EASTERN SHORE METROPOLITAN PLANNING ORGANIZATION

2040 LONG RANGE TRANSPORTATION PLAN

APPENDIX C
MODEL DEVELOPMENT REPORT

C.1 OVERVIEW

MPOs are required to generate a travel demand model as a component of their long range transportation plan. The travel demand model is a computer model that predicts how commuters will drive and how congestion will increase as population increases in an area. The model subdivides the planning area into zones called traffic analysis zones (TAZs). The number of households, employees, and students are determined for each zone, and then the model calculates the likely trips from each zone to every other zone in the planning area based on the productions (households) and attractions (employment, shopping, etc) in each zone.

ESMPO staff, in coordination with the Technical Advisory Committee (TAC), the University of Alabama at Huntsville, and the Alabama Department of Transportation developed the travel demand model through the following process:

1. Establish Base Year and Future Socio-Economic Data
    - Identify appropriate data for model and take steps to acquire data
    - Import data into GIS
2. Update and Establish Base Highway Network
    - Review existing road network and update roadway classifications as appropriate.
3. Development of Traffic Analysis Zones (TAZs) for Planning Area
    - Create TAZs from 2010 US Census Blocks
    - Establish proposed TAZ centroids and links to the base highway network
4. Create Cube Network
    - Import GIS files (TAZ, Highway Network, Centroids and Links) into Cube Voyager
    - Add centroids, links, link nodes, and external stations to Cube network
    - Add network data such as speed, capacity, and, where available, the ADT
5. Run Trip Gen
    - Prepare Tabulated Data for Trip Gen software
    - Run Trip Gen software to create trip generation file for Cube Voyager
6. Build Cube Voyager Applications
    - Step 1: Trip Generation
    - Step 2: Trip Distribution
    - Step 3: Mode Choice
    - Step 4: Assignment
7. Model Validation
    - Review model for errors and evaluate model outputs
8. Development of 2010, 2020, and 2040 Models
    - Add projects programed for funding between 2010 and 2020
    - Add projects programed for funding between 2010 and 2040
    - Run model with socio-economic data
9. ESMPO Model Results Report

C.2 ESTABLISH BASE YEAR AND FUTURE SOCIO-ECONOMIC DATA

C.2.1 - Introduction

The development of base year socio-economic data and the forecasting of future socio-economic data for a travel model is the first of several steps in in the development process. For this reason it was important to obtain the most current local data available to develop the 2010, 2020, and 2040 socio-economic data. ALDOT only requires MPOs to prepare a base model and a model with a 25 year planning horizon (in our case 2040). However, as will be discussed in more detail below, the 2040 ESMPO population projections are so high that the model is likely to show a completely overloaded network, making it difficult to determine which roads need attention and in what order. To accommodate for this problem, MPO staff elected to produce an additional future model for the year 2020. Projects would be prioritized in the LRTP based on the 2020 model.

ESMPO staff identified the data needed for the travel demand model and acquired the data by downloading the information from the U.S. Census Bureau website, by purchasing the data from third-party providers, or by collecting the data "in-house". The travel model requires the number of households, the number of employees (both retail and non-retail), and student enrollment for each TAZ. After collecting all of the 2010 data, the MPO reviewed third party research to establish a 2020 and 2040 future population for the ESMPO. The projected 2020 and 2040 population was used as the basis for projected 2020 and 2040 households, employment, and student enrollment. The sections below describe the steps taken by ESMPO staff to develop the 2010, 2020, and 2040, socio-economic data for the Eastern Shore Metropolitan Planning Organization (ESMPO) model.

C.2.2 - 2010 Socio-Economic Data

ESMPO staff gathered data from the Baldwin County Commission, the City of Spanish Fort, the City of Daphne, the City of Fairhope, the Town of Loxley, InfoGroup, and the American Community Survey (ACS) in order to develop a complete 2010 socio-economic data set. A complete listing of the 2010 socio-economic data by TAZ is located in Table C.7 on page 14.

C.2.2.1 - 2010 Population Data

2010 population data was collected from the U.S. Census Bureau by Census Block. Because all TAZs (as discussed in more detail below) represent an aggregation of one or more census blocks, the Population of each TAZ was easily calculated based on the population of the aggregated blocks. Based on the 2010 census data, the estimated population of all TAZs within the ESMPO planning area is 98,178. The 2010 population data by TAZ is located in Table C.7 on page 14.

C.2.2.2 - 2010 Occupied Housing Data

2010 Occupied Housing (tenure) data was collected from the U.S. Census Bureau by Census block. As with the population data, the number of occupied households in each TAZ was easily calculated by the number of occupied households in the aggregated Census Blocks that formed

the TAZ. Based on the 2010 census data, the estimated number of occupied housing units within the ESMPO planning area is 38,898. Household size within the MPO planning area in 2010 averaged at 2.54 persons per household. The 2010 household data by TAZ is located in Table C.7 on page 14.

C.2.2.3 - 2010 Median Household Income Data

2010 median household income data was collected from the U.S. Census Bureau and applied to each TAZ within the ESMPO study area for 2010. The U.S. Census collects median income data at the Census tract level. MPO staff assigned the median income for a given Census tract to every Census block within that tract. A few TAZs were located within two or more Census tracts and therefore the Census blocks forming the TAZ were assigned different median income values. MPO staff utilized GIS tools to find the average income for all blocks within a TAZ and utilized the block average as the median household income for the entire TAZ. The 2010 household data by TAZ is located in Table C.7 on page 14.

C.2.2.4 - 2010 Employment

The 2010 estimated total employment for the ESMPO study area is 41,067. The travel model assigns trips to businesses based on the number of employees at the business and based on whether the business is a retail or non-retail establishment. The MPO acquired 2012 business data from InfoGroup USA. MPO staff felt that business data from 2010 and 2012 were reasonably equivalent to allow interchangeable use. The 2012 InfoGroup business data set was used to obtain a list of all businesses located within the ESMPO planning area. The 2010 employment data by TAZ is located in Table C.7 on page 14.

The InfoGroup data was sorted by reported number of employees. Each business with a reported employment of 30 or more was contacted by phone to confirm employment numbers at their location. Businesses with more than 30 employees were considered to be major employers. ESMPO staff contacted over 220 businesses in the ESMPO planning area to confirm their reported employment. Businesses with less than 30 reported employees were not contacted.

Each business was broken down into retail and non-retail using Standard Industrial Classification (SIC) codes for retail and non-retail businesses. The SIC code for each business in the planning area was provided as part of the InfoGroup data set. Proper delineation between retail and non-retail is important because the travel model assigns significantly more trips to retail establishments than to non-retail establishments. MPO staff also considered some non-retail businesses that function more like retail businesses (health care facilities, government services, banks, etc) to determine whether a reclassification would increase the accuracy of the model. After a review of the business data, MPO staff elected to move banks and similar financial institutions to the retail business list and leave other borderline businesses in the non-retail list.

According to the InfoGroup data the ESMPO planning area is home to 1268 retail establishments with approximately 12947 employees and 4473 non-retail establishments with approximately 28,120 employees. Retail accounts for approximately 32% of the planning area's employment with non-retail accounting for approximately 68% of the planning area's employment.

After the year 2010 employment data had been confirmed, a GIS point-file with all the business locations was created by MPO staff using reported latitude and longitude and/or addresses for each business. The GIS point-file was then added to the existing ESMPO planning area map and all 2010 employment data was assigned to the appropriate TAZs.

C.2.2.5 - 2010 School Enrollment

MPO Staff identified all public and private schools and colleges within the planning area and contacted each school to obtain accurate enrollment data. The travel model calculates traffic patterns on the assumption that school is in session as this will provide a worst-case scenario. The 2010 school enrollment data by TAZ is located in Table C.7 on page 14.

C.2.3 - 2020 and 2040 Socio-economic Data

ESMPO staff gathered data from the University of Alabama Center for Business and Economic Research, TischlerBise/Strategic Planning Group, the al-Chalibi Group, the Baldwin County Commission, the City of Spanish Fort, the City of Daphne, the City of Fairhope, the Town of Loxley, and the American Community Survey (ACS) in order to develop 2020 and 2040 socio-economic data. A complete listing of the 2020 and 2040 socio-economic data by TAZ is shown in Table C.7 on page 14.

C.2.3.1 - 2020 and 2040 Population Data

MPO staff calculated the population increase for the Eastern Shore MPA from 2010 to 2040 to be approximately 66,084 bringing the total population up from 98,178 in 2010 to 164,262 in 2040. In developing these projections the MPO utilized population projections prepared for Baldwin County by the University of Alabama Center for Business and Economic Research (CBER), TischlerBise/Strategic Planning Group, and the al-Chalabi Group.

The CBER prepares population projections for each county following each decennial census. The CBER estimates that the population of Baldwin County will increase by 64% from 2010 to 2040 from 182,265 to 298,447, a population increase of 116,182.

In 2001 the CBER prepared projections using 1990 to 2000 growth trends and predicted that Baldwin County's population would be 184,375 in 2010. The actual 2010 Census count was 182,265. The CBER was off by only 2,110 people, a 1.2% error. For the prior decade, CBER had projected that Baldwin County would grow by 43,960 new residents and the projections were 5.0 percent above the actual population growth of 41,850.

The CBER's current series of population projections show strong growth continuing in Baldwin County through 2040, with the rate of growth slowing every five years. The CBER anticipates that the 0-19 year old population is expected to increase more slowly than the total population or the older population of the county across the projection period. Therefore, the demand for new schools will not be so rapid. Across the 2010 to 2040 period, the increase in Baldwin County residents aged 65+ is projected to be 47,561—amounting to 40.9 percent of the total projected

population gain of 116,182. This is partly due to the baby boomers turning 65, but also to in-migration of older individuals (retirees). While these residents use the roadways, they are not generally looking for employment. The CBER predicts that the increase in the 65+ population will slow after 2030–the youngest baby boomers turn 65 in 2029.

TischlerBise was retained by Baldwin County in 2007 to perform an impact fee study for the County. As part of that study, detailed population and housing projections were prepared for 2020. The Strategic Planning Group projected this data out to 2025 for use in the Baldwin County Horizon 2025 Comprehensive Plan. Because the TischlerBise study only looked at the population from 2000 to 2025, MPO staff took the projected increase from 2010 to 2025 and doubled the number to determine a 2040 projection. Based on the TischlerBise study the population of Baldwin County will increase by 93% from 2010 to 2040 from 190,765 to 367,865 a population increase of 116,182.

The al-Chalabi Group (ACG) was hired by Baldwin County to prepare an independent Economic Growth Analysis for the County. ACG's full report was provided to the Baldwin County Highway Department in October 2010. The report provided detailed forecasts of population, employment and visitors/tourists at 10-year intervals from 2010 through 2040. According to the al-Chalabi Group, the population of Baldwin County will increase by 61.46% from 2010 to 2040 from 182,265 to 294,285, a population increase of 112,020.

Based on the population growth data released so far this decade, Baldwin County grew by 13,275 residents from 2010 to 2013, an annual growth rate of 2.4%. Assuming the growth will slow slightly over time, the existing data suggests that the CBER and al-Chalabi Group estimates are the most accurate. Based on this information, MPO staff elected to use the al-Chalabi Group data as the population estimate for Baldwin County in 2040. The ACG and CBER estimates differed by approximately 4000, a relatively small number when considering the overall estimated increase. In response to some criticism that population projections were too ambitious or aggressive, the MPO elected to use the more conservative of the two estimates.

