

CMAP Counties and Townships

**Historic and Forecasted Growth
of Employment and Population**

Market-Driven Forecasts (2010-2040)
**(Based on Trends, Opportunities
and Holding Capacities)**
With 2010 Census Data

January 2012

ACG: The al Chalabi Group, Ltd.,
in association with Parsons Brinckerhoff, Inc.

Socio-Economic Forecast Report

I-290 No-Build

A. Introduction

For the past year, ACG: The al Chalabi Group, Ltd. has been conferring with the Chicago Metropolitan Agency for Planning (CMAP) in its development of a Market-Driven socio-economic forecast for the extended (18-County) Chicago Metropolitan Area. This Market-Driven forecast accepts and incorporates the 2040 total forecasts for the CMAP region; but, it differs in the distribution of those forecasts. The conference with CMAP was intended to establish the ground rules for developing an alternative, but complementary, forecast. These ground rules were:

- Articulate alternative assumptions.
- Show the math.
- Produce standard outputs.

This memo describes those steps, as initially employed by ACG/Parsons Brinckerhoff, Inc., in the I-290 No-Build scenario.

The socio-economic forecasts, by subzone, for the I-290 No-Build scenario were generated by ACG: The al Chalabi Group, Ltd., in accordance with the provisions of a subcontract with Parsons Brinckerhoff, Inc., dated December 2, 2010. The ACG subzone forecasts were based on ACG-generated Market-Driven (trends) township forecasts. The distribution of the township forecasts to subzones considered, among other factors, the distribution of the NIPC/CMAP 2030 forecasts. The I-290 No-Build, socio-economic forecasts were completed several weeks prior to the initial release of the 2010 Census results.

The NIPC/CMAP 2030 forecasts are modified Market-Driven Forecasts in that they incorporate commonly-accepted planning principles – e.g. encouraging infill development and avoiding development in environmentally-sensitive areas. Although independently generated, the ACG 2040 forecasts – by adopting similar principles – constitute an approximate update and extrapolation of the NIPC/CMAP 2030 forecasts. However, both of these Market-Driven forecasts are quite different from the CMAP Go to 2040: Comprehensive Regional Plan forecasts, produced in 2010. The latter CMAP 2040 forecasts represent a Policy-Based approach. This report summarizes the methodology used for generating the ACG 2040 Market-Driven forecasts and compares these forecasts to those generated for the CMAP 2040 Plan and its predecessor NIPC/CMAP 2030 forecasts.

B. Population and Employment Forecasts – General Approach

Population and employment are the two most-important variables used in the socio-economic forecasts for transportation planning. To understand the growth dynamics of these two variables, it was necessary to review the development history of the region and to identify the factors that caused its spatial growth and development. National and regional economic factors: transportation networks (rail, port, expressway and airport), infrastructure development, and land availability were identified, early, as being critical.

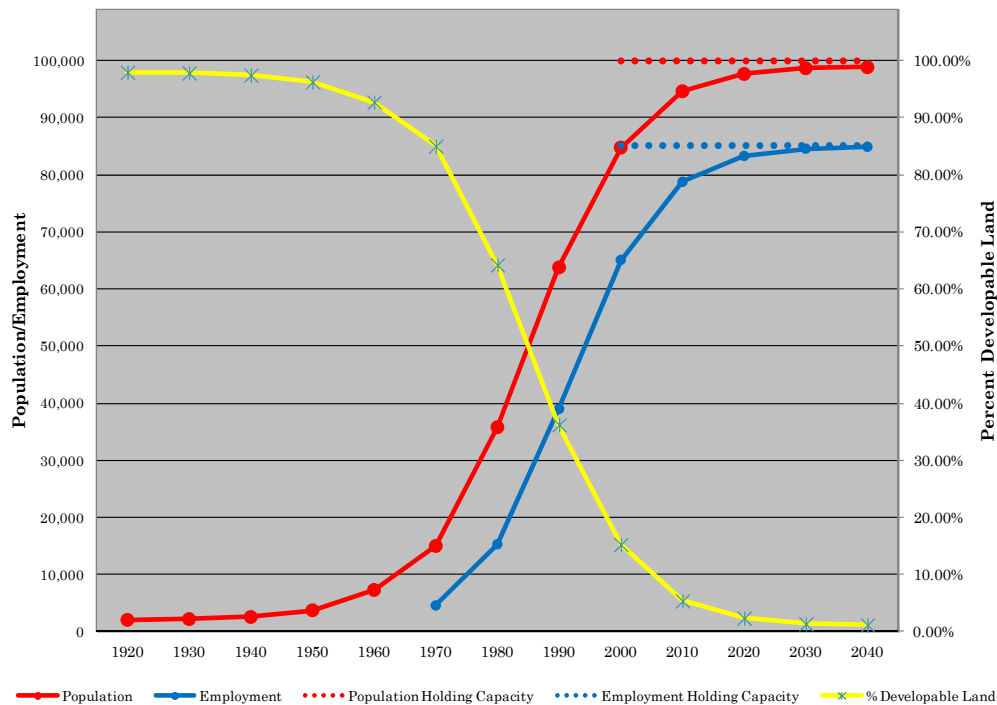
Forecasts by regional planning agencies, supplemented by Wood & Poole Economics, were accepted as regional control totals. Local land use plans and regional land use policies were analyzed to establish the township holding capacities for population and jobs. The township was the major planning unit; its totals aggregated to the County; and its details examined at the quarter-square mile level.

From these preliminary analyses, it was determined that a standard S-Curve (or logistics curve) could describe historic growth, take-off development, and maturity at the township level; and that an S-Curve describing land availability and holding capacities describes its inverse. The theoretical basis of the Market-Driven forecasts is as follows:

- Township population and employment growth progress through several phases:
 - Initial farming base
 - Take-off phase
 - Growth period
 - Maturity/stability
- Development follows a logistics function shaped by:
 - Location
 - Time/technology
 - Density/plan/zoning
 - Available land

A representation of this function – a standard logistics S-Curve – is shown in the Exhibit, below. It should be noted, that the use of the S-Curve to explain population growth and forecasts, within physically-defined boundaries, dates back to the mid-nineteenth century. This formulation has gained popular acceptance, recently, among planners. However, before accepting and applying it to generate Market-Driven forecasts, it had to be tested against long-term trends, at the township level, in Northeastern Illinois.

Exhibit 1



C. Population and Employment Forecasts – Defining the Methodology

The process of metropolitan area development and suburbanization are fairly well-known and understood. The growth of an urban area – outward from a central core, incorporating existing older towns, and creating new centers at nodes of high accessibility – follows a generally-recognizable and well-documented pattern.

