

Capital Facilities Inventory and Gap Analysis Due to Aberdeen Proving Ground BRAC Expansion

Appendix D: Sub Area Demographics

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APPENDIX D: SUB AREA DEMOGRAPHICS AND ALLOCATION METHODOLOGY

METHODOLOGY FOR SUB AREA ALLOCATION

A sub area analysis was conducted for Harford County Fire/EMS and public school capital facilities. This was done because of the magnitude of Aberdeen Proving Ground (APG) BRAC impact on Harford County and the availability of sub area data. Each of these facility categories has distinct service areas that define where service is provided. For Fire/EMS, service is provided by volunteer fire companies, each with its own service area. Harford County Public Schools has distinct attendance areas for elementary schools and middle/high schools.

The methodology used by TischlerBise to allocate BRAC and non-BRAC growth by Traffic Analysis Zone (TAZ) using Round 7 projections is described in this Appendix. The methodology used by Harford County to allocate population, employment, and households for the Round 7 projections by TAZ is detailed at the end of the Appendix.

Round 7 projections use TAZs to allocate population, employment, and households at a sub county level. The projections are made in five year increments from 2000 to 2030 with the last update issued within the past year. Round 7 is the most recent projection issued by Harford County and includes APG BRAC growth in the County. However, the County does not distinguish between BRAC and non-BRAC growth. Based on feedback from Harford County, Sage BRAC projections for population, employment, and households are considered to be a subset of Harford County's total growth projection in Round 7. The methodology used to distinguish BRAC growth from non-BRAC for Fire/EMS and public school capital facilities is described in the following sections. Sage BRAC projections were not allocated by sub area. Upon direction from the County, Sage projections are distributed to sub areas based on the distribution of total growth in Harford County's Round 7 projections.

ALLOCATING GROWTH BY TRAFFIC ANALYSIS ZONE

The sub area allocation process described below is used to apportion population, household, and employment growth on a sub area basis.

The Aberdeen Proving Ground BRAC impact is anticipated to occur between 2007 and 2017 per the Sage report. However, sub county TAZ data is only available in five year increments. The five year increments used were 2005 to 2010 and 2015 to 2020. A straight line projection was used between 2005 to 2010 and 2015 to 2020 by TAZ in order to obtain total population for each TAZ in 2007 and 2017. Population and employment drive the demand for Fire and EMS services; therefore fire company boundaries use these two demand units to project future need for services. Households, which are used to derive student enrollment projections, drive the demand for school facilities.

The difference between 2007 and 2017 by TAZ is considered to be the growth in the County due to the impact of BRAC and normal County (non-BRAC) development. The TAZs are then summed to obtain total growth in the County. The population increases or decreases are then divided by the total increase in population from 2007 to 2017. This results in a percentage increase or decrease for each TAZ. The percentage is then multiplied by the total BRAC growth in population reported by Sage (19,059) for Harford County to obtain the increase or decrease in population for each TAZ due to BRAC. The difference between BRAC growth and total growth for each TAZ is considered to be regular county (non-BRAC) growth. The BRAC and non-BRAC population growth by TAZ, increase in the same proportion that is forecasted in Round 7. This means that if the total Round 7 population projections for TAZ 904 are expected to increase by 2.2%, the BRAC and non-BRAC population will also increase by 2.2% from 2007 to 2017. A sample of the results can be seen in Table D-1.

Table D-1. BRAC and non-BRAC Population Growth by Traffic Analysis Zone

TAZ	Round 7 Projections				Straightline Projections		Difference Pop 07-17	Pct. of Growth 2007-2017	BRAC Pop 2007-2017	non-BRAC Pop 2007-2017
	Pop 05	Pop 10	Pop 15	Pop 20	2007	2017				
863	1017	1071	1116	1120	1,039	1,118	79	0.2611%	50	29
864	1858	2032	2185	2210	1,928	2,195	267	0.8839%	168	99
904	1814	2217	2591	2750	1,975	2,655	679	2.2459%	428	251
915	2194	2171	2131	2105	2,185	2,121	-64	-0.2122%	-40	-24
944	4905	7318	9728	10188	5,870	9,912	4,042	13.3608%	2,546	1,495
996	1322	1316	1299	1285	1,320	1,293	-26	-0.0866%	-17	-10
997	779	827	867	858	798	863	65	0.2155%	41	24
1000	2666	2879	3066	3104	2,751	3,081	330	1.0909%	208	122
Total	237,166	256,996	274,264	276,977	245,098	275,349	30,251	100%	19,059	11,192

GROWTH PROJECTIONS BY SERVICE AREA BOUNDARIES

The next step of the methodology involved the use of Geographic Information Systems (GIS), which is a mapping and analysis tool that allows users to view the TAZs as a map. The fire company boundary layer was overlaid with the TAZ layer so that an analysis could be performed to determine which TAZs fell within certain fire company boundaries, as shown in Figure D-1. This was also done with public schools by type (elementary, middle, and high) using households.

If a TAZ is completely within a fire company boundary it was allocated to that particular fire company. However, if a TAZ overlapped two or more fire boundaries then a proportionate share was used to assign a portion of the total acreage of the TAZ to each fire company the TAZ overlapped. An example is shown in Figure D-1. TAZ 00904 overlaps three fire company boundaries (Bel Air, Fallston, and Joppa Magnolia). The total acreage for TAZ 904 is approximately 1,248 acres of which 34.8% lies within Bel Air, 14.8% within Fallston, and 50.4% within Joppa Magnolia. The BRAC population for TAZ 904 was then allocated based on this percentage to each fire company. All TAZs were allocated to the fire companies and then multiplied by the percentage to obtain growth in population for BRAC and non-BRAC within the fire company. The non-BRAC growth for population and employment was not used in the level of service (LOS) or gap analysis.