MPO staff was then faced with the task of determining the proper growth rate for the MPO planning area. One possible calculation method would have been to apply the CBER's projected growth rate for Baldwin County directly to the population within the MPO planning. However, this method assumes that the population growth in the MPO will be the same as the rest of the county. Census data indicates otherwise.

From 2000 to 2010 Baldwin County's population increased by 41,850. Fifty-nine percent (59%), or 24,726, of that increase took place in the MPO planning area. MPO staff therefore assumed that the same proportional increase between the planning area and the county as a whole would apply from 2010 to 2040. Assuming that 59% of Baldwin County's growth from 2010 to 2040 occurs within the MPO planning area, then the planning area population will increase by approximately 21,0101 from 2010 to 2020, and 66,084 from 2010 to 2040.

The 2040 projected population increase for the MPO was distributed throughout the TAZs within the planning area utilizing projected 2040 occupied housing data. A complete listing of the 2020 and 2040 population data by TAZ is shown in Table C.7 on page C-13.

C.2.3.2 - 2020 and 2040 Occupied Housing Data

The number of occupied housing units within the planning area is projected to increase by 8,399 from 2010 to 2020 and 26,285 from 2010 to 2040. MPO staff calculated this increase by dividing the projected 2040 population (66,084) by the average household size in the planning area for 2010 (approx. 2.5). MPO staff made the assumption that the average household size within the planning area would remain constant from 2010 to 2040. The reasonableness of this assumption was verified by calculating the average household size for the MPO planning area in 2000, which revealed only a 1.2% difference over ten years (2.57).

The projected households had to be distributed throughout the planning area. To accomplish this, MPO staff first located properties throughout the planning area that are currently being developed or for which development is likely. These properties were given a number rating of 1-3. The rating indicates when the development is likely to be completely built out. The number of likely developments exceeded the estimated 2040 households. As a result, MPO staff was forced to designate a number of properties as not likely to develop until after 2040. For each developable property, staff also noted the number of housing units likely to be built on the property.

- 1 – Likely to develop between 2011 and 2020
- 2 – Likely to develop between 2021 and 2040
- 3 – Not likely to develop until after 2040

In addition to development properties MPO staff considered the likely construction of new homes outside of conventional large subdivisions. ESMPO staff estimated that 432 new homes would be built throughout the planning area at "random" locations. Map C.7 in Appendix C illustrates future household projections. A complete listing of the 2020 and 2040 household data by TAZ is shown in Table C.7 on page 14.

C.2.3.3 - 2020 and 2040 Median Household Income Data

The 2010 median household income was used for the 2040 median household income for each TAZ. At the end of the day median household income has little impact on the number of trips generated by a given household. A complete listing of the 2020 and 2040 median household income data by TAZ is shown in Table C.7 on page 14.

C.2.3.4 - 2020 and 2040 Employment Data

Some difficulty was encountered when generating 2020 and 2040 employment projections because a relatively large percentage of the MPO population is employed outside the planning area and some percentage of the jobs within the MPO are filled by individuals who live outside the planning area. As noted above, the MPO planning area had a 2010 population of 98,178 with approximately 41,469 jobs (based on the number of individuals employed) within the planning area. This results in a 42:100 employment-to-population ratio (E-P ratio) within the planning

area for 2010. Assuming the jobs to population ratio remains unchanged from 2010 to 2040, the number of jobs in the planning area would increase to 50,343 in 2020 and 69,382 in 2040.

As with the household date, future employment data had to be distributed to the various TAZs. MPO staff started by collecting a sampling of existing commercial areas within the MPO and using these areas to calculate the average number of employees per acre of commercial property.

ESMPO staff then divided the planning area into five employment regions. Using the Infogroup employment data, MPO staff developed a 2010 E-P ratio for each of the five employment regions. Assuming that the 2010 E-P ratio for each region would remain constant through 2020 and 2040 and using the population projections for 2020 and 2040, MPO staff projected the employment for each region in 2020 and 2040.

MPO staff next reviewed land use maps from each municipality and began the process of identifying property that is likely to develop commercially in the next 30 years. It is important to keep in mind that it is impossible to make these determinations with great certainty. Staff relied heavily on input from our Technical Committee members and Policy Board members.

After identifying developable property we calculated the acreage of each property and applied the employees-per-acre value calculated in the first step. With a specific number of employees assigned to each developable commercial property, MPO staff proceeded to rank the properties for likelihood of development by 2020 and 2040 until target amounts of employment for each region had been achieved.

- 1 – Likely to develop between 2011 and 2020
- 2 – Likely to develop between 2021 and 2040
- 3 – Not likely to develop until after 2040

Finally, MPO staff calculated the ratio between 2010 retail and non-retail employment for each of the five employment regions and assumed that the ratio for each region would remain constant through 2020 and 2040. Using this ratio the employment assigned to each parcel was split into retail and non-retail. The employment calculations by region are shown in the Tables C.1 through C.2 below.

Table C.1
2010 – 2040 Employment Projections for Metropolitan Planning Area

2010 - 2040 Employment for Entire MPA			
	2010	2020	2040
Retail:	12,953	15,725	21,672
Non-Retail:	28,516	34,618	47,710
Total Employment:	41,469	50,343	69,382

Table C.2
2010 – 2040 Employment Projections by Region

Region 1 (Fairhope Area)			
	2010	**2020**	**2040**
Retail:	3,424	4,119	5,008
Non-Retail:	10,043	12,073	14,690
Population:	23,609	28,387	34,969
Total Employment:	13,467	16,192	19,698
R-NR Ratio:	0.34	0.34	0.34
Emp-Pop Ratio:	0.57	0.57	0.56

Region 2 (Daphne Area)			
	2010	**2020**	**2040**
Retail:	4,406	5,255	6,583
Non-Retail:	8,632	10,307	12,906
Population:	26,811	32,529	41,157
Total Employment:	13,038	15,562	19,489
R-NR Ratio:	0.51	0.51	0.51
Emp-Pop Ratio:	0.49	0.48	0.47

Region 3 (Spanish Fort Area)			
	2010	**2020**	**2040**
Retail:	3,193	4,555	10,010
Non-Retail:	4,215	6,019	13,198
Population:	15,448	22,050	48,397
Total Employment:	7,408	10,574	23,208
R-NR Ratio:	0.76	0.76	0.76
Emp-Pop Ratio:	0.48	0.48	0.48

Region 4 (Loxley/County)			
	2010	**2020**	**2040**
Retail:	1,686	1,875	2,033
Non-Retail:	5,173	5,751	6,234
Population:	27,143	30,177	32,715
Total Employment:	6,859	7,626	8,267
R-NR Ratio:	0.33	0.33	0.33
Emp-Pop Ratio:	0.25	0.25	0.25

Region 5 (Point Clear/Fish River)			
	2010	2020	2040
Retail:	244	244	326
Non-Retail:	487	487	649
Population:	4,577	4,577	4,577
Total Employment:	731	731	975
R-NR Ratio:	0.50	0.50	0.50
Emp-Pop Ration:	0.16	0.16	0.21

A complete listing of the 2020 and 2040 employment data by TAZ is shown in Table C.7 on page 14.

C.2.3.5 - 2020 and 2040 School Enrollment Data

MPO staff started by collecting the enrollment numbers for schools within the planning area and categorizing the enrollment numbers by grade (K-6, 7-8, and 9-12). See Tables C.3 below.

Table C.3
2010 School Enrollment within Metropolitan Planning Area

K-6		7-8		9-12		College	
Fairhope Elementary School	1025	Spanish Fort Middle School	857	Fairhope High School	1500	Faulkner State (Fairhope Campus)	1029
Robertsdale Elementary School	1081	Daphne Middle School	594	Daphne High School	1221	South Alabama (Fairhope Campus)	315
Daphne East Elementary School	969	Fairhope Middle School	764	Robertsdale High School	1338		
Spanish Fort Elementary School	721	Central Baldwin Middle School	654	Spanish Fort High School	1074		
Rockwell Elementary School	849	Bayshore Christian Academy	26	Bayshore Christian Academy	17		
Daphne Elementary School	685	St. Patrick School	37	Central Christian	79		
Silverhill Elementary School	463	Christ the King	85	Bayside Academy	256		
Delta Elementary School	229	Central Christian	37				
Loxley Elementary School	410	Bayside Academy	112				
Rosinton Elementary School	340						
Stapleton Elementary School	184						
J Larry Newton School	664						
Fairhope Intermediate School	769						
WJ Carroll Intermediate School	465						
Bayshore Christian Academy	120						
St. Patrick School	169						
Christ the King	374						
Central Christian	150						
Bayside Academy	345						
Total Public:	8854	Total Public:	2869	Total Public:	5,133		
Total Private:	1158	Total Private:	297	Total Private:	352		
TOTAL:	10012	TOTAL:	3166	TOTAL:	5485	Total:	1344

Staff then calculated student-to-population ratios for each of these grade categories. It was assumed that the student-to-population ratios would remain constant from 2010 to 2040. This allowed staff to calculate the projected number of students in each grade category based on the projected populations for 2020 and 2040. See Tables C.4 below.

Table C.4
2010 - 2040 Enrollment Projections within Metropolitan Planning Area

Student Projections Entire MPA									
	2010	2015	2020	2020 Inc.	2025	2030	2035	2040	2040 Inc.
Population:	98,178	108,683	119,188		130,154	141,119	152,691	164,262	
# K-6 Public Students:	8,854	9,801	10,749	1,895	11,738	12,727	13,770	14,814	5,960
Public K-6 to Pop Ratio:	0.090	0.090	0.090		0.090	0.090	0.090	0.090	
# K-6 Private Students:	1,158	1,282	1,406	248	1,535	1,664	1,801	1,937	779
Private K-6 to Pop Ratio:	0.012	0.012	0.012		0.012	0.012	0.012	0.012	
# 7-8 Public Students:	2,869	3,176	3,483	614	3,803	4,124	4,462	4,800	1,931
Public 7-8 to Pop Ratio:	0.029	0.029	0.029		0.029	0.029	0.029	0.029	
# 7-8 Private Students:	297	329	361	64	394	427	462	497	200
Private 7-8 to Pop Ratio:	0.003	0.003	0.003		0.003	0.003	0.003	0.003	
# 9-12 Public Students:	5,133	5,682	6,231	1,098	6,805	7,378	7,983	8,588	3,455
Public 9-12 to Pop Ratio:	0.052	0.052	0.052		0.052	0.052	0.052	0.052	
# 9-12 Private Students:	352	390	427	75	467	506	547	589	237
Private 9-12 to Pop Ratio:	0.004	0.004	0.004		0.004	0.004	0.004	0.004	
# College Students:	1,344	1,488	1,632	288	1,782	1,932	2,090	2,249	905
College to Pop Ratio:	0.014	0.014	0.014		0.014	0.014	0.014	0.014	
Total Students:	20,007	22,148	24,288	4,281	26,523	28,758	31,116	33,474	13,467

Next, MPO staff calculated the average enrollment for elementary, middle, and high schools in the planning area as well as the average enrollment for private schools. These figures allowed for the calculation of the total number of new schools that would be needed in the planning area by 2020 and 2040. See Tables C.5 below.

