (MWCOG) Cooperative Forecasting program – a joint effort with Federal and local governments of the region to produce a consistent set of long-range economic and demographic forecasts.
The regional forecast is used in travel demand models that determine how various transportation investments affect mobility in the region. A primary purpose of the model is to determine air quality conformity through the regional air quality analysis as mandated by the federal Clean Air Act Amendments of 1990. Air quality conformity is necessary to receive federal funding for transportation projects.

Arlington County’s population forecast has proven to be accurate with a low margin of error. Between the forecast years of 1994-2010, the forecasts have a relatively low margin of error – an average of 3%. Every round the forecast is readjusted to reflect current economic conditions.

Arlington County’s Population Forecast Round 9.0 was produced in the Fall of 2015 and officially adopted by MWCOG in November 2016. Figure 2 below reports Arlington’s forecast housing units, households, household population, and total population for years 2020, 2030, and 2040.

**Figure 2: Arlington County’s Population Forecast Round 9.0**

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing Units</td>
<td>105,404</td>
<td>116,400</td>
<td>128,200</td>
<td>138,500</td>
</tr>
<tr>
<td>Households</td>
<td>98,050</td>
<td>109,300</td>
<td>120,700</td>
<td>131,100</td>
</tr>
<tr>
<td>Household Population</td>
<td>204,735</td>
<td>229,400</td>
<td>252,700</td>
<td>274,800</td>
</tr>
<tr>
<td>Total Population</td>
<td>207,627</td>
<td>232,700</td>
<td>256,000</td>
<td>278,100</td>
</tr>
</tbody>
</table>
The following document has been prepared as a part of Arlington County’s official challenge to Weldon Cooper Center’s 2017 Provisional Total Projections by Locality. The essential issue is that the projections are based on a growth rate of an estimation, which applies a uniform household size across all types of housing located in the Commonwealth. The following report examines how the use of housing units without compensating for type of unit or household size produces an overestimated population for Arlington County.

**Background:**
WCC annually produces population estimates for the Commonwealth of Virginia and each locality. The estimates are produced through a methodology which utilizes the following variables: housing units, school enrollment, births, deaths, and driver’s licenses. Each of the variables are weighted, which results in some variables having more of an impact than others. Housing units hold the largest weight which is the main cause of overestimation of Arlington population.

**Housing Unit Variable:**
WCC’s population estimate model does not account for different household sizes among housing types. Therefore, the model assumes the same household size for all types of housing units across all localities. It does not differentiate among varying household sizes for multifamily and single family housing units. Arlington’s average household size differs based on the type of housing unit: single family detached, single family attached and multifamily.

**Arlington’s Average Household Size**
The 2010 Census reported Arlington County’s average household size as 2.09 persons per household. Throughout Arlington, the average household size varies based on the type of housing. For example, household sizes range from 1.24 in multi-family blocks to 3.50 in single family blocks. In 2010, 68% of Arlington housing stock was multifamily, apartments and condos, and 32% single family detached and attached housing. Arlington’s average household size has remained just above 2 persons per household since 1980, as shown in Figure 1 to the right.

**Figure 1: Arlington County Average Housing 1950-2010**

![Graph showing Arlington County average housing from 1950 to 2010](image)

*Source: U.S. Census Bureau, Decennial Census 1950-2010.*
Throughout the 1960s and 1970s Arlington County instituted award winning and nationally recognized Smart Growth policies and plans. By the 1980s, Arlington’s smart growth pattern was well underway, concentrating development around Metrorail Stations and preserving the single family neighborhoods. Since this development pattern is still observed today, Arlington’s growth rate and average household size has remained relatively constant.

If WCC estimated growth occurred in Arlington, the average household size would be 2.31 persons per household – an average size that has not occurred in Arlington in about 40 years. (See Figure 2)

Between 2010 and 2015, 4,021 housing units were added to Arlington’s housing stock. 95% of these units were multifamily – apartment or condo. Half of the units added were in Census Blocks with average household sizes less than 2 persons per household. Due to these facts, it is highly unlikely that Arlington experienced a significant increase in average household size during this period.

Figure 2: Estimated Household Size with WCC 2015 Estimates

| 110,300 housing units  | x 92% Occupancy Rate = 101,476 households |
| 234,678 persons        | / 101,476 households = 2.31 person per household |

Source: Arlington County Housing Units 2015 Estimate and U.S. Census Bureau 2015 ACS Occupancy Rate,

Another way to look at this is to compare the net new housing to the net new population. If all of the new residents lived in new housing, there would have to be at least 6 persons per households.