This process and its general pattern are tempered by four major factors:

- Technology at the time growth is occurring – in terms of transportation, manufacturing and construction.
- The underlying economy of the nation and region.
- Societal preferences for, and ability to afford, densities and amenities in both residential and commercial developments.
- The siting and construction of major growth magnets – airports, universities, research facilities, corporate headquarters/campuses, regional commercial/office/medical centers.

There are additional demographic trends which are major factors in prompting density changes. These include:

- Family or household size
- Household income levels
- Jobs per household
- Ethnic characteristics and immigrant levels

The process and the first three factors, above, are addressed directly in this study. The fourth is addressed, indirectly, at the township level, and through past immigrant (international and domestic) trends at the county/sub-county levels. All four factors affect density levels utilizing or passing through existing structures, as well as creating demand for new.

Whatever the rate of change or density of development, growth within a county, a township, or a smaller unit ultimately reaches a point at which it can no longer continue unimpeded. The ACG research estimates that this is the point at which: available, vacant land, at the county level, has fallen to approximately three-to-five percent; and land, at the individual township level, has declined to one-to-three percent.

D. Historical Growth of the Region and its Influence on Long-Range Development

As previously stated, a region's growth follows generally-recognizable patterns. Documenting the Chicago Region's historic growth, therefore, was a crucial element in this analysis. Exhibits 2 to 10 show the population change, by township, for each decade, starting in 1920 and ending in 2010. The outward growth of the region; the influence of transportation facilities; and the phases of growth relative to regional job centers and economic conditions can be clearly identified.

Exhibit 2
1920 - 1930 Historic Trend
Population Change Per Square Mile
by Minor Civil Division

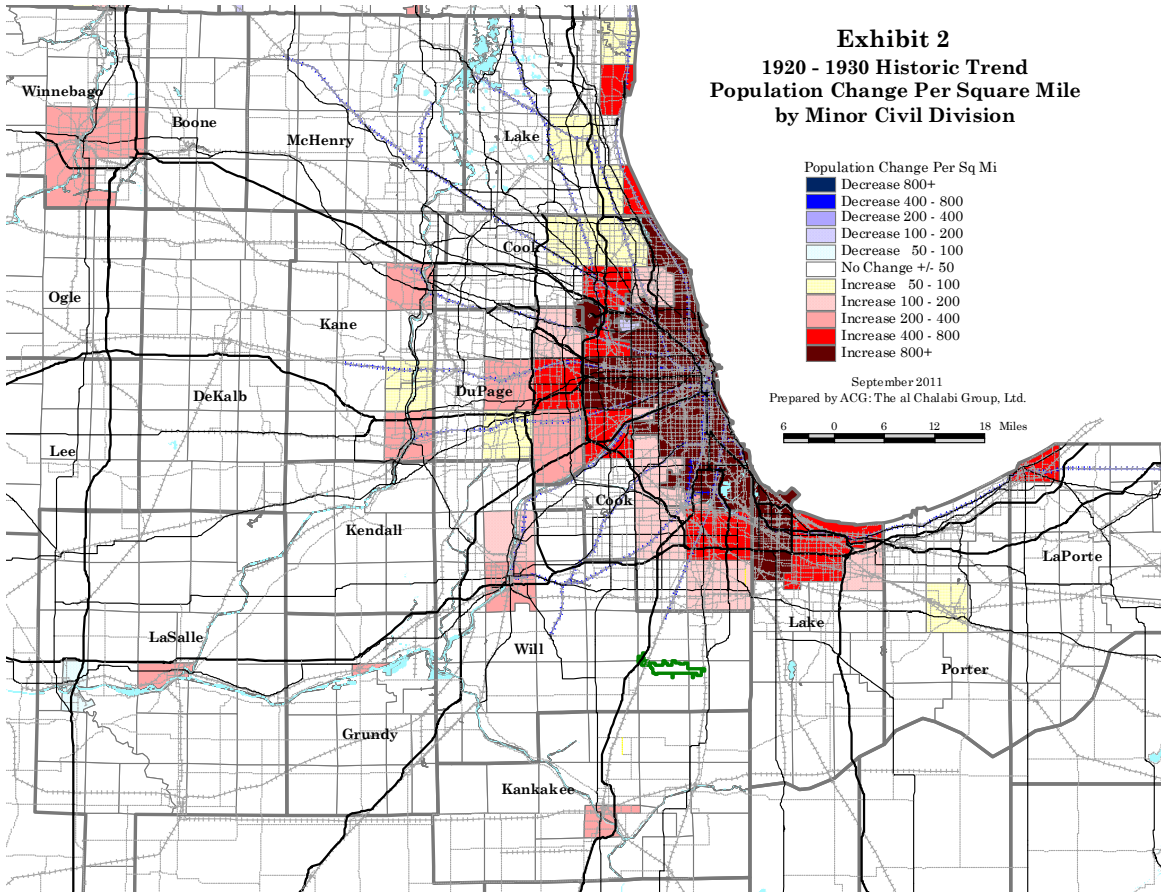


Exhibit 3
1930 - 1940 Historic Trend
Population Change Per Square Mile
by Minor Civil Division