Table C.5
2010 - 2040 Estimated New Schools

	Avg. Students by School	Est. 2020 New Schools	Est. 2040 New Schools
Public Elementary Schools:	632	3.0	9.4
Public Middle Schools:	717	0.9	2.7
Public High Schools:	1,283	0.9	2.7
Private Schools:	361	1.1	3.4

Finally, to better identify where these schools might be located, MPO staff utilized the same 5 regions used in the employment projections. Looking at the population increases within that region alone, staff considered how many students by category would be generated in each region and the number of schools needed to accommodate those students. Based on these calculations, staff placed the possible new schools at various locations within the zones so the model could calculate the traffic patterns generated by the increase in students.

In a letter dated May 28, 2015, the Superintendent of the Baldwin County Public School system confirmed that the school system, while not necessarily endorsing the projections, had not objections to the data.

Table C.6
2010 - 2040 Enrollment Projects by Area

Student Projections Zone 1 (Fairhope Area)					
	2010	**2020**	**2020 Inc.**	**2040**	**2040 Inc.**
Population:	23,609	28,387		34,969	
# K-6 Public Students:	2,129	2,560	431	3,154	1,024
# K-6 Private Students:	278	335	56	412	134
# 7-8 Public Students:	690	830	140	1,022	332
# 7-8 Private Students:	71	86	14	106	34
# 9-12 Public Students:	1,234	1,484	250	1,828	594
# 9-12 Private Students:	85	102	17	125	41
Total Students:	4,488	5,396	908	6,647	2,159

	Avg. Students by School	Est. 2020 New Schools	Est. 2040 New Schools
Public Elementary Schools:	632	0.7	1.6
Public Middle Schools:	717	0.2	0.5
Public High Schools:	1,283	0.2	0.5
Private Schools:	361	0.2	0.6

Student Projections Zone 2 (Daphne Area)					
	2010	**2020**	**2020 Inc.**	**2040**	**2040 Inc.**
Population:	26,811	32,529		41,157	
# K-6 Public Students:	2,418	2,934	516	3,712	1,294
# K-6 Private Students:	316	384	67	485	169
# 7-8 Public Students:	783	951	167	1,203	419
# 7-8 Private Students:	81	98	17	125	43
# 9-12 Public Students:	1,402	1,701	299	2,152	750
# 9-12 Private Students:	96	117	21	148	51
Total Students:	5,097	6,184	1,087	7,824	2,727

	Avg. Students by School	Est. 2020 New Schools	Est. 2040 New Schools
Public Elementary Schools:	632	0.8	2.0
Public Middle Schools:	717	0.2	0.6
Public High Schools:	1,283	0.2	0.6
Private Schools:	361	0.3	0.7

Student Projections Zone 3 (Spanish Fort Area)					
	2010	**2020**	**2020 Inc.**	**2040**	**2040 Inc.**
Population:	15,448	22,050		48,397	
# K-6 Public Students:	1,393	1,989	595	4,365	2,971
# K-6 Private Students:	182	260	78	571	389
# 7-8 Public Students:	451	644	193	1,414	963
# 7-8 Private Students:	47	67	20	146	100
# 9-12 Public Students:	808	1,153	345	2,530	1,723
# 9-12 Private Students:	55	79	24	174	118
Total Students:	2,937	4,192	1,255	9,200	6,263

	Avg. Students by School	Est. 2020 New Schools	Est. 2040 New Schools
Public Elementary Schools:	632	0.9	4.7
Public Middle Schools:	717	0.3	1.3
Public High Schools:	1,283	0.3	1.3
Private Schools:	361	0.3	1.7

Student Projections Zone 4 (Loxley/Robertsdale/County)					
	2010	**2020**	**2020 Inc.**	**2040**	**2040 Inc.**
Population:	27,143	30,177		32,715	
# K-6 Public Students:	2,448	2,721	274	2,950	502
# K-6 Private Students:	320	356	36	386	66
# 7-8 Public Students:	793	882	89	956	163
# 7-8 Private Students:	82	91	9	99	17
# 9-12 Public Students:	1,419	1,578	159	1,710	291
# 9-12 Private Students:	97	108	11	117	20
Total Students:	5,160	5,736	577	6,219	1,059

	Avg. Students by School	Est. 2020 New Schools	Est. 2040 New Schools
Public Elementary Schools:	632	0.4	0.8
Public Middle Schools:	717	0.1	0.2
Public High Schools:	1,283	717.0	0.2
Private Schools:	361	0.2	0.3

Student Projections Zone 5 (Point Clear/Fish River)					
	2010	**2020**	**2020 Inc.**	**2040**	**2040 Inc.**
Population:	4,577	4,577		4,577	
# K-6 Public Students:	413	413	0	413	0
# K-6 Private Students:	54	54	0	54	0
# 7-8 Public Students:	134	134	0	134	0
# 7-8 Private Students:	14	14	0	14	0
# 9-12 Public Students:	239	239	0	239	0
# 9-12 Private Students:	16	16	0	16	0
Total Students:	870	870	0	870	0

	Avg. Students by School	Est. 2020 New Schools	Est. 2040 New Schools
Public Elementary Schools:	632	0.0	0.0
Public Middle Schools:	717	0.0	0.0
Public High Schools:	1,283	0.0	0.0
Private Schools:	361	0.0	0.0

Table C.7
2010, 2020, & 2040 Socio-economic Data by Traffic Analysis Zone

TAZ	2010 Population	2020 Population (+21,010) 119188	2040 Population (+66,084) 164262	2010 Households	2020 Households (+8,399)	2040 Households (+26,285)	2010 Median Household Income	2020 Median Household Income	2040 Median Household Income	2010 Retail Employment	2020 Retail Employment (+2,680)	2040 Retail Employment (+8,450)	2010 Non-Retail Employment	2020 Non-Retail Employment (+6,057)	2040 Non-Retail Employment (+19,084)	2010 School Enrollment	2020 School Enrollment (+4,352)	2040 School Enrollment (+13,637)
TOTAL	98,178	119,188	164,262	38,898	47,312	64,915				12,820	15,256	21,026	27,889	34,445	47,472	20,201	24,553	33,838
1	227	223	221	105	105	105	$ 43,952	$ 43,952	$ 43,952	0	0	0	0	0	0	0	0	0
2	175	172	171	78	78	78	$ 43,952	$ 43,952	$ 43,952	0	0	0	0	0	0	0	0	0
3	162	159	157	86	86	86	$ 43,952	$ 43,952	$ 43,952	0	0	0	12	12	12	0	0	0
4	385	377	374	189	189	189	$ 43,952	$ 43,952	$ 43,952	8	8	8	32	32	32	0	0	0
5	76	74	73	45	45	45	$ 43,952	$ 43,952	$ 43,952	9	9	9	0	0	0	0	0	0
6	170	166	165	88	88	88	$ 43,952	$ 43,952	$ 43,952	73	73	73	287	287	287	500	500	500
7	95	93	93	41	41	41	$ 43,952	$ 43,952	$ 43,952	0	0	0	14	14	14	0	0	0
8	4	4	4	3	3	3	$ 43,952	$ 43,952	$ 43,952	3	3	3	34	34	34	0	0	0
9	44	43	43	18	18	18	$ 43,952	$ 43,952	$ 43,952	0	0	0	34	34	34	0	0	0
10	22	21	21	16	16	16	$ 43,952	$ 43,952	$ 43,952	257	257	257	128	128	128	0	0	0
11	288	282	279	154	154	154	$ 43,952	$ 43,952	$ 43,952	10	10	10	72	72	72	0	0	0
12	0	0	0	0	0	0	$ 43,952	$ 43,952	$ 43,952	91	91	91	115	115	115	1029	1,029	1,029
13	0	0	0	0	0	0	$ 43,952	$ 43,952	$ 43,952	0	0	0	4	4	4	0	0	0
14	357	351	348	155	155	155	$ 43,952	$ 43,952	$ 43,952	110	110	110	93	93	93	0	0	0
15	37	36	36	21	21	21	$ 53,368	$ 53,368	$ 53,368	136	136	136	269	269	269	0	0	0
16	0	0	0	0	0	0	$ 53,368	$ 53,368	$ 53,368	70	70	70	29	29	29	0	0	0
17	0	0	0	0	0	0	$ 53,368	$ 53,368	$ 53,368	0	0	0	39	39	39	0	0	0
18	140	137	136	76	76	76	$ 48,660	$ 48,660	$ 48,660	7	7	7	24	24	24	0	0	0
19	23	23	23	2	2	2	$ 53,368	$ 53,368	$ 53,368	63	63	63	128	128	128	0	0	0
20	82	80	80	47	47	47	$ 53,368	$ 53,368	$ 53,368	31	31	31	66	66	66	0	0	0
21	2	2	2	2	2	2	$ 53,368	$ 53,368	$ 53,368	0	0	0	196	196	196	1789	1,789	1,789
22	529	520	516	236	236	236	$ 53,368	$ 53,368	$ 53,368	0	0	0	12	12	12	0	0	0
23	121	119	118	61	61	61	$ 53,368	$ 53,368	$ 53,368	210	223	223	23	62	62	0	0	0
24	141	139	138	62	62	62	$ 43,952	$ 43,952	$ 43,952	27	27	27	366	366	366	0	0	0
25	51	50	50	18	18	18	$ 43,952	$ 43,952	$ 43,952	0	0	0	216	216	216	0	0	0
26	54	53	53	15	15	15	$ 43,952	$ 43,952	$ 43,952	40	40	40	1276	1,276	1,276	0	0	0
27	955	1084	1079	426	493	494	$ 43,952	$ 43,952	$ 43,952	106	106	106	76	76	76	0	0	0
28	228	224	222	104	104	104	$ 43,952	$ 43,952	$ 43,952	0	0	0	23	23	23	0	0	0
29	113	111	110	47	47	47	$ 43,952	$ 43,952	$ 43,952	0	0	0	3	3	3	0	0	0
30	453	843	1315	192	363	571	$ 43,952	$ 43,952	$ 43,952	20	33	34	26	63	66	0	0	0
31	349	344	343	132	132	132	$ 43,952	$ 43,952	$ 43,952	0	0	5	173	173	187	0	0	0
32	173	171	170	59	59	59	$ 43,952	$ 43,952	$ 43,952	0	0	0	9	9	9	0	0	0
33	163	160	160	68	68	68	$ 43,952	$ 43,952	$ 43,952	67	103	103	469	574	574	0	0	0
34	711	818	1032	269	314	399	$ 48,333	$ 48,333	$ 48,333	3	18	18	1171	1,215	1,215	1500	1,500	1,500
35	665	739	1143	238	268	418	$ 60,621	$ 60,621	$ 60,621	4	4	4	42	42	42	0	0	0
36	1582	1552	1540	752	752	753	$ 60,621	$ 60,621	$ 60,621	128	138	138	290	318	318	0	0	0
37	203	319	577	68	108	197	$ 48,333	$ 48,333	$ 48,333	0	0	44	14	14	143	0	0	0
38	521	639	1629	197	245	630	$ 60,621	$ 60,621	$ 60,621	3	3	3	3	3	3	0	0	0
39	68	147	145	35	77	77	$ 60,621	$ 60,621	$ 60,621	162	164	164	250	256	256	0	0	0
40	61	60	60	22	22	22	$ 60,621	$ 60,621	$ 60,621	0	15	15	2	44	44	0	0	0
41	371	365	363	162	162	163	$ 60,621	$ 60,621	$ 60,621	0	0	7	82	82	103	0	0	0
42	147	143	142	95	95	95	$ 60,621	$ 60,621	$ 60,621	17	30	30	143	184	184	0	0	0
43	0	0	0	0	0	0	$ 60,621	$ 60,621	$ 60,621	219	219	219	45	45	45	0	0	0
44	438	510	504	316	379	379	$ 53,368	$ 53,368	$ 53,368	199	229	229	352	440	440	769	769	769
45	426	637	633	164	249	249	$ 60,621	$ 60,621	$ 60,621	11	30	30	35	90	90	0	0	0
46	138	136	136	50	50	50	$ 60,621	$ 60,621	$ 60,621	0	6	6	6	22	22	0	0	0
47	4	4	4	2	2	2	$ 53,368	$ 53,368	$ 53,368	39	43	43	22	34	34	0	0	0
48	721	708	704	337	337	338	$ 53,368	$ 53,368	$ 53,368	10	233	519	49	703	1,551	0	0	0
49	812	798	793	347	347	347	$ 53,368	$ 53,368	$ 53,368	83	105	105	84	147	147	0	0	0
50	318	313	311	130	130	130	$ 53,368	$ 53,368	$ 53,368	0	0	0	69	69	69	0	0	0
51	307	301	299	144	144	144	$ 53,368	$ 53,368	$ 53,368	35	35	35	241	241	241	0	0	0
52	226	222	220	111	111	111	$ 53,368	$ 53,368	$ 53,368	6	6	6	243	243	243	0	0	0
53	126	124	123	53	53	53	$ 53,368	$ 53,368	$ 53,368	5	5	5	27	27	27	0	0	0
54	69	68	68	29	29	29	$ 53,280	$ 53,280	$ 53,280	0	0	0	5	5	5	0	0	0
55	76	75	74	33	33	33	$ 53,170	$ 53,170	$ 53,170	0	0	0	0	0	0	0	0	0
56	298	293	292	120	120	120	$ 53,170	$ 53,170	$ 53,170	0	0	0	5	5	5	0	0	0
57	319	314	313	123	123	123	$ 53,170	$ 53,170	$ 53,170	0	0	0	20	20	20	0	0	0
58	128	126	125	52	52	52	$ 53,170	$ 53,170	$ 53,170	0	0	0	5	5	5	0	0	0
59	569	560	557	221	221	221	$ 53,170	$ 53,170	$ 53,170	5	5	5	62	62	62	0	0	0
60	68	67	67	29	29	29	$ 53,170	$ 53,170	$ 53,170	0	0	0	112	112	112	732	732	732
61	180	179	178	41	41	41	$ 53,170	$ 53,170	$ 53,170	1	1	1	11	11	11	0	0	0
62	550	542	539	215	215	215	$ 53,170	$ 53,170	$ 53,170	41	41	41	266	266	266	0	0	0
63	337	332	330	136	136	136	$ 53,170	$ 53,170	$ 53,170	0	0	0	172	172	172	685	685	685
64	0	0	0	0	0	0	$ 46,262	$ 46,262	$ 46,262	26	26	26	172	172	172	0	0	0
65	450	438	434	294	294	294	$ 47,797	$ 47,797	$ 47,797	172	172	172	349	349	349	0	0	0
66	786	766	758	501	501	501	$ 46,262	$ 46,262	$ 46,262	115	122	122	188	202	202	0	0	0
67	371	984	2205	124	333	751	$ 60,587	$ 60,587	$ 60,587	141	271	363	59	440	710	0	0	0