The American Community Survey (ACS) 1-Year estimate for 2015 reports an average household size of 2.19 (+/-0.05) for Arlington County. If this average household size is applied to Arlington’s 2015 households of 101,476 this results in a range of population from 217,200 to 227,300. The high estimate of 227,300 is about 7,000 lower than WCC 2015 estimate.

Conclusion:
As discussed in this document, WCC’s population estimate methodology does not incorporate average household size or take into account the difference in household size based on housing type. This has a dramatic impact on Arlington County’s population estimates. The model assumes that the housing added to Arlington’s housing stock over the 2010-2015 period is occupied by the same number of people as a single family detached unit in suburban and rural Virginia. This results in overestimation of Arlington’s 2015 population by as much as 18,000 residents.
March 3, 2017

Robert J. Duffy, AICP
Planning Director
Arlington County, VA 22201

Re: Challenge to Provisional Total Population

Dear Mr. Duffy,

We received Arlington County’s challenge letter and appreciate the time you took to express Arlington County’s concerns regarding the 2017 provisional population projections and for sharing suggestions to improve the projections.

Before I respond to your specific concerns, I would like to clarify that Northern Virginia regional growth rates and share of the Commonwealth’s growth were not a consideration in the development of the methodology for the 2017 provisional projections. As we stated in the response letter to the County’s initial review of the projections, the considerations for the methodology selection were the following: 1) localities tend to use projections most frequently when looking at the near, instead of the distant, future; 2) an intuitive, easy-to-understand methodology is preferred to those involving advanced statistics approaches; and 3) assumptions and data based on the recent past are preferable to those based on years longer past.

First, let me address the County’s challenge to the Cooper Center 2015 estimates, which were part of the input data used in developing the provisional projections. According to the County, the Cooper Center estimates indicate a larger annual growth rate than Arlington’s own population estimates. The fact that the County’s own estimates differed from the Cooper Center’s, which are the state’s official estimates, is not sufficient evidence that the Cooper Center estimates are less accurate than the County’s own estimates. The estimates are different because they are derived from different methodologies. The Cooper Center estimates are not based on the housing unit method used by the County. They are produced by a ratio-correlation method that entails a regression model with five indicative variables: births, deaths, school enrollments, driver’s licenses, and housing units.

The supplemental materials you provided were helpful for us to see your point of view. However, in the middle of the decade, it is impossible to tell which 2015 estimate was more accurate. The County’s estimate was 18,000 lower than the Cooper Center estimate, and 13,000 lower than the Census Bureau’s estimate. Because there are no technical or input errors in the Cooper Center 2015 estimates, we will use the Cooper Center estimates for all 133 localities as planned. Applying a uniform methodology and consistent input data across all localities helps to ensure the integrity of state-wide projections.

Second, the County recommends “that a margin of error be developed and included for each locality’s estimate to better reflect actual population totals.” The truth is such an error does not exist, as the estimates are not generated from a sample survey. We will only know what the errors are for the 2020 estimates when we can compare them to the 2020 Census.
However, we do know, based on empirical studies of nationwide county population projections, the average error for 10-year projections for counties with more than 100,000 people is 10 percent. I believe both the Cooper Center’s and the County’s own projections for 2020 are likely to be in the 10 percent range of the actual 2020 count, but perhaps in different directions. As we each continue to update our projections between now and 2020, the accuracy may further improve.

Finally, I found your idea of producing a projection range for each locality intriguing. If additional funding is available in the future, we would be willing to consider producing a low-mid-high series, based on varying assumptions.

After carefully reviewing the challenge submitted by Arlington County, we have concluded that the input data and technical procedures used to develop the projections are error-free. As a result, we will not change the 2017 provisional population projections for Arlington County.

It might be helpful for all of us to keep in mind that any population projection presents only one of endless possibilities. All projections are limited by the inherently unknown nature of the future.

I thank you again for being an engaging, thoughtful partner and for helping us to do a better job.

Sincerely,

Qian Cai
Director, Demographics Research Group
City of Danville

Challenge letter submitted by the City and response from the Demographics Research Group
To: Meredith Gunter, Interim Director Weldon Cooper Center for Public Service

From: Jackie Wells, Housing and Development Planning Specialist, City of Danville

Date: February 24, 2017

Re: Comments on Provisional Official State Population Projection Totals for 2020, 2030 and 2040

The City of Danville challenges the Weldon Cooper population projection based on the failure of the model to consider the effects of employment loss and gain to population.