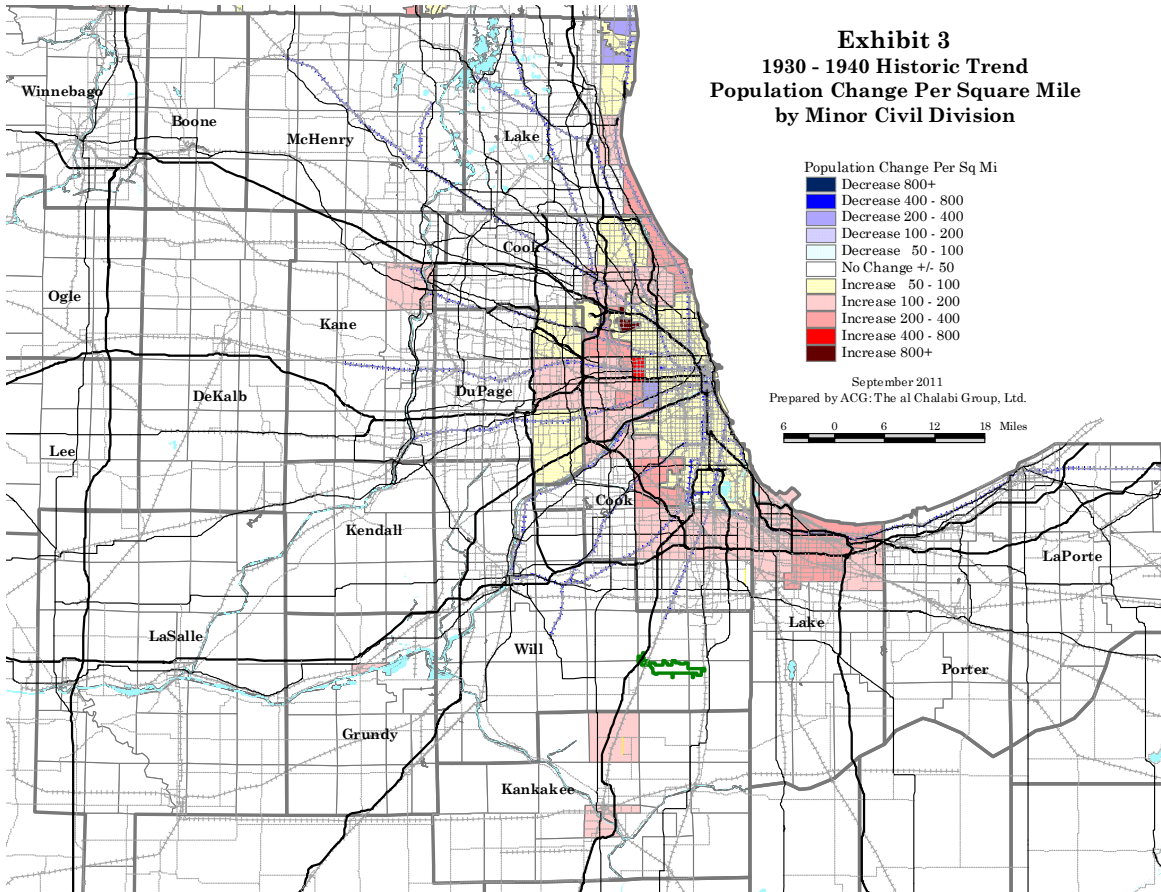


Exhibit 4
1940 - 1950 Historic Trend
Population Change Per Square Mile
by Minor Civil Division

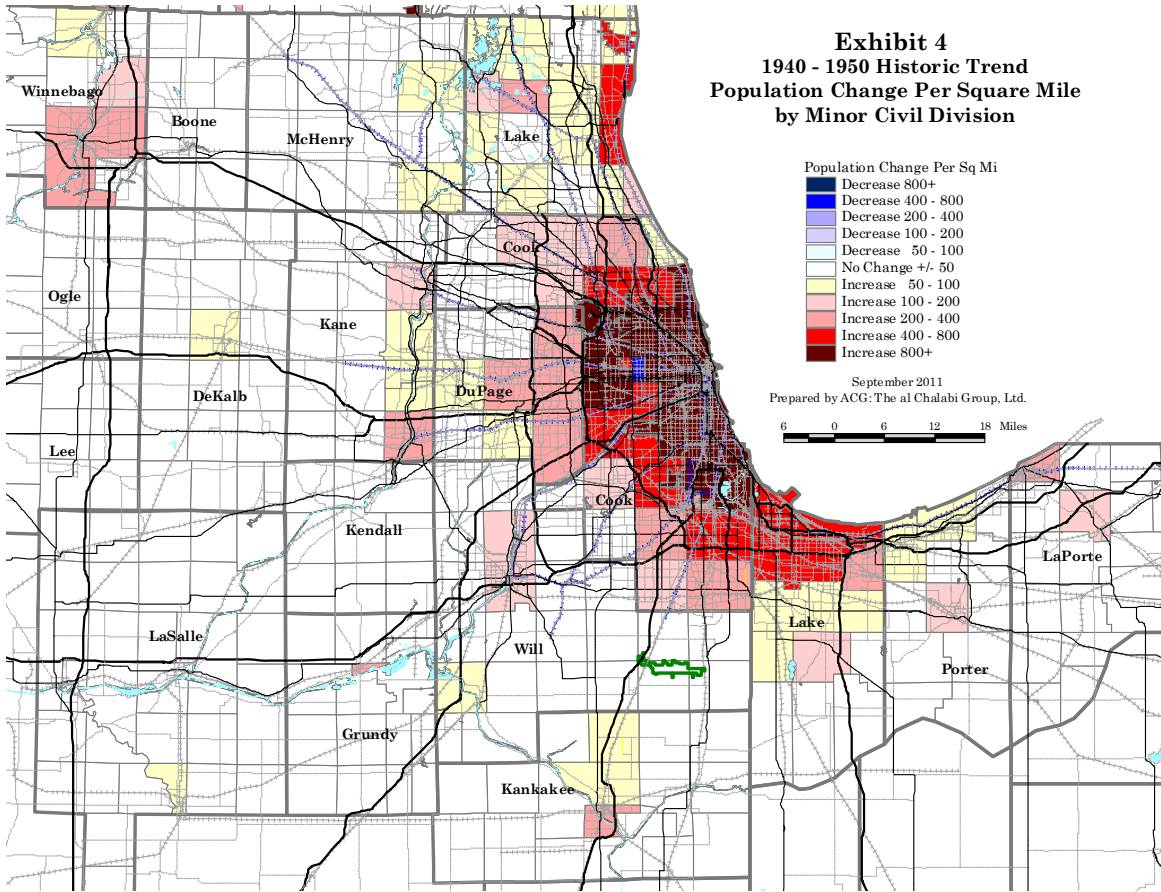


Exhibit 5
1950 - 1960 Historic Trend
Population Change Per Square Mile
by Minor Civil Division