Table C.7 (Cont'd)
2010, 2020, & 2040 Socio-economic Data by Traffic Analysis Zone

TAZ	2010 Population	2020 Population (+21,010) 119188	2040 Population (+66,084) 164262	2010 Households	2020 Households (+8,399)	2040 Households (+26,285)	2010 Median Household Income	2020 Median Household Income	2040 Median Household Income	2010 Retail Employment	2020 Retail Employment (+2,680)	2040 Retail Employment (+8,450)	2010 Non-Retail Employment	2020 Non-Retail Employment (+6,057)	2040 Non-Retail Employment (+19,084)	2010 School Enrollment	2020 School Enrollment (+4,352)	2040 School Enrollment (+13,637)
68	0	0	0	0	0	0	$ 53,368	$ 53,368	$ 53,368	0	0	0	0	0	0	0	0	0
69	76	75	75	30	30	30	$ 53,170	$ 53,170	$ 53,170	8	10	14	173	179	190	0	0	0
70	163	161	161	44	44	44	$ 53,170	$ 53,170	$ 53,170	4	13	13	101	127	127	0	0	0
71	170	168	167	63	63	63	$ 53,170	$ 53,170	$ 53,170	0	20	43	29	90	156	0	0	0
72	169	167	166	60	60	60	$ 53,170	$ 53,170	$ 53,170	314	326	326	22	58	58	0	0	0
73	164	162	161	60	60	60	$ 53,170	$ 53,170	$ 53,170	35	50	59	22	53	71	0	0	0
74	44	43	43	18	18	18	$ 53,170	$ 53,170	$ 53,170	7	7	7	94	94	94	0	0	0
75	486	476	472	251	251	251	$ 53,170	$ 53,170	$ 53,170	208	244	264	504	576	616	465	465	465
76	0	0	0	0	0	0	$ 53,368	$ 53,368	$ 53,368	0	0	0	90	90	90	0	0	0
77	63	62	61	34	34	34	$ 53,170	$ 53,170	$ 53,170	107	107	107	300	300	300	0	0	0
78	101	99	98	53	53	53	$ 53,170	$ 53,170	$ 53,170	149	157	157	280	296	296	0	0	0
79	689	903	899	293	391	392	$ 53,508	$ 53,508	$ 53,508	8	8	8	25	25	25	0	0	0
80	84	239	239	38	110	111	$ 53,508	$ 53,508	$ 53,508	0	0	0	5	5	5	0	0	0
81	131	129	128	55	55	55	$ 53,368	$ 53,368	$ 53,368	3	5	5	14	18	18	0	0	0
82	107	105	104	57	57	57	$ 53,508	$ 53,508	$ 53,508	19	19	19	710	710	710	0	0	0
83	628	620	623	271	272	275	$ 53,508	$ 53,508	$ 53,508	30	30	30	27	27	27	0	0	0
84	209	208	210	75	76	77	$ 53,508	$ 53,508	$ 53,508	53	53	114	22	22	143	0	0	0
85	132	130	129	64	64	64	$ 43,952	$ 43,952	$ 43,952	6	6	6	17	17	17	0	0	0
86	108	106	106	41	41	41	$ 43,952	$ 43,952	$ 43,952	0	0	0	4	4	4	0	0	0
87	141	140	141	55	55	56	$ 50,058	$ 50,058	$ 50,058	4	4	25	17	17	80	0	0	0
88	450	749	747	160	270	271	$ 48,333	$ 48,333	$ 48,333	28	32	44	137	147	183	664	664	664
89	86	87	91	29	30	31	$ 51,986	$ 51,986	$ 51,986	56	56	77	173	173	214	0	0	0
90	496	491	491	182	183	184	$ 50,403	$ 50,403	$ 50,403	12	12	12	40	40	40	0	0	0
91	97	96	96	31	31	31	$ 73,711	$ 73,711	$ 73,711	836	836	836	122	122	122	0	0	0
92	187	186	187	71	72	73	$ 53,508	$ 53,508	$ 53,508	7	7	7	66	66	66	0	0	0
93	207	206	208	77	78	79	$ 53,508	$ 53,508	$ 53,508	36	36	36	24	24	24	0	0	0
94	749	739	738	302	303	305	$ 53,508	$ 53,508	$ 53,508	5	5	5	76	76	76	0	0	0
95	476	468	467	219	220	221	$ 39,891	$ 39,891	$ 39,891	0	0	0	10	10	10	0	0	0
96	1082	1070	1074	428	430	435	$ 46,793	$ 46,793	$ 46,793	40	40	40	65	65	65	0	0	0
97	345	340	338	151	151	152	$ 39,404	$ 39,404	$ 39,404	0	0	0	6	6	6	0	0	0
98	325	504	501	124	195	196	$ 60,621	$ 60,621	$ 60,621	1	1	53	41	41	194	0	0	0
99	589	581	582	261	262	265	$ 38,977	$ 38,977	$ 38,977	10	10	10	21	21	21	0	0	0
100	429	597	594	142	200	201	$ 60,621	$ 60,621	$ 60,621	6	6	6	51	51	51	0	0	0
101	447	561	558	172	219	220	$ 60,621	$ 60,621	$ 60,621	9	41	125	57	151	399	0	0	632
102	195	193	577	67	67	202	$ 60,621	$ 60,621	$ 60,621	0	6	39	50	67	166	0	0	0
103	86	681	2638	30	241	939	$ 73,822	$ 73,822	$ 73,822	0	0	125	10	10	375	0	0	0
104	172	440	1513	58	150	520	$ 73,822	$ 73,822	$ 73,822	0	0	25	48	48	98	0	1,283	1,283
105	1617	1594	1587	611	612	613	$ 67,300	$ 67,300	$ 67,300	103	103	105	508	508	513	161	161	161
106	473	466	464	181	181	181	$ 53,777	$ 53,777	$ 53,777	4	49	108	71	159	274	0	0	0
107	269	266	265	101	101	102	$ 53,170	$ 53,170	$ 53,170	329	399	487	754	893	1063	0	0	0
108	967	951	1487	424	425	669	$ 57,595	$ 57,595	$ 57,595	13	73	242	231	351	682	0	0	0
109	1233	1275	1270	420	440	441	$ 73,822	$ 73,822	$ 73,822	77	104	163	214	266	382	0	0	0
110	310	583	1179	104	198	403	$ 73,822	$ 73,822	$ 73,822	5	18	142	23	48	289	0	0	0
111	416	536	534	148	193	194	$ 73,822	$ 73,822	$ 73,822	8	29	81	17	59	161	0	0	0
112	259	255	255	99	99	99	$ 46,262	$ 46,262	$ 46,262	77	86	123	291	307	378	0	0	0
113	232	228	227	116	116	117	$ 46,262	$ 46,262	$ 46,262	18	85	145	557	690	809	2036	2,036	2,036
114	563	554	552	223	223	224	$ 53,170	$ 53,170	$ 53,170	41	85	85	191	278	278	0	0	0
115	321	315	313	149	149	149	$ 53,170	$ 53,170	$ 53,170	94	94	94	322	322	322	0	0	0
116	1138	1315	1307	516	607	608	$ 46,262	$ 46,262	$ 46,262	495	532	585	201	273	377	0	0	0
117	780	1614	1608	235	492	493	$ 46,262	$ 46,262	$ 46,262	10	38	87	208	263	360	0	0	0
118	141	139	139	51	51	51	$ 46,262	$ 46,262	$ 46,262	13	13	13	158	158	158	0	0	0
119	602	590	585	302	302	302	$ 46,262	$ 46,262	$ 46,262	7	11	11	69	76	76	0	0	0
120	1723	1690	1677	829	829	830	$ 46,262	$ 46,262	$ 46,262	1	1	1	168	168	168	0	0	0
121	436	426	423	242	242	242	$ 70,661	$ 70,661	$ 70,661	8	8	8	58	58	58	0	0	0
122	485	478	475	181	181	181	$ 73,711	$ 73,711	$ 73,711	0	0	0	3	3	3	0	0	0
123	2395	2359	2346	906	906	907	$ 68,159	$ 68,159	$ 68,159	7	7	7	53	53	53	0	0	0
124	1011	997	994	370	371	372	$ 75,536	$ 75,536	$ 75,536	285	424	424	567	755	755	0	0	0
125	450	438	433	294	294	294	$ 59,987	$ 59,987	$ 59,987	187	187	187	51	51	51	0	0	0
126	0	0	0	0	0	0	$ 53,170	$ 53,170	$ 53,170	9	16	20	7	19	28	0	0	0
127	1534	1511	1503	579	579	580	$ 46,262	$ 46,262	$ 46,262	9	9	9	385	385	385	0	0	0
128	644	640	637	229	231	231	$ 58,739	$ 58,739	$ 58,739	0	0	0	1	1	1	0	0	0
129	96	149	149	33	52	52	$ 62,731	$ 62,731	$ 62,731	0	0	0	1	1	1	0	0	0
130	0	0	0	0	0	0	$ 73,767	$ 73,767	$ 73,767	6	6	6	7	7	7	0	0	0
131	120	118	117	47	47	47	$ 73,711	$ 73,711	$ 73,711	13	13	13	69	69	69	0	0	0
132	172	169	168	67	67	67	$ 73,711	$ 73,711	$ 73,711	5	5	5	6	6	6	0	0	0
133	164	162	161	63	63	63	$ 73,711	$ 73,711	$ 73,711	0	0	0	6	6	6	0	0	0
134	218	215	214	78	78	78	$ 73,711	$ 73,711	$ 73,711	0	0	0	1	1	1	0	0	0