BACKGROUND

The population projection performed by Weldon Cooper for the years 2020, 2030 and 2040 project a rate of population decline in the City of Danville that is severe, more than 22% by 2040. The projection technique used is an exponential technique that functions on two assumptions:

1. The past rates of population growth or decline for the City will continue into the future; and
2. The local community will continue to be a share of the State (i.e.: the City will rise and fall as the State rises and falls).

Table One, below, shows that the population of Danville has risen and fallen as has employment. The ratio of jobs to population is falling slowly but within a narrow band of 41-46 percent. This suggests the population of Danville rises and falls with the availability of jobs, not with some long term trend of decline as argued in the Weldon Cooper projection.

Table 1: Employment and Population Ratios 1980-2015

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>21,172</td>
<td>23,699</td>
<td>20,448</td>
<td>17,390</td>
<td>17,617</td>
</tr>
<tr>
<td>Population</td>
<td>46,391</td>
<td>53,167</td>
<td>48,149</td>
<td>42,914</td>
<td>42,544</td>
</tr>
<tr>
<td>Ratio: Jobs/Pop</td>
<td>46%</td>
<td>45%</td>
<td>42%</td>
<td>41%</td>
<td>41%</td>
</tr>
</tbody>
</table>


The data shown below in Table Two shows that the number of people employed in the City of Danville is stable. Therefore, the population of the City will likely stabilize after declining at a decreasing rate.

Table 2: Number Employed 2010-2015

<table>
<thead>
<tr>
<th>City</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danville</td>
<td>17,390</td>
<td>17,918</td>
<td>17,915</td>
<td>17,878</td>
<td>17,815</td>
<td>17,617</td>
</tr>
</tbody>
</table>

Sources: [https://www.bls.gov/lau/#tables](https://www.bls.gov/lau/#tables)
ASSUMPTION ONE

The exponential technique used to project the population of the City of Danville functions on two assumptions, the first being that past rates of population growth or decline for the City will continue into the future. Weldon Cooper based their projection on U.S. Census data from 2000 and 2010 and their own estimate from 2015. As Table One, above, reveals, 2000 and 2010 saw severe declines in population which the Weldon Cooper population projection has trended forward with their exponential technique. However, the population decline experienced in 2000 and 2010 were unique circumstances caused by the closing of a major employment center in the City. The sharp decline experienced in these years will not likely occur going forward as the circumstances that catalyzed the events will not exist. As Table Two shows, employment has been stable since 2010; therefore population loss will not decrease at an exponential rate as projected by the Weldon Cooper model, but will likely decrease at a decreasing rate.

ASSUMPTION TWO

The second assumption that the exponential population projection functions on is that the local community will continue to be a share of the state. The City of Danville is geographically located on the border of North Carolina approximately 45-60 minutes away from other cities such as Greensboro, Chapel Hill and Raleigh (the Triangle). The future population growth and decline of the City will continue to be a share of the growth and decline of the Triangle as much as it will continue to be a share of the State of Virginia. The Weldon Cooper model fails to account for future growth and decline in this region.
March 3, 2017

Jackie Wells
Housing and Development Planning Specialist
City of Danville

Dear Ms. Wells,

Thank you for providing comments regarding the provisional population projections for the City of Danville. I understand your concerns and have addressed them below.

First, the City of Danville is concerned that the Cooper Center used the annual exponential rate in producing its projections which assumes that “the past rates of population growth or decline for the City will continue into the future”. As you may see in our methodology document, we used the annual exponential rate from 2010-2015 to project 2020 only. For the 2030 and 2040 projections, we did not use an exponential rate. Instead, we used the actual annual growth/decline (the absolute number) observed between 2000 and 2015, and assumed that the annual growth/decline (in absolute number) would remain the same between 2020 and 2030, and between 2030 and 2040. Using the absolute annual change instead of the annual rate effectively slows down the speed of growth or decline.

In the challenge letter, you mention that “the population of Danville rises and falls with the availability of jobs, not with some long term trend of decline.” I appreciate your concern that the City of Danville may not continue its past pattern into the future. All projections, as you know, are based on observations in the past and assumptions about the future, which is inherently unknown. Our methodology and input data provide only one of endless future possibilities. Since we are charged to develop projections for all 133 counties and cities, the assumptions and input data must be consistent across all localities. We cannot make customized projections using alternative data, such as employment, or alternative methodology to project the future populations for Danville.