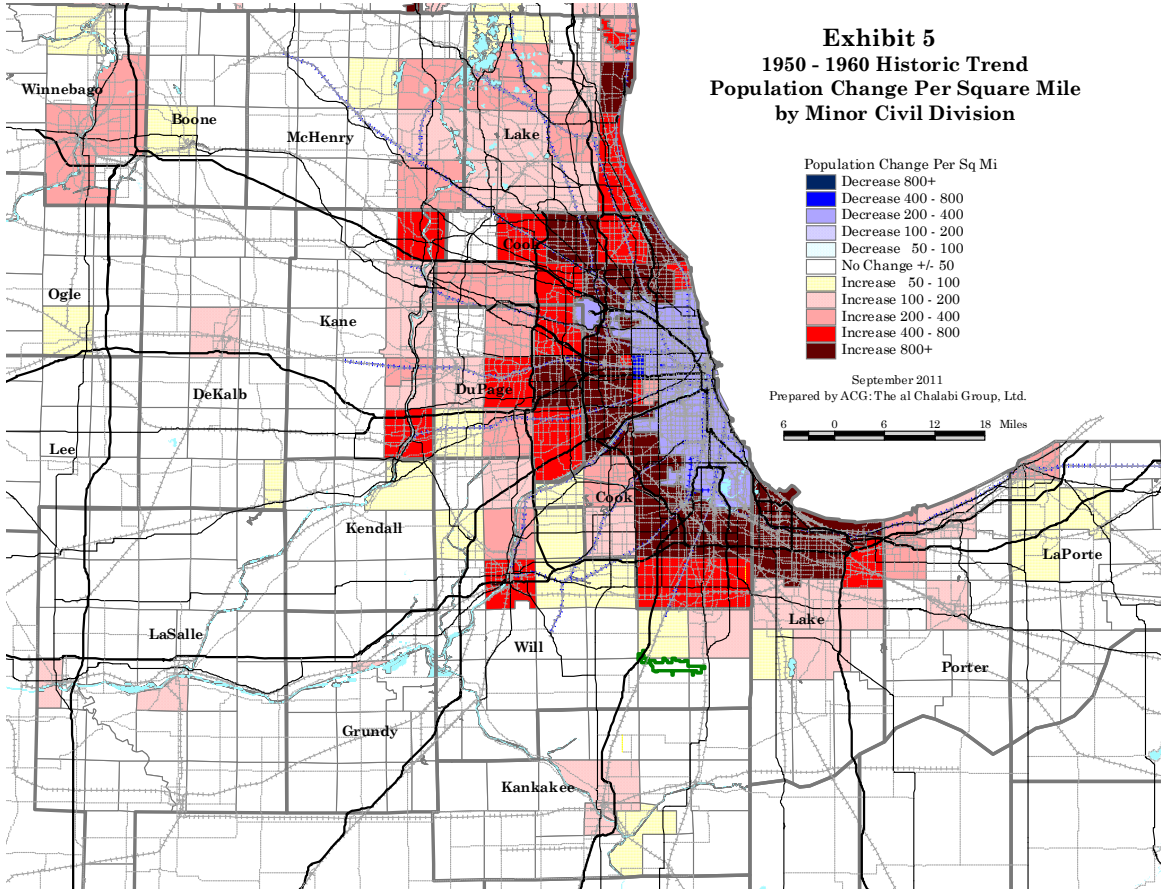


Exhibit 6
1960 - 1970 Historic Trend
Population Change Per Square Mile
by Minor Civil Division

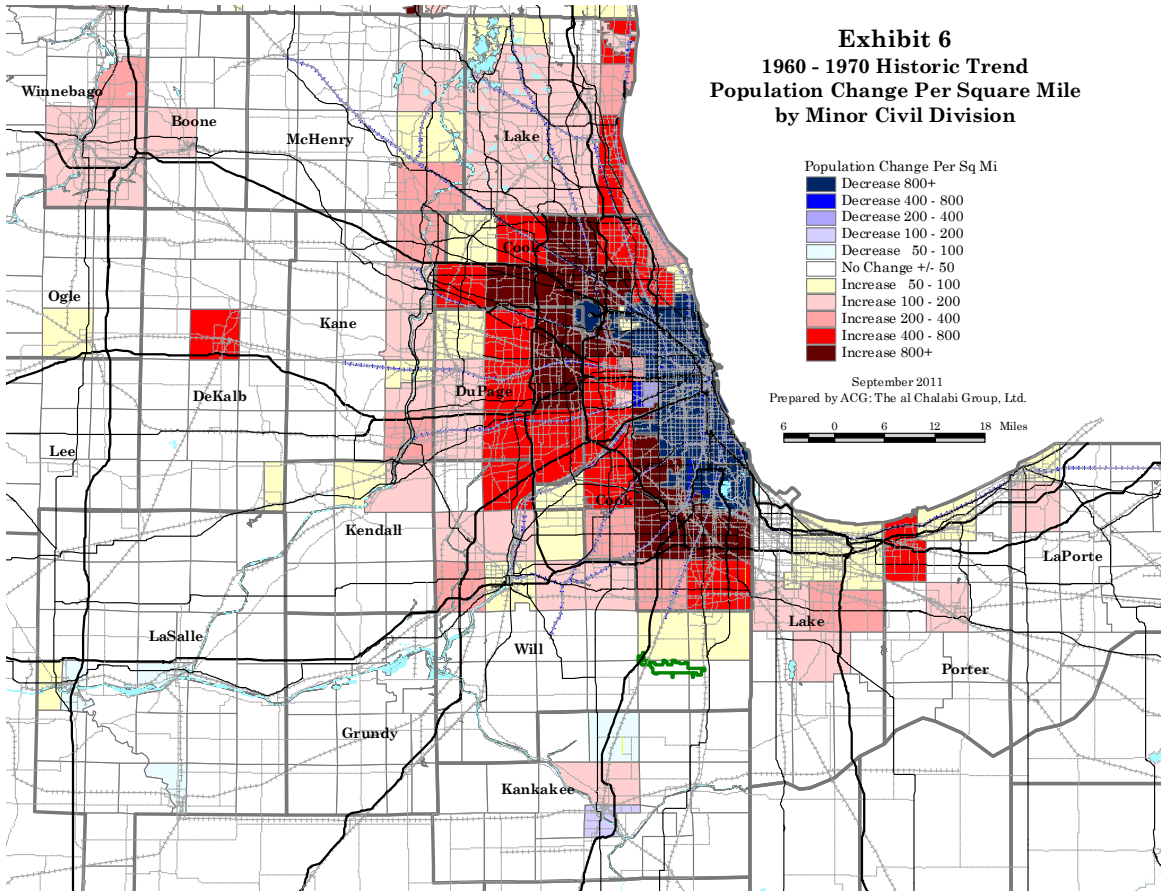


Exhibit 7
1970 - 1980 Historic Trend
Population Change Per Square Mile
by Minor Civil Division