Table C.7 (Cont'd)
2010, 2020, & 2040 Socio-economic Data by Traffic Analysis Zone

TAZ	2010 Population	2020 Population (+21,010) 119188	2040 Population (+66,084) 164262	2010 Households	2020 Households (+8,399)	2040 Households (+26,285)	2010 Median Household Income	2020 Median Household Income	2040 Median Household Income	2010 Retail Employment	2020 Retail Employment (+2,680)	2040 Retail Employment (+8,450)	2010 Non-Retail Employment	2020 Non-Retail Employment (+6,057)	2040 Non-Retail Employment (+19,084)	2010 School Enrollment	2020 School Enrollment (+4,352)	2040 School Enrollment (+13,637)
135	483	476	473	176	176	176	$ 73,711	$ 73,711	$ 73,711	3	3	3	7	7	7	0	0	0
136	0	0	0	0	0	0	$ 73,711	$ 73,711	$ 73,711	0	0	0	114	114	114	0	0	0
137	0	0	0	0	0	0	$ 46,262	$ 46,262	$ 46,262	280	284	288	454	461	468	0	0	0
138	837	824	2622	358	358	1149	$ 59,288	$ 59,288	$ 59,288	0	0	0	135	135	135	0	0	0
139	455	449	446	159	159	159	$ 73,822	$ 73,822	$ 73,822	0	0	0	113	113	113	1221	1,221	1,221
140	0	0	0	0	0	0	$ 73,711	$ 73,711	$ 73,711	35	59	59	164	212	212	0	0	0
141	0	0	3	0	0	1	$ 75,232	$ 75,232	$ 75,232	492	543	637	102	172	295	0	0	0
142	85	83	83	42	42	42	$ 75,536	$ 75,536	$ 75,536	63	63	63	42	42	42	0	0	0
143	203	200	198	88	88	88	$ 75,536	$ 75,536	$ 75,536	7	7	7	4	4	4	0	0	0
144	555	547	544	216	216	217	$ 75,536	$ 75,536	$ 75,536	7	59	59	96	165	165	721	721	721
145	886	1414	1405	354	574	575	$ 75,536	$ 75,536	$ 75,536	10	16	74	76	85	161		0	0
146	1069	1054	1049	374	374	375	$ 75,536	$ 75,536	$ 75,536	2	2	2	30	30	30	0	0	0
147	415	410	409	124	124	124	$ 75,536	$ 75,536	$ 75,536	3	3	3	22	22	22	0	0	0
148	597	834	833	184	260	261	$ 51,827	$ 51,827	$ 51,827	10	10	10	23	23	23	0	0	0
149	224	221	221	79	79	79	$ 75,536	$ 75,536	$ 75,536	0	0	0	4	4	4	0	0	0
150	648	637	634	277	277	278	$ 75,536	$ 75,536	$ 75,536	36	66	66	215	254	254	0	0	0
151	304	295	291	233	233	233	$ 75,536	$ 75,536	$ 75,536	43	43	43	295	295	295	0	0	0
152	206	203	202	78	78	78	$ 75,536	$ 75,536	$ 75,536	0	37	37	1	50	50	0	0	0
153	454	447	445	176	176	176	$ 75,380	$ 75,380	$ 75,380	79	121	121	151	209	209	0	0	0
154	465	459	457	173	173	174	$ 75,215	$ 75,215	$ 75,215	71	71	71	426	426	426	1931	1,931	1,931
155	583	578	581	221	222	225	$ 73,833	$ 73,833	$ 73,833	16	16	16	118	118	118	0	0	0
156	63	63	64	25	25	26	$ 73,822	$ 73,822	$ 73,822	24	303	1,069	247	614	1,622	0	0	0
157	395	387	384	211	211	212	$ 73,822	$ 73,822	$ 73,822	1946	2190	2472	420	740	1113	0	0	0
158	136	134	134	45	45	45	$ 75,536	$ 75,536	$ 75,536	0	0	0	3	3	3	0	0	0
159	439	735	731	155	263	264	$ 73,822	$ 73,822	$ 73,822	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	$ 73,822	$ 73,822	$ 73,822	700	872	872	34	373	373	0	0	0
161	583	600	596	253	265	265	$ 73,822	$ 73,822	$ 73,822	24	24	24	52	52	52	0	0	0
162	41	41	42	13	13	13	$ 73,770	$ 73,770	$ 73,770	37	37	236	65	65	455	0	0	0
163	0	0	0	0	0	0	$ 73,711	$ 73,711	$ 73,711	153	153	314	291	291	606	0	0	0
164	59	479	476	24	198	198	$ 73,711	$ 73,711	$ 73,711	0	0	0	5	5	5	0	0	0
165	40	866	1070	17	374	466	$ 73,822	$ 73,822	$ 73,822	0	129	189	2	256	373	0	0	0
166	84	90	3029	30	32	1104	$ 46,823	$ 46,823	$ 46,823	49	85	740	614	726	1,786	0	0	0
167	555	717	866	283	373	455	$ 59,392	$ 59,392	$ 59,392	6	6	33	31	31	112	0	0	0
168	687	810	922	265	317	364	$ 60,621	$ 60,621	$ 60,621	457	468	489	131	162	224	0	0	0
169	506	551	548	174	192	192	$ 60,621	$ 60,621	$ 60,621	8	27	44	44	97	144	0	0	0
170	161	159	158	66	66	66	$ 60,621	$ 60,621	$ 60,621	3	3	3	22	22	22	0	0	0
171	362	608	1045	136	232	401	$ 48,333	$ 48,333	$ 48,333	6	6	36	64	64	151	0	0	0
172	322	319	320	119	120	121	$ 49,698	$ 49,698	$ 49,698	10	10	10	19	19	19	0	0	0
173	419	560	833	151	205	306	$ 59,256	$ 59,256	$ 59,256	0	0	0	24	24	24	0	0	0
174	250	247	247	93	93	94	$ 60,621	$ 60,621	$ 60,621	3	3	3	13	13	13	0	0	632
175	18	19	21	9	10	11	$ 73,822	$ 73,822	$ 73,822	0	23	23	1	69	69	0	361	361
176	760	896	898	272	325	328	$ 49,847	$ 49,847	$ 49,847	7	7	7	39	39	39	0	0	0
177	237	234	234	96	96	97	$ 44,710	$ 44,710	$ 44,710	0	0	0	3	3	3	0	0	0
178	253	250	249	97	97	98	$ 44,710	$ 44,710	$ 44,710	3	3	3	84	84	84	0	0	0
179	43	44	46	18	19	20	$ 73,822	$ 73,822	$ 73,822	0	0	0	4	4	4	0	0	0
180	493	502	531	183	189	201	$ 46,823	$ 46,823	$ 46,823	0	0	0	18	18	18	0	0	0
181	199	1242	2051	64	405	672	$ 73,822	$ 73,822	$ 73,822	0	0	0	17	17	17	0	0	0
182	187	361	540	67	131	198	$ 73,822	$ 73,822	$ 73,822	3	3	63	39	39	158	0	0	717
183	591	792	789	185	251	252	$ 73,822	$ 73,822	$ 73,822	5	5	5	69	69	69	0	0	0
184	401	621	741	139	218	262	$ 73,822	$ 73,822	$ 73,822	3	3	3	21	21	21	0	632	632
185	807	1235	1259	269	417	428	$ 66,747	$ 66,747	$ 66,747	2	2	2	36	36	36	0	0	0
186	489	567	593	175	206	217	$ 41,983	$ 41,983	$ 41,983	0	0	0	5	5	5	0	0	0
187	1255	1329	1348	302	323	329	$ 43,575	$ 43,575	$ 43,575	13	13	13	121	121	121	410	410	410
188	121	120	120	46	46	46	$ 41,983	$ 41,983	$ 41,983	59	59	59	40	40	40	0	0	0
189	294	378	378	113	148	149	$ 60,621	$ 60,621	$ 60,621	3	7	10	40	53	62	0	0	0
190	162	160	159	54	54	54	$ 41,983	$ 41,983	$ 41,983	35	37	37	2	8	8	0	0	0
191	518	980	978	192	369	370	$ 41,983	$ 41,983	$ 41,983	0	0	0	5	5	5	0	0	0
192	212	209	207	85	85	85	$ 41,983	$ 41,983	$ 41,983	19	26	26	362	385	385	0	0	0
193	58	57	57	21	21	21	$ 41,983	$ 41,983	$ 41,983	143	143	143	591	593	593	0	0	0
194	231	227	226	95	95	95	$ 41,983	$ 41,983	$ 41,983	34	34	34	26	26	26	0	0	0
195	18	18	18	7	7	7	$ 41,809	$ 41,809	$ 41,809	22	27	27	29	45	45	0	0	0
196	458	452	450	166	166	167	$ 41,575	$ 41,575	$ 41,575	8	8	8	30	30	30	0	0	0
197	332	329	331	114	115	116	$ 41,461	$ 41,461	$ 41,461	0	0	0	201	201	201	0	0	0
198	54	53	54	24	24	25	$ 41,461	$ 41,461	$ 41,461	0	0	0	5	5	5	0	0	0
199	253	248	247	118	118	118	$ 41,983	$ 41,983	$ 41,983	9	17	20	141	164	174	0	0	0
200	429	426	430	148	149	151	$ 45,823	$ 45,823	$ 45,823	13	13	13	86	86	86	0	0	0
201	1432	1906	2669	529	715	1007	$ 41,983	$ 41,983	$ 41,983	31	37	37	186	204	204	654	654	654

Table C.7 (Cont'd)
2010, 2020, & 2040 Socio-economic Data by Traffic Analysis Zone