Second, the City of Danville is concerned that the Cooper Center projections assume “the local community will continue to be a share of the State (i.e.: the City will rise and fall as the State rises and falls)”. I believe this is a reference to the proportional adjustment in the final step of the projections development. It was a necessary and customary step so that the sum of 133 localities equals the state total. It is true that if the sum of the raw locality projections is smaller than the state control total, each locality will be adjusted proportionally larger; if the sum is larger than the state
control total, each locality will be adjusted proportionally smaller. This is a common practice among projections professionals. The final adjustment should have minimum effect on a locality's growth/decline. You also mentioned that the City is near the Triangle region and follows the population patterns of the region. However, since the scope of this project is only for the Commonwealth and its counties and cities, we are not able to consider regional patterns.

As stated in the challenge process document, only technical errors or input data errors are accepted as basis for challenge. Based on your comments and alternative data, we do not believe we have the evidence required to revise the projections.

Please feel free to contact me, should you have further questions or comments.

Sincerely,

Qian Cai
Director, Demographics Research Group
City of Alexandria

Challenge letter submitted by the City and response from the Demographics Research Group
Dr. Qian Cai, Director  
Weldon Cooper Center for Public Service  
P.O. Box 400206  
Charlottesville, VA 22904-4206

Dear Dr. Cai,

Thank you for providing a challenge process following the February 10, 2017 release of the *Weldon Cooper Center's (WCC) Provisional Total Projections by Locality*. We appreciate the fact that the WCC has accepted and incorporated comments from the Northern Virginia region in the past, particularly relating to the region's share of the state's growth, and hope that comments from the City of Alexandria outlined in this letter will be considered for the determination of final projection releases going forward. The Department of Planning & Zoning for the City of Alexandria has reviewed the *Provisional Total Projections by Locality* and finds that the provisional totals for the City of Alexandria are not plausible as they far exceed historic and current population growth trends.

As stated in our letter dated December 15, 2016, the City of Alexandria has grown at a rate of approximately 1% annually since the 1980's, yet the provisional WCC projections show a much higher annual growth rate. While the City of Alexandria continues to see new residential construction, most new housing has one and two bedrooms per unit and houses a professional workforce with a small household size, typically between 1.3 and 1.8 persons per household. This is in stark contrast with housing development in the outer suburbs of Northern Virginia.

Additionally, the City of Alexandria still takes issue with the input data estimate for Alexandria used in the projections. This number is inflated above what local and regional officials believe to be the estimated population and it is higher than the U.S. Census Bureau estimate (which historically has been higher than actual counts). This has ripple effects on the projections for 2030 and 2040. The City of Alexandria would like the WCC to consider using a regionally or locally accepted estimate for the input data.

The City of Alexandria requests that the WCC consider a revision to either the variables in the model that inflate the growth rate above what is practically possible, or reduce the 2015 population estimate for Alexandria for consistency with other reputable sources, such as the Metropolitan Washington Council of Governments or the U.S. Census Bureau. Even though we have concerns about the Census Bureau estimate, it is closer to what we believe is the City’s actual population than the WCC estimate. Providing a margin of error could also alleviate concerns, if indeed the margin of error shows the possibility of a lower projection. It is understood from the instructions on the WCC’s website that unique modifications by jurisdiction
cannot be made, but given the unique demographics of Alexandria and other Northern Virginia jurisdictions, it is hoped that the WCC will consider a revised methodology for future exercises.

Thank you,

Karl Moritz, Planning Director, City of Alexandria

CC:
Meredith Gunter, Interim Director, Weldon Cooper Center
Dan Timberlake, Director, Virginia Department of Planning and Budget
Mark Jinks, City Manager, City of Alexandria
March 3, 2017

Karl Moritz
Planning Director
Department of Planning and Zoning
301 King Street, Room 2100
Alexandria, VA 22314

Re: Challenge to Provisional Total Population Projections

Dear Mr. Moritz,

We received City of Alexandria’s challenge letter and appreciate the time you took to express the City’s concerns regarding the 2017 provisional population projections and for sharing suggestions for improving the projections.

Before I respond to your specific concerns, I would like to clarify that Northern Virginia regional growth rates and share of the Commonwealth’s growth were not a consideration in the development of the methodology for this round of projections. As we stated in the response letter to the County’s initial review of the projections, the considerations for the methodology selection were the following: 1) localities tend to use projections most frequently when looking at the near, instead of the distant, future; 2) an intuitive, easy-to-understand methodology is preferred to those involving advanced statistics approaches; and 3) assumptions and data based on the recent past are preferable to those based on years longer past.