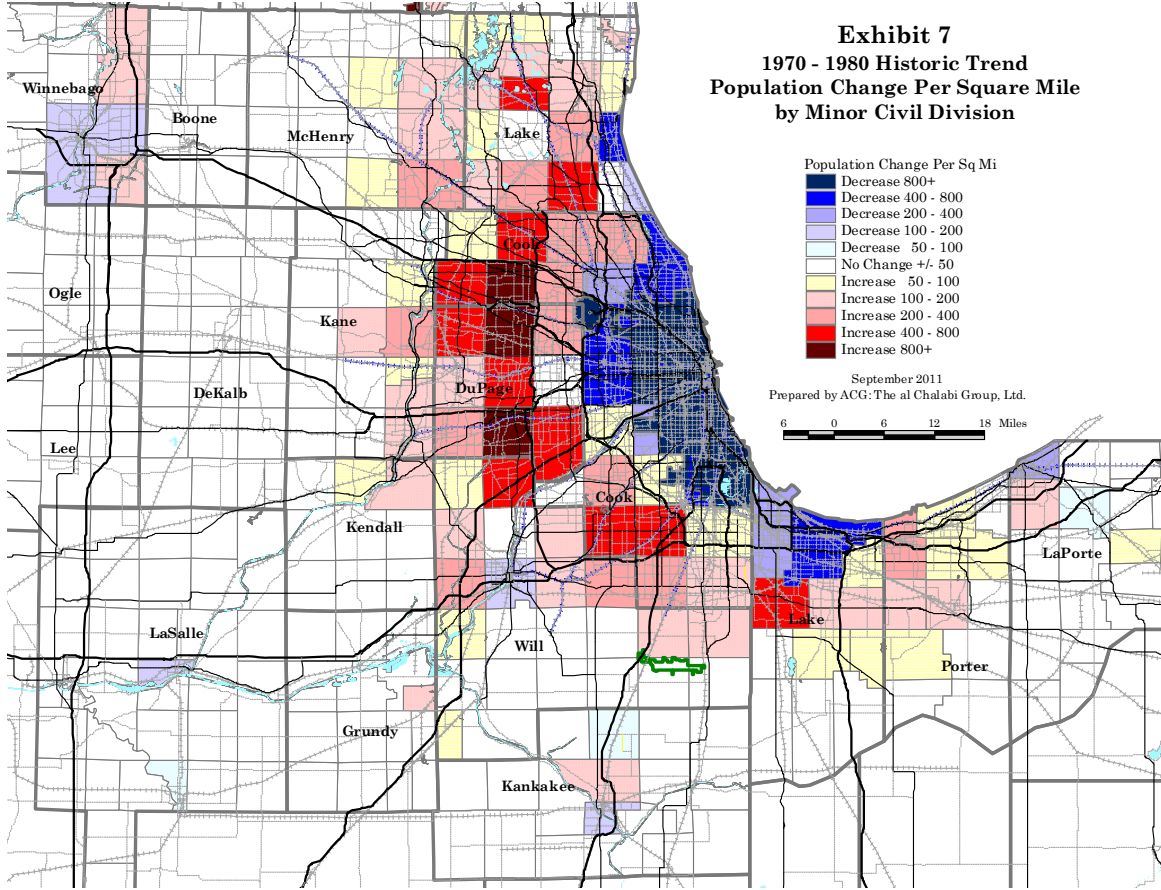


Exhibit 8
1980 - 1990 Historic Trend
Population Change Per Square Mile
by Minor Civil Division