TAZ	2010 Population	2020 Population (+21,010) 119188	2040 Population (+66,084) 164262	2010 Households	2020 Households (+8,399)	2040 Households (+26,285)	2010 Median Household Income	2020 Median Household Income	2040 Median Household Income	2010 Retail Employment	2020 Retail Employment (+2,680)	2040 Retail Employment (+8,450)	2010 Non-Retail Employment	2020 Non-Retail Employment (+6,057)	2040 Non-Retail Employment (+19,084)	2010 School Enrollment	2020 School Enrollment (+4,352)	2040 School Enrollment (+13,637)
202	326	586	768	116	212	279	$ 44,710	$ 44,710	$ 44,710	8	11	11	30	39	39	0	0	0
203	605	692	907	217	252	332	$ 46,357	$ 46,357	$ 46,357	4	4	13	10	10	39	0	0	0
204	891	1188	1183	286	386	387	$ 75,536	$ 75,536	$ 75,536	0	60	60	28	107	107	0	0	0
205	594	591	599	206	208	212	$ 41,461	$ 41,461	$ 41,461	2	2	2	48	48	48	0	0	0
206	1609	1590	1591	599	601	605	$ 47,454	$ 47,454	$ 47,454	10	10	10	115	115	115	0	0	0
207	243	242	245	76	77	78	$ 41,461	$ 41,461	$ 41,461	9	9	9	6	6	6	0	0	0
208	149	148	151	53	54	55	$ 41,461	$ 41,461	$ 41,461	15	15	15	44	44	44	340	340	340
209	148	149	154	59	60	63	$ 41,461	$ 41,461	$ 41,461	1	1	16	9	9	55	0	0	0
210	288	287	291	109	110	113	$ 45,645	$ 45,645	$ 45,645	165	171	184	80	100	139	0	0	0
211	87	87	90	37	38	39	$ 73,822	$ 73,822	$ 73,822	0	0	0	3	3	3	0	632	632
212	374	377	392	123	126	131	$ 55,314	$ 55,314	$ 55,314	1	1	1	1	1	1	0	0	0
213	959	958	977	342	347	356	$ 46,823	$ 46,823	$ 46,823	8	8	8	65	65	65	184	184	816
214	2255	2281	4963	800	821	1797	$ 73,822	$ 73,822	$ 73,822	7	30	65	76	120	189	0	0	0
215	205	745	1148	76	280	435	$ 73,822	$ 73,822	$ 73,822	10	10	10	7	7	7	0	0	361
216	241	766	1374	84	271	489	$ 73,822	$ 73,822	$ 73,822	0	0	0	20	20	20	0	0	0
217	464	827	1584	176	319	614	$ 51,827	$ 51,827	$ 51,827	2	2	2	11	11	11	229	229	229
218	128	127	130	62	63	65	$ 41,983	$ 41,983	$ 41,983	6	6	6	48	48	48	0	0	0
219	371	369	371	118	119	120	$ 56,226	$ 56,226	$ 56,226	0	0	0	10	10	10	0	0	632
220	911	1101	1276	358	440	513	$ 44,710	$ 44,710	$ 44,710	21	21	21	381	381	381	0	0	0
221	46	45	45	21	21	21	$ 44,710	$ 44,710	$ 44,710	7	7	7	29	29	29	0	0	0
222	3	3	3	2	2	2	$ 44,710	$ 44,710	$ 44,710	6	6	6	28	28	28	204	204	204
223	228	223	221	120	120	120	$ 44,710	$ 44,710	$ 44,710	0	0	0	5	5	5	0	0	0
224	54	53	53	26	26	26	$ 44,710	$ 44,710	$ 44,710	18	18	18	109	109	109	0	0	0
225	18	18	17	11	11	11	$ 44,710	$ 44,710	$ 44,710	11	11	11	31	31	31	0	0	0
226	15	15	15	4	4	4	$ 44,710	$ 44,710	$ 44,710	4	4	4	7	7	7	0	0	0
227	0	0	0	0	0	0	$ 44,710	$ 44,710	$ 44,710	38	38	38	0	0	0	0	0	0
228	0	0	0	0	0	0	$ 44,710	$ 44,710	$ 44,710	58	58	58	81	81	81	0	0	0
229	100	98	98	40	40	40	$ 44,710	$ 44,710	$ 44,710	34	36	36	24	30	30	0	0	0
230	132	130	130	49	49	49	$ 44,710	$ 44,710	$ 44,710	10	10	13	49	49	60	0	0	0
231	232	228	227	92	92	92	$ 45,810	$ 45,810	$ 45,810	23	23	23	43	43	43	0	0	0
232	148	146	145	62	62	62	$ 46,911	$ 46,911	$ 46,911	3	3	3	10	10	10	0	0	0
233	768	757	753	293	293	294	$ 48,011	$ 48,011	$ 48,011	6	6	6	193	193	193	0	0	0
234	448	441	440	178	178	179	$ 48,011	$ 48,011	$ 48,011	3	3	3	138	138	138	1081	1,081	1,081
235	270	266	266	105	105	106	$ 48,011	$ 48,011	$ 48,011	0	0	0	6	6	6	0	0	0
236	406	578	576	114	164	164	$ 44,710	$ 44,710	$ 44,710	233	239	239	114	131	131	0	0	0
237	395	390	389	121	121	121	$ 44,710	$ 44,710	$ 44,710	99	99	99	172	172	172	1338	1,338	1,338
238	396	572	571	132	193	194	$ 47,186	$ 47,186	$ 47,186	3	3	3	48	48	48	0	0	0
239	164	162	161	65	65	65	$ 44,710	$ 44,710	$ 44,710	13	55	55	17	145	145	0	0	0
240	21	21	21	8	8	8	$ 44,710	$ 44,710	$ 44,710	82	82	82	16	16	16	0	0	0
241	170	169	170	59	59	60	$ 46,361	$ 46,361	$ 46,361	21	21	21	44	44	44	0	0	0
242	175	173	172	69	69	69	$ 44,710	$ 44,710	$ 44,710	6	6	6	15	15	15	0	0	0
243	156	154	154	60	60	61	$ 44,710	$ 44,710	$ 44,710	3	3	3	167	167	167	0	0	0
244	688	680	679	252	253	254	$ 44,710	$ 44,710	$ 44,710	6	6	6	187	187	187	463	463	463
245	400	395	395	163	164	165	$ 44,710	$ 44,710	$ 44,710	21	21	21	25	25	25	0	0	0
246	116	115	116	39	39	40	$ 44,710	$ 44,710	$ 44,710	3	3	3	73	73	73	246	246	246
247	112	172	346	45	70	142	$ 44,710	$ 44,710	$ 44,710	0	61	61	2	184	184	0	0	0
248	101	101	102	34	34	35	$ 44,710	$ 44,710	$ 44,710	0	0	0	3	3	3	0	0	0
249	375	593	592	135	217	218	$ 44,710	$ 44,710	$ 44,710	0	0	0	15	15	15	0	0	0
250	379	730	729	144	282	283	$ 44,710	$ 44,710	$ 44,710	0	0	0	22	22	22	0	0	0
251	87	990	4659	33	381	1806	$ 73,822	$ 73,822	$ 73,822	0	0	179	3	3	239	0	0	0
252	173	401	550	67	158	218	$ 52,666	$ 52,666	$ 52,666	1	1	1	9	9	9	0	0	0
253	698	685	680	345	345	346	$ 73,822	$ 73,822	$ 73,822	10	249	328	78	393	496	849	849	849
254	74	254	254	27	94	95	$ 73,822	$ 73,822	$ 73,822	0	0	0	0	0	0	0	0	0
255	290	285	284	123	123	124	$ 73,822	$ 73,822	$ 73,822	14	136	162	74	235	270	0	0	0
256	39	39	39	17	17	17	$ 44,710	$ 44,710	$ 44,710	5	5	5	3	3	3	0	0	0
257	58	58	58	20	20	20	$ 44,710	$ 44,710	$ 44,710	0	0	0	6	6	6	0	0	0
258	272	274	3910	111	114	1634	$ 51,827	$ 51,827	$ 51,827	43	43	270	140	140	437	0	0	0
259	579	2734	6026	190	909	2015	$ 73,822	$ 73,822	$ 73,822	8	69	1289	80	160	1765	0	0	0
260	141	1653	8334	49	583	2955	$ 73,822	$ 73,822	$ 73,822	3	3	712	10	10	943	0	0	2,547
261	570	568	577	214	216	221	$ 51,827	$ 51,827	$ 51,827	0	0	234	3	3	311	0	0	2,000
262	150	1435	6820	68	663	3174	$ 69,127	$ 69,127	$ 69,127	5	5	1,046	5	5	1,375	0	1,349	1,710
263	105	104	104	45	45	46	$ 38,977	$ 38,977	$ 38,977	9	9	9	18	18	18	0	0	0
264	215	213	215	86	87	88	$ 44,710	$ 44,710	$ 44,710	2	2	2	8	8	8	0	0	0
265	556	856	1680	205	321	633	$ 38,977	$ 38,977	$ 38,977	20	20	20	6	6	6	0	0	0
266	493	488	491	192	193	195	$ 44,710	$ 44,710	$ 44,710	3	3	3	28	28	28	0	0	0
267	413	412	421	164	166	171	$ 51,827	$ 51,827	$ 51,827	0	0	0	5	5	5	0	0	0
268	205	218	559	77	83	215	$ 46,823	$ 46,823	$ 46,823	34	34	34	57	57	57	0	0	0

Table C.7 (Cont'd)
2010, 2020, & 2040 Socio-economic Data by Traffic Analysis Zone

TAZ	2010 Population	2020 Population (+21,010) 119188	2040 Population (+66,084) 164262	2010 Households	2020 Households (+8,399)	2040 Households (+26,285)	2010 Median Household Income	2020 Median Household Income	2040 Median Household Income	2010 Retail Employment	2020 Retail Employment (+2,680)	2040 Retail Employment (+8,450)	2010 Non-Retail Employment	2020 Non-Retail Employment (+6,057)	2040 Non-Retail Employment (+19,084)	2010 School Enrollment	2020 School Enrollment (+4,352)	2040 School Enrollment (+13,637)
269	347	345	350	135	136	139	$ 38,977	$ 38,977	$ 38,977	0	0	0	2	2	2	0	0	0
270	55	242	243	20	89	90	$ 38,977	$ 38,977	$ 38,977	29	34	34	221	237	237	0	0	0
271	1630	1628	1662	609	617	634	$ 41,461	$ 41,461	$ 41,461	5	5	5	4	4	4	0	0	0
272	996	993	1011	363	367	376	$ 41,461	$ 41,461	$ 41,461	0	0	0	2	2	2	0	0	0
273	1285	1284	1313	469	476	490	$ 40,268	$ 40,268	$ 40,268	0	0	0	6	6	6	0	0	0
274	539	533	533	179	179	180	$ 48,011	$ 48,011	$ 48,011	6	6	6	4	4	4	0	0	0
275	451	451	462	170	173	178	$ 38,977	$ 38,977	$ 38,977	60	60	60	83	83	83	0	0	0
276	42	42	2	21	21	21	$ 48,011	$ 48,011	$ 48,011	211	211	211	81	81	81	0	0	0
277	0	0	0	0	0	0	$ 38,977	$ 38,977	$ 38,977	84	84	84	10	10	10	0	0	0

C.3 - UPDATE AND ESTABLISH BASE HIGHWAY NETWORK

The ESMPO utilized the 2010 base year highway network as the foundation for the Long Range Transportation Plan (LRTP). ESMPO staff, in coordination with the Technical Advisory Committee (TAC), the MPO Policy Board, the Advisory Committees, and the University of Alabama at Huntsville developed the 2010 base network in 2012 and 2013.