First, let me address the City’s challenge to the Cooper Center 2015 estimates, which were part of the input data used in producing the population projections. According to the City, the Cooper Center estimates indicate a larger annual growth rate than Alexandria’s own population estimates. The fact that the City’s own estimates differed from the Cooper Center’s, which are the state’s official estimates, is not sufficient evidence that the Cooper Center estimates are less accurate than the City’s own estimates. The Cooper Center estimates differed from the City’s own estimates and the Census Bureau’s estimates, because different methodologies generate different results. The City’s own 2015 estimate was 12,000 lower than the Cooper Center estimate and 6,000 lower than the U.S. Census Bureau estimate. The true population in 2015 is unknown and unknowable. Because there are no technical or input errors in the Cooper Center 2015 estimates, we will use the Cooper Center estimates for all 133 localities as planned. Applying a uniform methodology and consistent input data across all localities helps to ensure the integrity of state-wide projections. We are certainly open to the option of using the Census Bureau estimates for all localities in the next round of projections. We are unable, however, to use the Census estimate for the City of Alexandria alone.

Second, the City recommends providing a margin of error to alleviate concerns of projections variability. The truth is that there is no margin of error for projections because the true population numbers do not exist. However, based on empirical studies of nationwide county population projections, the average error for 10-year projections for counties with more than 100,000 people is 10 percent (Please note that 10 percent indicates, on average, how far projections are from true populations. It does not necessarily mean true
populations will fall in the 10 percent range of projections. The denominators are different). I believe both the Cooper Center’s and the City’s own projections (adopted by MWCOG) for 2020 are likely in the 10 percent range of the actual 2020 count, but perhaps in different directions. As we each continue to update our projections between now and 2020, the accuracy may further improve.

After carefully reviewing the challenge submitted by City of Alexandria, we have concluded that the input data and technical procedures used to develop the projections are error-free. As a result, we will not change the 2017 provisional population projections for City of Alexandria.

It might be helpful for us all to keep in mind that any population projection presents only one of endless possibilities. All projections are limited by the inherently unknown nature of the future.

I thank you for being an engaging, thoughtful partner and for working with us to improve population projections.

Sincerely,

Qian Cai
Director, Demographics Research Group
Prince William County

Challenge letter, accompanying documents, and corrected documents submitted by the County and response from the Demographics Research Group
Qian Cai, Ph.D.
Director, Demographics Research Group
Weldon Cooper Center for Public Service
P.O. Box 400206
Charlottesville, VA 22904

Re: Prince William County’s Comments on 2017 Population Projections

Dear Dr. Cai,

We wish to commend the Weldon Cooper Center (WCC) on the comprehensive demographic work that is done both nationally and locally. We understand that WCC is under contract with the Commonwealth of Virginia’s Department of Planning and Budget (VDPB) to provide estimates and projections statewide, which VDPB then uses for policy, planning, public/private investment, and budget purposes. We are taking this opportunity to challenge WCC on the 2017 iteration of population projections for Prince William County.

Prince William’s landscape has undergone significant changes in the past 16 years. We experienced a surge of 121,189 residents between 2000 and 2010, and an estimated addition of 52,236 residents between the 2010 and the present. As the county’s government has greatly expanded to serve the needs of a major metropolitan county, our population growth has slowed since 2010 and the Planning Department is working on a comprehensive plan update that will greatly expand efforts to curtail suburban sprawl, preserve and maintain the county’s substantial rural, natural, and historical character (about 52% of the county’s land), and funnel future development into more dense, transit-oriented communities and redevelopment projects. Our most recent build-out analysis concludes that the county has the capacity to handle 32,995 additional residential units, which in the long-run could translate into approximately 100,000 additional residents (based on an average household size estimate of 3.09 people and a 96.3% occupancy rate). With an increased focus on redevelopment and density, and if Prince William becomes a mainstream alternative for Washington, D.C. commuters, we could potentially accommodate 150,000 additional residents. This translates into a 605,000 resident capacity (when the remaining capacity is added to the county’s in-house population estimate of 454,238). In contrast, WCC projects that by 2040 we’ll have about 682,111 residents - 77,000 more residents than an overestimated capacity. (In the attached document, see Table 1 for MWCOG’s projections for Prince William County and see Table 2 for a comparison between the WCC and MWCOG projections).