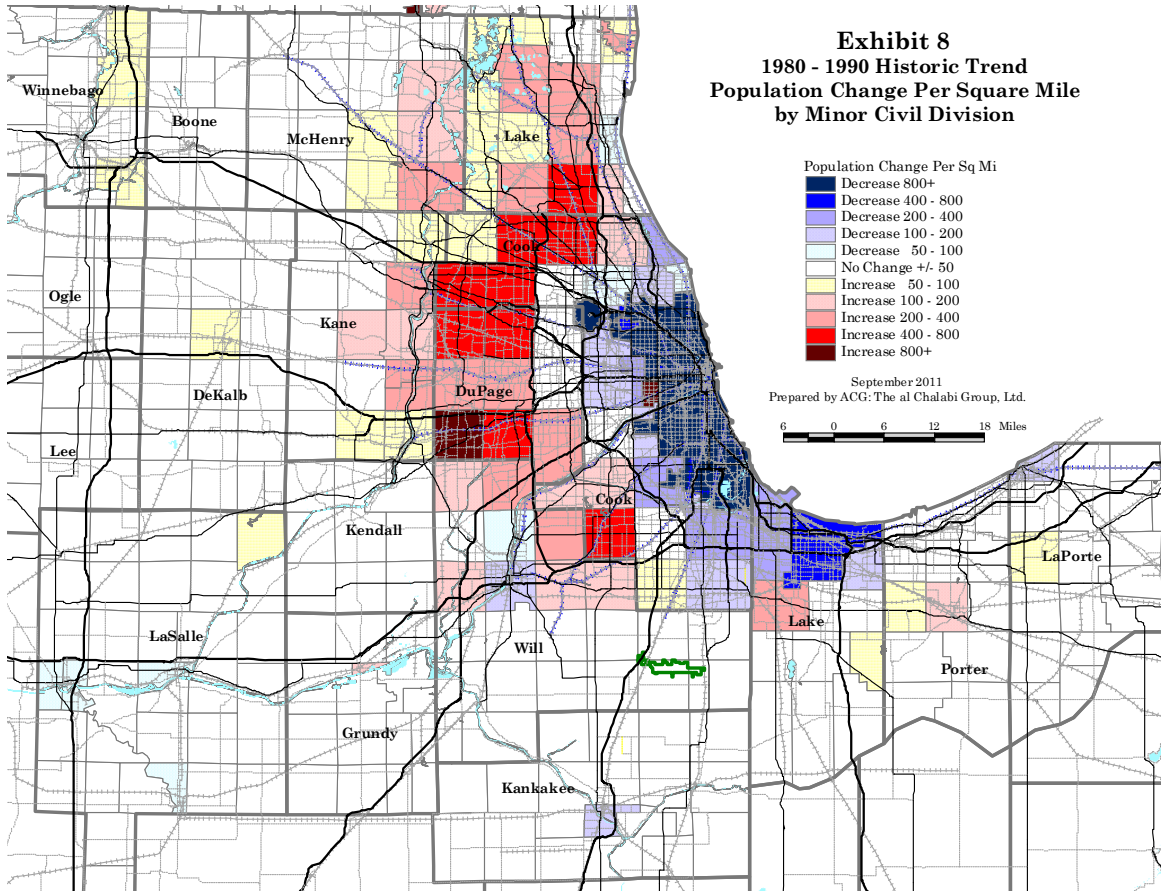
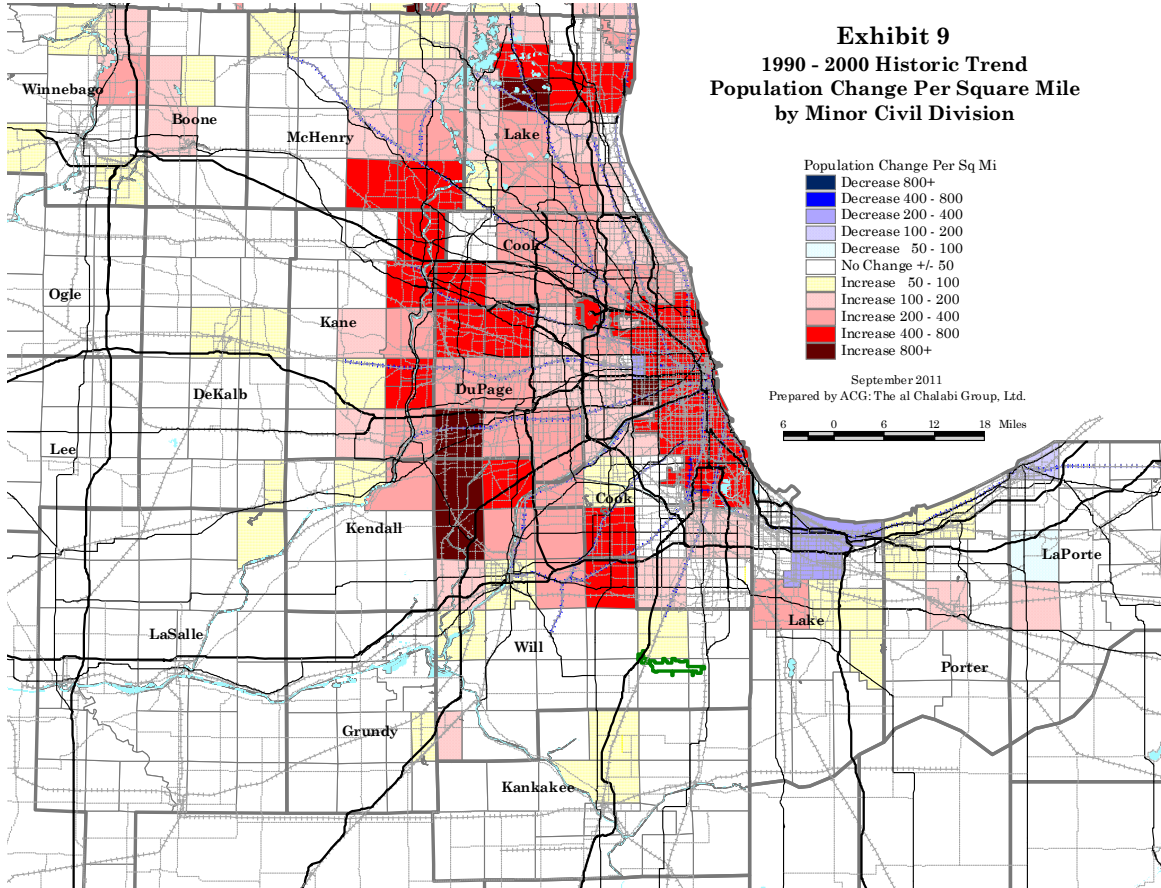
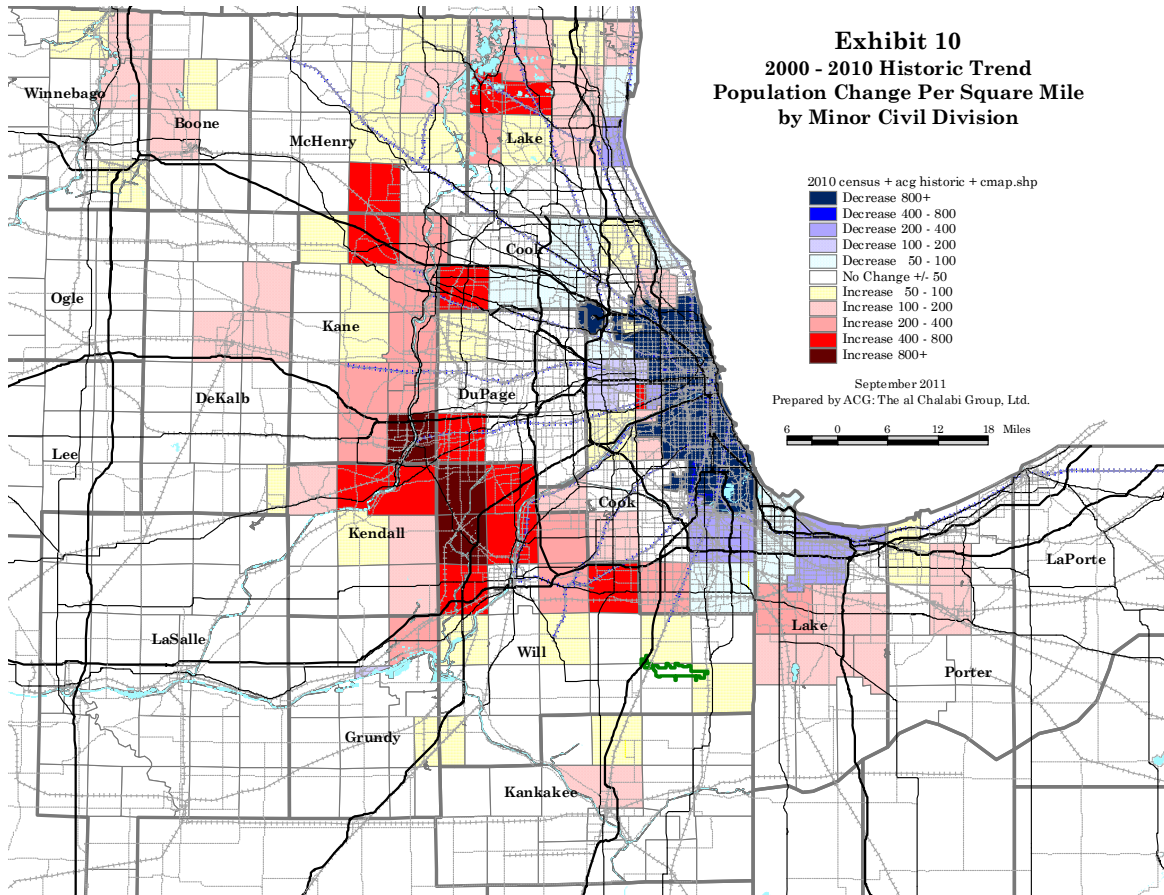