Development of the 2010 base highway network consisted primarily of updating the functional classification of the existing roads within the MPO planning area. The MPO collected data including traffic counts, lanes counts, road widths and the like on over one hundred roads within the planning area. The proposed revisions were reviewed by the MPO advisory committees, approved by the Policy Board, and ultimately reviewed and approved by ALDOT.

C.4 - DEVELOP TRAFFIC ANALYSIS ZONES (TAZS) FOR PLANNING AREA

C.4.1 - Formation of Traffic Analysis Zones

In traffic models, the socioeconomic data is organized into geographic units call traffic analysis zones and often abbreviated as TAZ. The model then calculates the number of trips that are produced by each zone and attracted by each zone and then shows the shortest paths that commuters will take to complete those trips. TAZs must be created before the traffic model can be properly built in the computer software.

C.4.1.1 – Data Collection

Three major data sources were utilized to form the 2010 Traffic Analysis Zones. First, the updated highway functional classification map for the Eastern Shore Metropolitan Planning Organization (ESMPO) planning area as prepared by the ESMPO and approved by the Alabama Department of Transportation (ALDOT). Second, a GIS line-file of the ESMPO highway network was obtained from the Baldwin County Highway Department. Finally, 2009 and 2013 aerial photography of the entire ESMPO study area was also obtained from the Highway Department.

C.4.1.2 - Traffic Analysis Zones

MPO staff developed a traffic analysis zone (TAZ) map for the ESMPO. TAZs were created by downloading the 2010 Census blocks from the U.S. Census Bureau and aggregating the Census blocks into TAZs based on land use, geographic features, and the functional classification network. According to the National Cooperative Highway Research Program (NCHRP), TAZ boundaries are usually determined by major roads, jurisdictional borders, and geographic features. To the extent possible, TAZs should be defined by homogeneous land use. The NCHRP Report 716 lists the following "rules of thumb" for determining the number and size of TAZs.

- The number of residents per TAZ should be greater than 1,200, but less than 3,000;
- Each TAZ should yield less than 15,000 person trips per day; and

- The size of each TAZ should be from one-quarter to one square mile in area.

Because of the diversity of land use within the MPO planning area, the MPO's TAZs varied greatly in size and population density. MPO staff created 277 TAZs within the planning area. The primary factor in determining a TAZs boundary was the functionally classified road network. ALDOT requires that all functionally classified roads be included in the model. In order for the model to put traffic on a road it generally will need to border a TAZ. Following is a list of the MPO's TAZ averages:

- The average number of residents per TAZ is 354;
- The average trips produced and attracted by MPO TAZs is 4703; and
- The average size of an MPO TAZ was 1.48 miles.

C.4.2 - Establish Centroid Locations and Centroid Connectors

All business and residential data within a TAZ is condensed into a single "centroid" positioned somewhere within the TAZ. The centroid should theoretically be located at the "center of gravity" of the trip attractors and producers within the particular TAZ. Links between the centroid and the Cube road network surrounding the TAZ allow transportation users to move between the centroid and the road network.

MPO staff relied heavily on aerial photographs to identify the proper location for the centroid of each TAZ. Centroids were drawn in on a GIS shape file and then links were drawn from the centroid the surrounding road network. Again, MPO staff relied heavily on aerial photography to identify these centroid links. Centroid links should be representative of real and existing travel routes. For instance, if a creek, forest, or other geographical feature runs through the TAZ and no road way exists to pass through or over these features, then no centroid link should be placed through that area to the bordering roads.

MPO staff also programed 14 external zones into the network. External zones represent traffic leaving and entering the network on functionally classified roads.

C.5 - CREATE CUBE NETWORK

Using the updated highway functional classification map, a GIS shape file was created with all classified roadways within the ESMPO study area. This GIS file was imported into Cube Voyager, the software modeling program utilized by the MPO, and a cube network was drawn over the imported GIS shape file. The GIS file contains spatially referenced data allowing the precise placement of both existing and new roadways within the Cube highway network.

MPO staff utilized aerial photography along with the updated functional classification map for the ESMPO study area to program the functional classification, capacity, and speed limit for each highway link within the 2010 Cube network. Where a 2010 traffic count was available, this information was also programed into the appropriate link within the 2010 cube network.

C.6 - RUN TRIP GENERATION SOFTWARE

Trip Generation software provided by the Alabama Department of Transportation was used to convert the ESMPOs socioeconomic data, as well as community behavior data, into trip productions and attractions. The resulting output files were then programed into Cube Voyager.

C.6.1 - Trip Generation Software Inputs

The ALDOT Trip Generation software uses the socio-economic data file, the external count data file, along with six other data files to produce productions and attractions values for the model. These data files contain community behavioral data specific to the planning area. However, because the Eastern Shore MPO is a brand new urban area community travel data does not exist.

For this reason the MPO staff, at the recommendation of Dr. Michael Anderson from the University of Alabama at Huntsville, borrowed the community travel data from Montgomery. The use of this borrowed data is likely to cause some error in the model. Efforts will be made to collect the necessary community driving data for the ESMPO planning area prior to preparation of the next Long Range Transportation Plan.

The eight data file inputs into the ALDOT Trip Generation software are as follows:

C.6.1.1 – Socio Economic Data File

The socioeconomic data file contains the number of households, the average income, the number of non-retail employees, the number of retail employees, and the number of students for each TAZ in a space delimited text document. If the data is not correctly formatted the program will not correctly calculate the trips generated by the TAZs and will likely produce an error message.

C.6.1.2 – Auto Ownership Curve File

The auto owner data file provides auto ownership information based on household income. For each income range, the percentage of households with 0, 1, 2, or 3 vehicles is expressed as a percentage. The model uses this information to determine how many trips homes in a certain income range will produce.

		Number of Autos Owned			
		0 Autos	1 Auto	2 Autos	3 Autos
Income	$ 10,000	0.321	0.481	0.151	0.047
	$ 20,000	0.134	0.577	0.224	0.065
	$ 30,000	0.069	0.519	0.328	0.084
	$ 40,000	0.043	0.399	0.405	0.153
	$ 50,000	0.027	0.263	0.505	0.205
	Over $50K	0.015	0.137	0.521	0.327

C.6.1.3 – Household Trip File

The household trip file designates the number trips per day per household with a given income range and a given number of automobiles.

Income	Number of Autos Owned			
	0 Autos	1 Auto	2 Autos	3 Autos
$ 10,000	0.432	3.56	6.042	7.045
$ 20,000	0.755	4.672	7.045	8.092
$ 30,000	1.159	5.374	7.429	8.641
$ 40,000	1.653	6.258	8.383	9.918
$ 50,000	1.294	4.744	6.211	7.332
Over $50K	1.478	4.956	6.347	7.478

C.6.1.4 – Production Factors File

The production factor file separates the trip generation into six purpose types: 1. Home-Based-Work (HBW), 2. Home-Based-Other (HBO), 3. Non-Home-Based (HNB), 4. Internal-External (I-E), 5. External-External (E-E), and Truck-Taxi (T-T).

	Trip Purposes					
	HBW	HBO	NHB	I-E	E-E	T-T
% Trips	0.22	0.53	0.25	0.154	0	0

C.6.1.5 – Attraction Factors File

The attraction factors file sets the number of trips attracted by various businesses, entertainment facilities, etc. For instance the model might assign 4.75 vehicle trips for every retail employee within a zone and 1.07 trips for every nonretail employee in a zone.

C.6.1.6 – External Count File

The external count file defines the number of vehicles entering and exiting, as well as the pass through rate, at all external zones on the model. The first column in this file identifies the zone number, the second column lists the ADT at that external zone or centroid, and the third column contains the road type, which ultimately dictates what percentage of the traffic from the external zone will pass through the planning area.

External Zone	ADT	Road Type
351	942	5
352	1374	4
353	7907	3
354	2880	4
355	656	5
356	0	4
357	23166	7
358	7720	4
359	0	3
360	4521	1
361	26120	8
362	1853	5
363	0	5
364	0	5
365	15768	1
366	957	4
367	3013	4
368	57870	1
369	14940	3

C.6.1.7 – Road Type File

The road type file assigns different pass through rates to different road types. These are user defined values and represent the percentage of vehicles passing through the planning area and not stopping or otherwise entering the rest of the road network in the planning area. Interstates generally have high pass through rates.

Road Type	% Pass Through
1	0.4
2	0.25
3	0.12
4	0.05
5	0.01
6	0.5
7	0.7
8	0.8

C.6.1.8 – Income Range File

The income range file simply dictates the income ranges under consideration in the rest of the files. In the case of this model the ranges were 10,000; 20,000; 30,000; 40,000; and 50,000.

C.6.2 - Trip Generation Software Output

C.6.2.1 – Standard Output

The standard output of the trip generation program is a single file with the number of trip productions by TAZ for each trip purpose and the number of attractions by TAZ for each trip purposes. This file, after some minor formatting, can be imported directly into the Cube Voyager software.

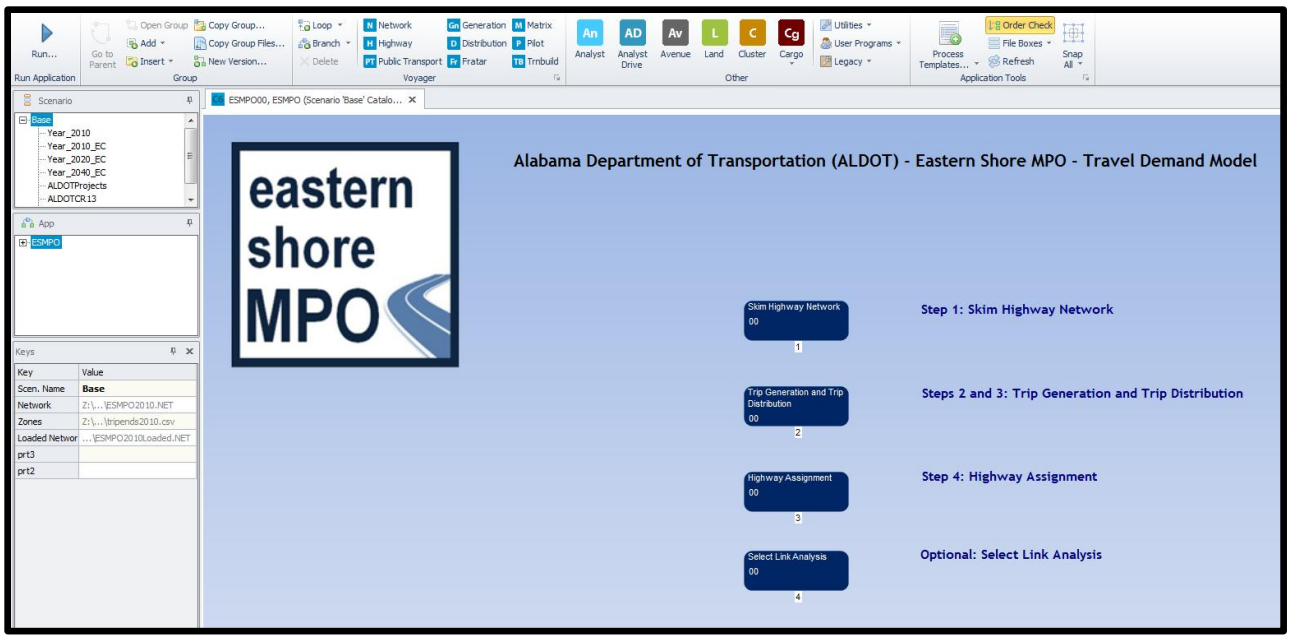
C.6.2.2 – Modification of Attractions for External Trips