In the case of WCC’s population projections, the use of population totals for the years 2000, 2010, and 2015 is problematic. Because the county experienced a peak population boom between 2000 and 2010, using this period of time in addition to 2010-2015 growth generates a misleading assumption that the county will continue fast-paced growth up to 2040 and beyond. This is partly why WCC’s 2040 estimate is 123,180 residents higher than the 2040 projections our county worked on intensively with MWCOG. Instead of reaching back to 2000, we suggest only using the 2010 and 2015 population totals in WCC’s projection calculation to generate a more
realistic assumption about growth. If we were to use 2000, 2010, and 2015 population numbers as inputs to a linear growth model, the outcome would be the light-gray dotted line shown in Figure 1 in the attached document. As illustrated in the graph, linear growth with 2010 and 2015 as inputs generates a projection more aligned with MWCOG’s growth forecasts, which have taken into account Prince William’s local land use patterns, construction trends, comprehensive plans, and build-out analyses. We’d like to emphasize that even a straightforward linear growth model with 2000, 2010, and 2015 population inputs contains drastically lower projections than those of WCC’s model.

With these figures in mind, it remains difficult to interpret WCC’s projections as reflective of processes occurring at the local level and the projections seem substantially off-base. If WCC altered the input data for the projections to omit the year 2000’s population, we believe WCC’s projections for Prince William may more closely represent our future growth. Additionally, perhaps there is a need to incorporate a new projection model that combs over the data in individual regions of the Commonwealth, using regional control totals. Population size and change varies widely by region and should be treated as such. Any future methodological alterations need to incorporate more local-level variables that strive to take into account the limits of a jurisdiction’s development as well as regional trends in construction. We would also suggest clearly stating any margins of error associated with the projections, as the 2030 and 2040 projections are especially prone to inaccuracies.

Because WCC’s population projections are markedly higher than those we have completed in collaboration with MWCOG, Prince William County does not support the 2017 Weldon Cooper Center population projections for 2020, 2030, and 2040. We believe that population projections that take into account local land use patterns, construction trends, comprehensive plans, and build-out analyses are more reliable.

We do hope that the future holds improvements to the population projection methodology and we thank you for the opportunity to contest the Weldon Cooper Center’s population projections. We hope that WCC will further increase the weight that local jurisdictions carry in the implementation of future population estimates and projections.

Sincerely,

Brian Engelmann, Ph.D.
County Demographer
Prince William County, VA

Attachment: contains tables and figures referenced in this document.

CC:  
Meredith Gunter, Director of Outreach, Weldon Cooper Center  
Michelle Casciato, Deputy County Executive, Prince William County Government  
Roger Byrd, Acting Chief Information Officer, Prince William County Government  
Angie Mills, GIS Division Chief, Prince William County Government  
Rebecca Horner, Planning Director, Prince William County Government  
David McGettigan, Long Range Planning Manager, Prince William County Government
ATTACHMENT
Re: Prince William County’s Comments on 2017 Population Projections

Table 1: Metropolitan Washington Council of Governments (MWCOG) Round 9.0 Forecasts for Prince William County:

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
<th>2015 to 2045</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>% Change</td>
<td>Share</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>144.613</td>
<td>164.96</td>
<td>184.388</td>
<td>204.541</td>
<td>223.103</td>
<td>245.139</td>
<td>258.28</td>
<td>113.667</td>
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<tr>
<td>Population</td>
<td>431.217</td>
<td>464.711</td>
<td>496.701</td>
<td>521.261</td>
<td>541.928</td>
<td>558.931</td>
<td>572.849</td>
<td>141.632</td>
</tr>
<tr>
<td>Households</td>
<td>140.407</td>
<td>151.861</td>
<td>164.373</td>
<td>173.773</td>
<td>181.615</td>
<td>187.94</td>
<td>192.892</td>
<td>52.485</td>
</tr>
</tbody>
</table>

*The 2010 population value is from the 2010 Census and does not represent estimates from WCC or MWCOG.