Table D-2: BRAC and non-BRAC Growth by TAZ Within the Fallston Fire and Ambulance Company

TAZ	Total Acres within TAZ	Acres within Fire Company	Percent of Total Acres	non-BRAC Pop 2017	BRAC Pop 2017	non-BRAC	BRAC
						Population within Fire Company	Population within Fire Company
871	982	41	4.2%	18	31	1	1
872	2538	889	35.5%	110	187	39	66
873	4308	2881	68.0%	4	7	3	5
874	1583	821	52.2%	28	47	14	24
875	1152	1152	100.0%	53	90	53	90
876	2227	2187	100.0%	14	23	14	23
890	2233	1300	59.4%	70	119	42	71
900	2263	2231	99.0%	58	99	57	98
901	1676	915	55.5%	20	34	11	19
902	1793	1779	100.0%	38	65	38	65
903	1814	1767	100.0%	-2	-3	-2	-3
904	1248	181	14.8%	251	428	37	63
906	1548	659	44.2%	30	50	13	22
Total						320	545

Figure D-1: Harford County Map of Fire Company Boundaries overlaid on TAZs



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**Harford County
Fire Company Boundaries**

SUB AREA METHODOLOGY FOR HARFORD COUNTY PUBLIC SCHOOLS

Harford County public schools uses the same methodology described for the sub area allocation of growth, with some additional steps as households derive demand for schools. Table D-3 shows two examples of schools for each school type, the balance of the remaining schools, and the total for each school type. Elementary schools have smaller attendance zones than middle and high schools, which means fewer households are allocated to each elementary school

attendance area. The middle and high schools have the same school attendance boundaries and therefore have the same number of households allocated to each school attendance zone, as shown in Table D-3. Based on the methodology used above, non-BRAC households will account for 7,574 households and BRAC 7,059 households. In the methodology section of the report, *Aberdeen Proving Ground BRAC Impacts on Seven Jurisdictions*, Sage stated that it obtained public school students by using a mid-case scenario of 0.66 students per household for a BRAC increase of 4,624 public school students (Please see Sage report for a discussion of assumptions). The total in Table D-3 (4,605 public school students) is slightly smaller than Sage’s total because students in alternative school types were not included in the gap analysis, which accounted for 19 students.

For example, to calculate Abingdon elementary school students, the number of BRAC households were multiplied by 0.66 students per household and then multiplied by 45.3% (which is the percentage of total students in Harford County currently enrolled in elementary schools). The Harford County students per household figure of 0.43 is used to calculate non-BRAC students from non-BRAC households. The same calculation is used to calculate BRAC and non-BRAC students (# of households X students per household X percentage of students in school type).

Table D-3. BRAC and non-BRAC Students by School and School Type (Two Examples and Total)

School Type	non-BRAC HH	BRAC HH	Total HH	Elementary Students	
				non BRAC Students	BRAC Students
Elementary Schools (45.3%)					
Abingdon	255	238	493	50	71
Bakerfield	554	517	1,071	108	153
Balance	6,764	6,304	13,069	1,317	1,870
<i>Total</i>	<i>7,574</i>	<i>7,059</i>	<i>14,633</i>	<i>1,475</i>	<i>2,094</i>
Middle Schools (23.2%)					
Aberdeen	1,643	1,532	3,175	164	233
Bel Air	752	700	1,452	75	106
Balance	5,179	4,827	10,006	516	733
<i>Total</i>	<i>7,574</i>	<i>7,059</i>	<i>14,633</i>	<i>755</i>	<i>1,072</i>
High Schools (31.3%)					
Aberdeen	1,643	1,532	3,175	220	312
Bel Air	752	700	1,452	101	143
Balance	5,179	4,827	10,006	693	984
<i>Total</i>	<i>7,574</i>	<i>7,059</i>	<i>14,633</i>	<i>1,014</i>	<i>1,439</i>
Total Students				3,244	4,605
Students per Household (BRAC)		0.66			
Students per Household (Non BRAC)		0.43			

METHODOLOGY FOR DEVELOPMENT OF ROUND 7 FORECASTS

The methodology below is used by the Harford County Department of Planning and Zoning for developing forecasts used in Round 7.

HOUSEHOLD FORECASTS

The County determines historic permits distribution and development capacity data by transportation analysis zone (TAZ) and applies permit distribution and capacity data to the housing unit control total for each five-year interval. New household growth that is projected in the TAZs that do not have capacity are reallocated into the next adjacent TAZ with capacity. A five percent vacancy rate (constant) is applied to new housing units to yield the number of households.

POPULATION FORECASTS

Population forecasts were derived by multiplying the average household size by TAZ with household projections by TAZ. Household size is projected using the historic rate of change in household size and then applying this rate into the future. The group quarter's population projection uses a growth factor based on historic trends. The total population forecast is the sum of the household and group quarter's population forecasts.

EMPLOYMENT FORECASTS

Employment projections were based on the Bureau of Economic Analysis (BEA) control totals obtained through Maryland Department of Planning (MDP) and then allocated to countywide projections by TAZ in accordance with the Master Establishment File (Dun and Bradstreet) data by TAZ.