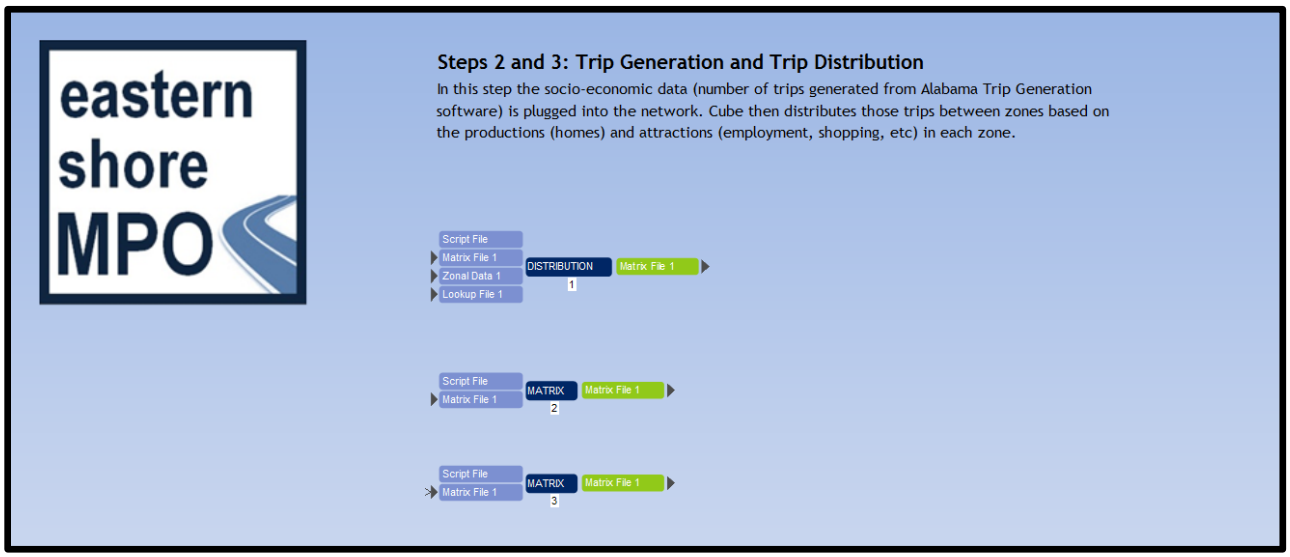
The Eastern Shore MPO is unique in that it functions more as a suburb of Mobile and does not have a single central business district. A large percentage of Eastern Shore residents work across the bay in the Mobile area. The trip generation software calculates productions and attractions under the assumption that most people who live in the planning area also work in the planning area and that vehicles entering into the planning area are being attracted to employment in the planning area.

To accommodate for this, the MPO adjusted the output file from the trip generation step. Instead of external trips (vehicles entering the planning area from somewhere outside the planning area) being attracted to employment within the planning area, external trips were set to be attracted by homes within the planning area. This was accomplished by dividing the households in district by the total households in the MPA and then multiplying the number for each district with the total external trips. This directed a certain percentage of the external trips to each zone based on the households in that zone. Dr. Anderson from the University of Alabama at Huntsville recommended this change to accommodate for the large group of commuters who leave the Eastern Shore each day to work in Mobile County.

C.7 - BUILD MODEL IN CUBE VOYAGER

The Cube Voyager software is very flexible allowing users to build a model in any number of ways. MPO staff created a catalog for the Eastern Shore travel model and built an application which in turn housed additional application subgroups (see example illustration below). The application and applications subgroups formed the based model in the catalog.





The four primary steps in the model development process are Trip Generation, Trip Distribution, Mode Choice, and Highway Assignment. The Mode Choice step deals more with public transit which is so underutilized in the State of Alabama that it is generally not included as a step in the modeling process. Ultimately, MPO staff settled on the following four steps plus an optional fifth step:

1. Skim Highway Network
2. Trip Generation
3. Trip Distribution
4. Highway Assignment
5. Optional: Select Link Analysis

C.7.1 - Skim Highway Network

In this first step the network file referenced in Section C.5 above was inputted into the Cube software. With the help of matrices, the Cube software calculates the shortest path from every individual zone to every other individual zone. Three additional matrices were run to block external commuters from entering the network, doing a u-turn, and leaving the network at the same point.

C.7.2 - Trip Generation

Though some models preform the trip generation step within the Cube Voyager software itself, MPO staff elected to run the trip generation software externally (see Section C.6) and input the results of the trip generation step directly into the model.

C.7.3 - Trip Distribution

The third step in the model takes the highway skims from step 1, and the trip generation output from step 2 and inputs this data, along with a friction factor file into a model that distributes the generated trips between zones based on the productions (homes) and attractions (employment, shopping, etc) in each zone.

The friction factor file denotes the preferred trip length (in time) for each trip type. Because, as a general rule, people like their trips to be shorter rather than longer, the MPO friction factor file decreases the likelihood of commuters making long trips. Because the MPO does not have local trip data, the MPO used data from the Montgomery MPO, at the recommendation of Dr. Anderson from UAH.

The output of step three is an origin-destination matrix which shows the number of vehicle trips from each zone to every other zone. This matrix will be used to project the roadway volumes in step four.

C.7.4 - Highway Assignment

Step four of the ESMPO modeling process, highway assignment, assigns the trips from the origin-destination matrix in step three, to the model network file. A loaded model network is the output of step 4. The loaded model provides projected volumes for all the roads on the network, congested speeds, vehicle miles traveled (VMT), vehicle hours traveled (VHT), and volume to capacity ratio (V/C ratio).

C.7.5 - Optional: Select Link Analysis

MPO staff added an optional 5^{th} step to the model that allows users to analyze the trips that pass through one specific link in the network. A user can enter the node numbers from a given link into the selection link module and then open the loaded network to view origin and destination of

the trips that pass through that link. The select link step can be useful to view general travel patterns for a specific portion of the road as well as in the validation process.

C.8 - MODEL VALIDATION

After the model is built in Cube Voyager it must go through a validation process to confirm that the model is actually replicating what is actually occurring on the road network. MPO staff preformed the model validation steps required by the Alabama Department of Transportation. To accomplish the validation, 2010 traffic counts (for roadways with ADT > 4000) were collected and programed into the appropriate links on the network. These volumes were then compared with the projected volumes from the model.

C.8.1 - Percent Difference by Facility Type

The first validation method employed by the MPO was calculating the percent difference between the projected volumes and observed ADTs for each roadway type. Links with high percent difference values were examined to locate and resolve (if possible) the source of the inaccurate projection. Greater error is allowed for collector roads because the lower traffic volume on these roads creates a higher chance of error.

Percent Difference by Facility Type		
Facility Type	FHWA Target	ESMPO % Values
Freeway	+/- 7%	4.78
Major Art	+/- 10%	-19.52
Minor Art	+/- 15%	-15.11
Collector	+/- 25%	24.17

The percent difference for each facility type fell within a range acceptable to ALDOT. While the percent different for the major arterials came in 9% above the target, MPO staff believe that this problem would be resolved, in part, if some of the state and federal roads within the network were reclassified from minor arterials to major arterials. ESMPO staff requested that ALDOT consider reclassifying several state and federal roads in early 2013. However, to date, ALDOT has not taken steps to reclassify these roads. Reclassification requires ALDOT and FHWA concurrence.

C.8.2 - Percent Root-Mean-Square Error (RMSE) by Facility Type

The second validation method was to calculate the percent root-mean-square error for each link that had an observed 2010 ADT. The RSME came within the range allowed by FHWA for each facility type.

% RMSE by Facility Type		
Facility Type	FHWA Target	% RMSE ESMPO
Freeway	18.33	7.41
Major Art	36.77	30.01
Minor Art	43.90	41.48
Collector	77.48	52.22
Ramps	74.85	27.96
Total	**36.77**	**31.95**

C.8.3 - Vehicle Miles Traveled (VMT) by Facility Type

The third and final validation method used by MPO staff was to compare vehicle miles traveled by facility type with FHWA targets. Similar to the percent difference by facility type, discrepancies appeared with the minor and major arterials.

VMT by Facility Type		
Facility Type	FHWA Target	ESMPO % Values
Freeway	18-23%	27%
Major Art	37-43%	27%
Minor Art	25-28%	32%
Collector	12-15%	13%

According to the validation data, there are not enough vehicles traveling on major arterials and too many vehicles traveling on minor arterials. Once again, this is likely due to a misclassification of major and minor arterials on the road network. Several state and federal roads currently classified as minor arterials should probably be classified as major arterials.

C.8.4 - UAH Review and Approval of Base Model

Dr. Michael Anderson with the University of Alabama at Huntsville was hired to provide technical assistance and oversight on the creation of the model. Dr. Anderson provided input through the entire modeling process with a great deal of time spent on the validation portion of the process. Dr. Anderson reviewed and approved the model, and issued a letter so stating to the MPO.

C.8.5 - ALDOT Review and Approval of Base Model

The Alabama Department of Transportation reviewed the MPO model and the accompanying validation statistics along with Dr. Anderson's approval letter. Following its review, ALDOT approved the base model for inclusion in the Long Range Transportation Plan.

C.9 - DEVELOPMENT OF 2010, 2020, AND 2040 MODELS

C.9.1 - 2010, 2020, and 2040 Base Models

Once the base model was approved, the MPO added several "child" models including a 2010 model, 2020 model, and 2040 model. The only variation between these models was the socioeconomic inputs. The models provided a glimpse of what traffic would be like in 2020 and 2040 if no capacity improvements were made to the network.

C.9.2 - 2020, and 2040 Existing plus Committed (E+C) Models

With the basic models in place, MPO staff created "siblings" for the 2020 and 2040 models which add any committed projects between 2010 and 2020 or between 2010 and 2040. The Existing-Plus-Committed (E+C) networks represent existing and future transportation projects for which a committed funding source exists. The E+C network also includes projects that have been constructed, or are significantly complete, between the base year, 2010, and the current year of the study, 2014. Maps showing the model outputs can be viewed in Appendix D.

The E+C network typically includes programmed projects in the most current regional Transportation Improvement Program (TIP). In the case of ESMPO, no TIP has been approved yet. The first TIP is expected to be approved in 2016. In the interim, the MPO considered projects on the State TIP within the planning area. As noted above, MPO staff created and ran both 2020 and 2040 E+C networks using socio-economic data from those years. The E+C models were used to forecast and analyze the level of congestion based on a roadway network that exists or will soon exist in the next few years based on current committed funding. The E+C network highlighted areas of future need based on measures of effectiveness such as congestion, level of service and volume.

Maps showing the E+C model outputs can be viewed in Appendix D.

C.10 - MODEL DEVELOPMENT REPORT

As a final step in the model development process, the MPO created this Model Development Report outlining the model development process in detail. The Model Development Report was reviewed by the MPO Technical Subcommittee charged with reviewing the Long Range Transportation Plan Development Process. The Model Development Report was approved with each approval of the Draft and Final LRTP by the Advisory Committees and Policy Board.