Table 2: MWCOG’s Projections for Prince William County

<table>
<thead>
<tr>
<th></th>
<th>Weldon Cooper Center (WCC)</th>
<th>Metropolitan Washington Council of Governments (MWCOG)</th>
<th>Difference: WCC/ MWCOG Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Population Projection</td>
<td>Projected Growth</td>
<td>Projected % Growth</td>
</tr>
<tr>
<td>2010*</td>
<td>402,002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>483,750</td>
<td>81,748</td>
<td>20.3</td>
</tr>
<tr>
<td>2040</td>
<td>682,111</td>
<td>94,053</td>
<td>16.0</td>
</tr>
</tbody>
</table>
Figure 1: Weldon Cooper Center and MWCOG Population Projections Comparison: Prince William County
Correction: Projection Challenge Letter: Prince William County

From: bengelmann@pwcgov.org
To: "demographics@virginia.edu" <demographics@virginia.edu>
Cc: Cai, Qian <qca6q@virginia.edu>, "Muldoon, Amy J. (ajm6u)" <ajm6u@eservices.virginia.edu>
Sent: February 27, 2017 2:23:20 PM
Attachments: Weldon Cooper Letter-2017-Attachment_Corrected.pdf (415KB)

Hello,

I do apologize for this, but there was a mistake on our original challenge submission’s attachment. The graph with trend lines on the 2nd page of the attachment had an uneven scale on the X axis. I’ve replaced the graph with the correct one in the document attached to this email. I hope you’ll take this into consideration.

Our point about using the 2010 and 2015 populations as input for the projections still remains—the linear projection using just those 2 years as inputs is lower than using 2000, 2010, and 2015, and still differs dramatically from our/MWCGC’s projections.

Again, I apologize for this oversight.

Sincerely,
Brian

---

Brian Engelmann, Ph.D.
Demographer
Dept. of Information Technology, GIS Division
Prince William County Government

5 County Complex Court #140
Woodbridge, VA 22192
bengelmann@pwcgov.org
(703) 792-7098
(571) 719-8735 (mobile)

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From: Muldoon, Amy J. (ajm6u) <ajm6u@eservices.virginia.edu>
Sent: Friday, February 24, 2017 3:59 PM
To: Engelmann, Brian M. <bengelmann@pwcgov.org>
Cc: Cai, Qian <qca6q@virginia.edu>
Subject: Re: Projection Challenge Letter: Prince William County

Good Afternoon, Brian:

We have received your challenge letter. We will review it carefully and respond to you within 2 weeks.

---

From: Engelmann, Brian M. <bengelmann@pwcgov.org>
Sent: Friday, February 24, 2017 3:56 PM
To: demographics@virginia.edu
Subject: [demographics] Projection Challenge Letter: Prince William County

Please see the attached documents for Prince William County’s challenge to WCC’s 2017 population projections.

Thank you for your time and we look forward to an ongoing conversation about this,
Brian

---

Brian Engelmann, Ph.D.
Demographer
Dept. of Information Technology, GIS Division
Prince William County Government

5 County Complex Court #140
Woodbridge, VA 22192
bengelmann@pwcgov.org
(703) 792-7098
(571) 719-8735 (mobile)
ATTACHMENT
Re: Prince William County’s Comments on 2017 Population Projections

Table 1: Metropolitan Washington Council of Governments (MWCOG) Round 9.0 Forecasts for Prince William County:

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
<th>2015 to 2045</th>
<th>COG/TPB Planning Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>144.613</td>
<td>164.96</td>
<td>184.388</td>
<td>204.541</td>
<td>223.103</td>
<td>245.139</td>
<td>258.28</td>
<td>113.667</td>
<td>0.786008 0.099754</td>
</tr>
<tr>
<td>Population</td>
<td>431.217</td>
<td>464.711</td>
<td>496.701</td>
<td>521.261</td>
<td>541.928</td>
<td>558.931</td>
<td>572.849</td>
<td>141.632</td>
<td>0.328447 0.094172</td>
</tr>
<tr>
<td>Households</td>
<td>140.407</td>
<td>151.861</td>
<td>164.373</td>
<td>173.773</td>
<td>181.615</td>
<td>187.94</td>
<td>192.892</td>
<td>52.485</td>
<td>0.373806 0.081762</td>
</tr>
</tbody>
</table>

Table 2: MWCOG’s Projections for Prince William County

<table>
<thead>
<tr>
<th></th>
<th>Weldon Cooper Center (WCC)</th>
<th>Metropolitan Washington Council of Governments (MWCOG)</th>
<th>Difference: WCC/MWCOG Projections</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Population Projection</td>
<td>Projected Growth</td>
<td>Projected % Growth</td>
</tr>
<tr>
<td>2010*</td>
<td>402,002</td>
<td>402,002</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>483,750</td>
<td>81,748</td>
<td>20.3</td>
</tr>
<tr>
<td>2030</td>
<td>588,058</td>
<td>104,308</td>
<td>21.6</td>
</tr>
<tr>
<td>2040</td>
<td>682,111</td>
<td>94,053</td>
<td>16.0</td>
</tr>
</tbody>
</table>