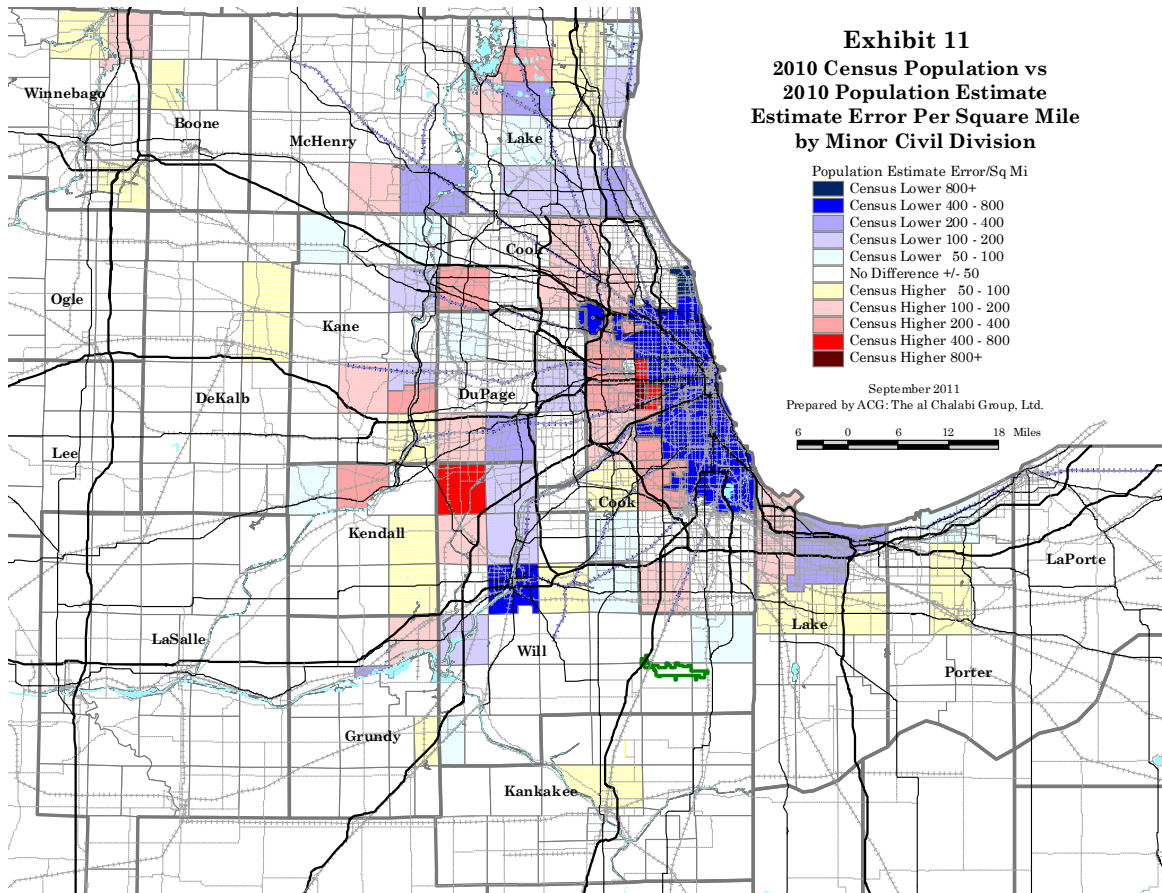
Exhibit 9
1990 - 2000 Historic Trend
Population Change Per Square Mile
by Minor Civil Division





It should be noted, that the last exhibit (Exhibit 10) reflects the results of the 2010 Census. As noted earlier, the I-290 forecasts were completed prior to the release of the 2010 Census results. The U.S. Bureau of the Census had been releasing annual population estimates, by township, since the prior decennial Census. The last of these estimates was for 2009. ACG used this estimate to generate a 2010 estimate. The actual 2010 Census population differed from the extrapolated 2010 population. Exhibit 11 shows these differences by township.

However, the impact of these differences on the ACG 2040 population forecasts were minimal, mainly because these differences did not impact the population holding capacity. Of the 40 townships in Cook and DuPage County, only one 2040 population was changed by more than 2 percent (Evanston was increased by 4.8 percent); four were adjusted by less than 2 percent (Hanover, Maine, Naperville and Wayne). Most of the forecast changes, after release of the Census, occurred in Lake and Will Counties, Illinois; the 2040 population for several of the maturing townships had to be lowered and those for some of the outer townships had to be increased.



In addition to the data/analysis depicted in the previously-referenced exhibits, ACG graphed the historic population, employment, land available for development (i.e. vacant and agricultural land), and holding capacities for each of CMAP’s 124 townships (also known as Minor Civil Divisions, or MCD’s). The graphs for four sample townships in the I-290/I-88 corridor are presented as Exhibits 12-15; these townships, representing a cross-section and time-line of the region’s growth, are (east to west): Proviso, York, Naperville and Sugar Grove. The data presented in each graph and their sources are as follows:

- **Population Trend 1920-2010:** This data is presented by a solid red line. The source for this data is the U.S. decennial Census, as reported by the U.S. Bureau of the Census. The source for the 2010 Census is its “Redistricting File”.
- **NIPC/CMAP 2030 and CMAP 2040 Population Forecasts:** These two forecasts are represented by a solid red line with red dots at the years 2030 and 2040; the latter are connected by a red line. The connecting red line has no special meaning (it does represent changes between these two years) other than emphasizing the difference between these two independent forecasts.
- **ACG Market-Driven Forecast:** ACG population and employment forecasts are represented by red and blue dashed lines, respectively.