*The 2010 population value is from the 2010 Census and does not represent estimates from WCC or MWCOG.
Figure 1: Weldon Cooper Center and MWCOG Population Projections Comparison: Prince William County
March 3, 2017

Brian Engelmann  
County Demographer  
5 County Complex Court, Suite 140  
Woodbridge, VA 22192

Re: Challenge to Provisional Total Population Projections

Dear Dr. Engelmann,

We received Prince William County’s challenge letter and appreciate the time you took to express the County’s concerns regarding the 2017 provisional population projections and for sharing suggestions for improving the projections.

Before I respond to your specific concerns, I would like to clarify the nature of the contract with the Department of Planning and Budget (DPB). The contract to provide statewide projections is not for DPB to use for policy, public/private investment, and budget purposes, as you stated in your letter. As you may know, the Virginia Employment Commission (VEC) was the agency responsible for producing the official statewide population projections in the last several decades. In 2012, VEC contracted the Cooper Center to produce the first round of projections after the 2010 Census. As the shelf life for these projections neared expiration, VEC had no staff or funding to continue the projections production. Understanding the importance of having updated population projections that incorporate more recent trends, the Cooper Center took the initiative, with VEC’s support, to seek funding from the Governor’s biennial budget. The approved funding then channeled through DPB as the sponsoring agency. The statewide projections will be made publicly available for anyone to use, whether that be the DPB, state agencies, or local governments, businesses and nonprofits.

You provided a comprehensive description of the County’s projection development based on land use, construction trends, and build-out analyses. As you know, the Cooper Center projections are for the entire state and its 133 individual localities, each with different sizes and growth patterns. The utility of the Cooper Center projections is to provide a consistent outlook into the future from the same lens. As such, it is not possible for us to take a local scenario planning approach. We need to maintain uniformity across methodology, assumptions, and data sources.

The concerns you expressed regarding the discrepancy between the County’s own projection and the Cooper Center projections are valid and understandable. The Cooper Center 2040 projection for the County, for example, is one of endless possibilities. As you can appreciate, the accuracy of projections declines quickly as years projected are farther away, similar to a one-day vs. a 10-day weather forecast. The typical error for 30-year projections at the county level is 36 percent. The County’s own projection for 2040 is currently 18 percent lower than the Cooper Center projection. The true population in 2040 may be somewhere in between. It is possible both projections are well within the typical error range. Even if the true population is lower than the County’s projection or higher than the Cooper Center projection, the error can still be within the expected average of 36 percent.
You suggested ways to more closely align the Cooper Center’s projections with the County’s own projections (adopted by MWCOG). While the County prefers a five-year growth trend from 2010-2015 to be used for projecting 2020-2040, a few localities in the region recommended using a 30-year trend between 1980-2010. It is just not possible to choose a base period that will appeal to every locality. The 15-year trend between 2000 and 2015 was a deliberate decision we made based on projections literature, as well as a balanced consideration for all 133 localities. While we appreciate the utility of a buffet-style approach where localities can choose their trend base, input data, and extrapolation method (linear vs. non-linear) to generate projections more in line with their visions, it is simply beyond the scope of this contract. In addition, it violates the very purpose of state-wide projections, which is to produce a consistent and comparable series of projections.

The regional approach is an intriguing idea. A few details would need to be thought through. For example, how does one define regions? How many regions should there be? Would regions have consensus of their growth share? Within each region, how would one distribute the population among member localities? Would it involve a negotiation process, similar to MWCOG? If additional funding is available in the future to support an exploration of a regional approach in developing a methodology and implementation plan for the projections, we would happily invite you and others to help.

You recommended developing margins of error associated with the projections. The truth is such an error does not exist, as true (future) populations do not yet exist. Projections can vary widely based on different assumptions. But we do know from empirical studies that the typical errors associated with county projections are 12%, 24%, and 36% percent for 10-, 20-, 30-year projections, respectively (note that these percentages are how far, on average, projections were from true populations based on past observations; they do not necessarily mean how far true populations will be from projections. The denominators are different).

After carefully reviewing the challenge submitted by Prince William County, we have concluded that the input data and technical procedures used to develop the projections are error-free. As a result, we will not change the 2017 provisional population projections for Prince William County.

I thank you for being an engaged, thoughtful partner and for working with us on population projections.

Sincerely,

Qian Cai
Director, Demographics Research Group