Exhibit 12
Proviso Township - West Suburban Cook

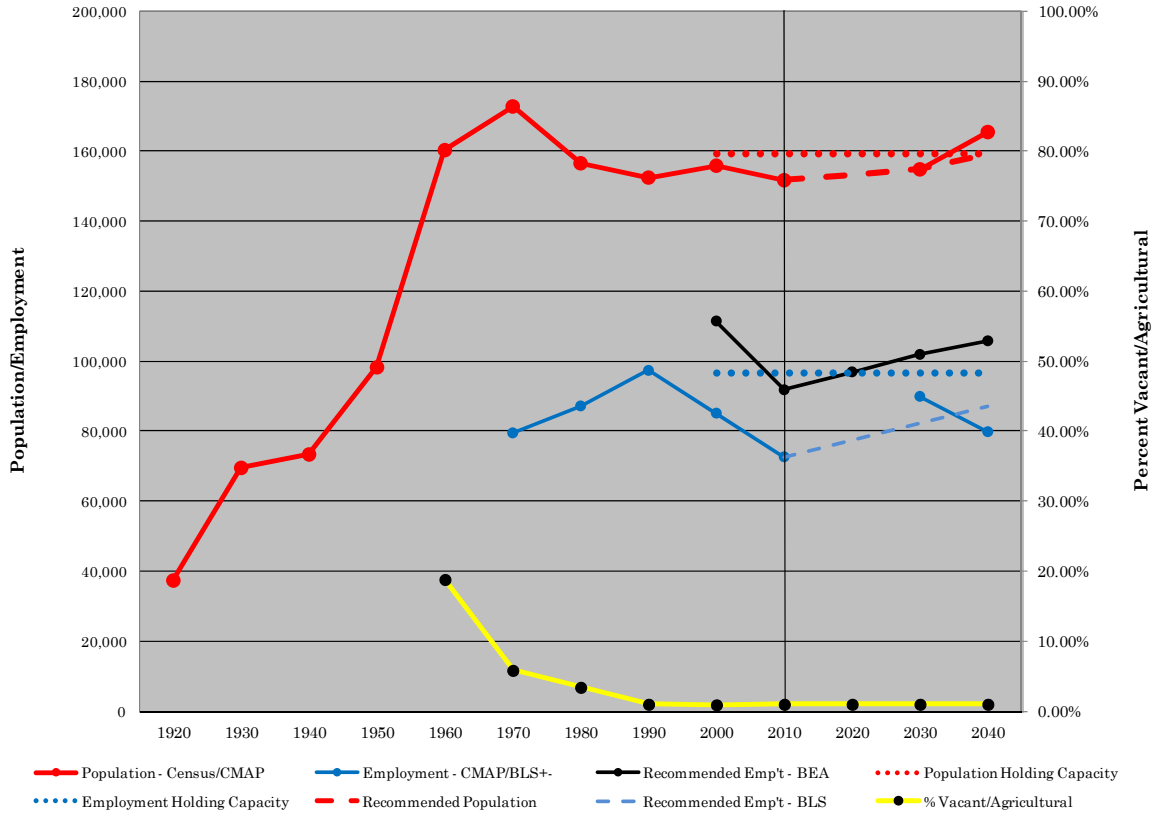


Exhibit 13
York Township - DuPage County

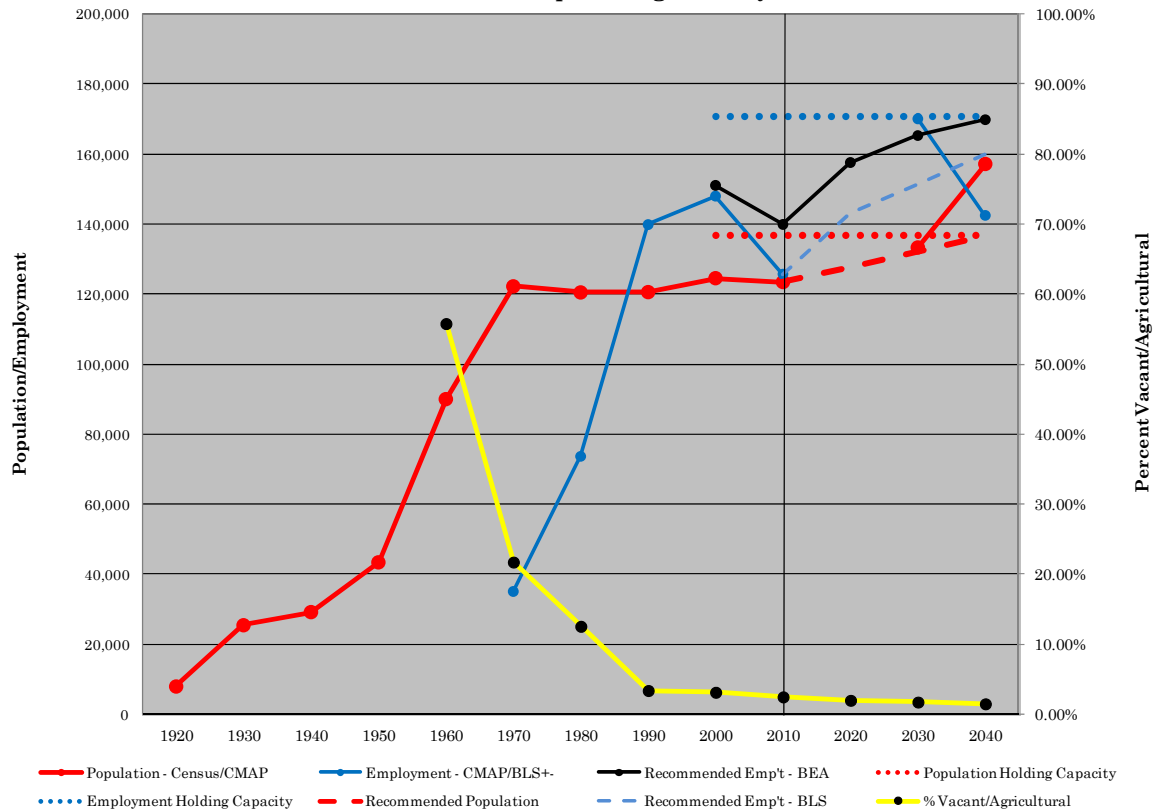


Exhibit 14
Naperville Township - DuPage County

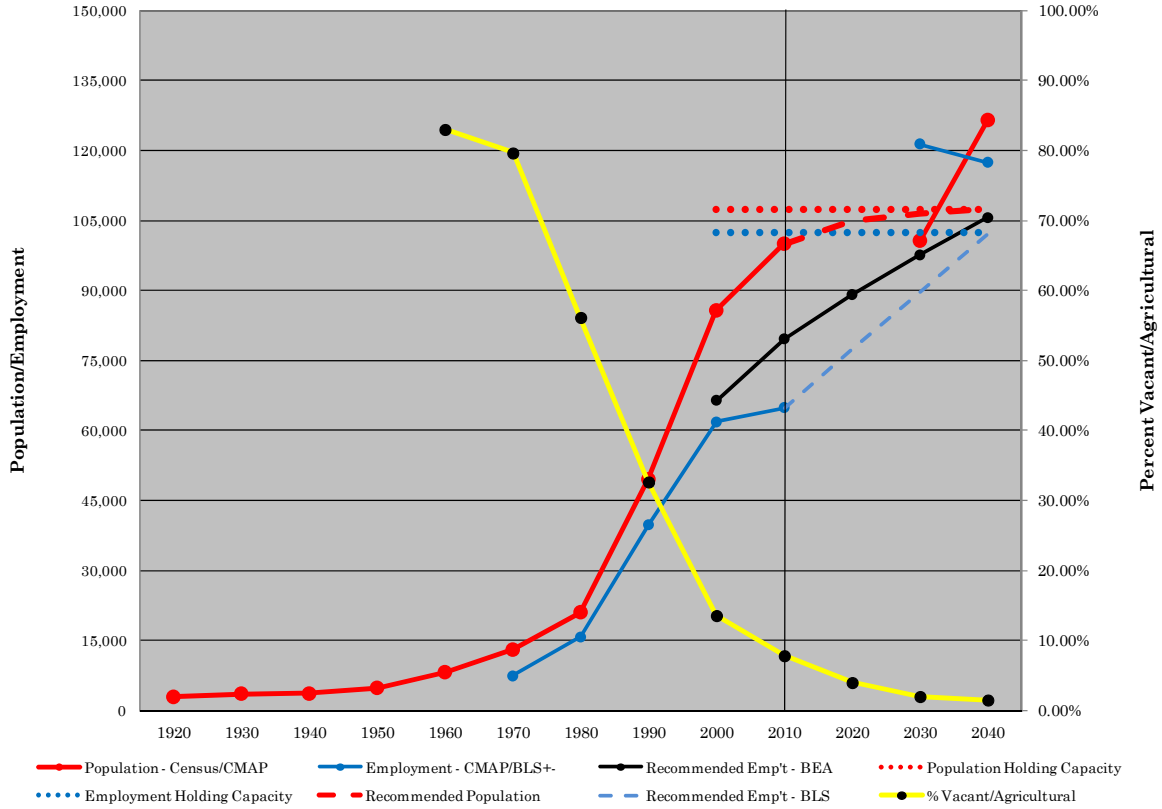
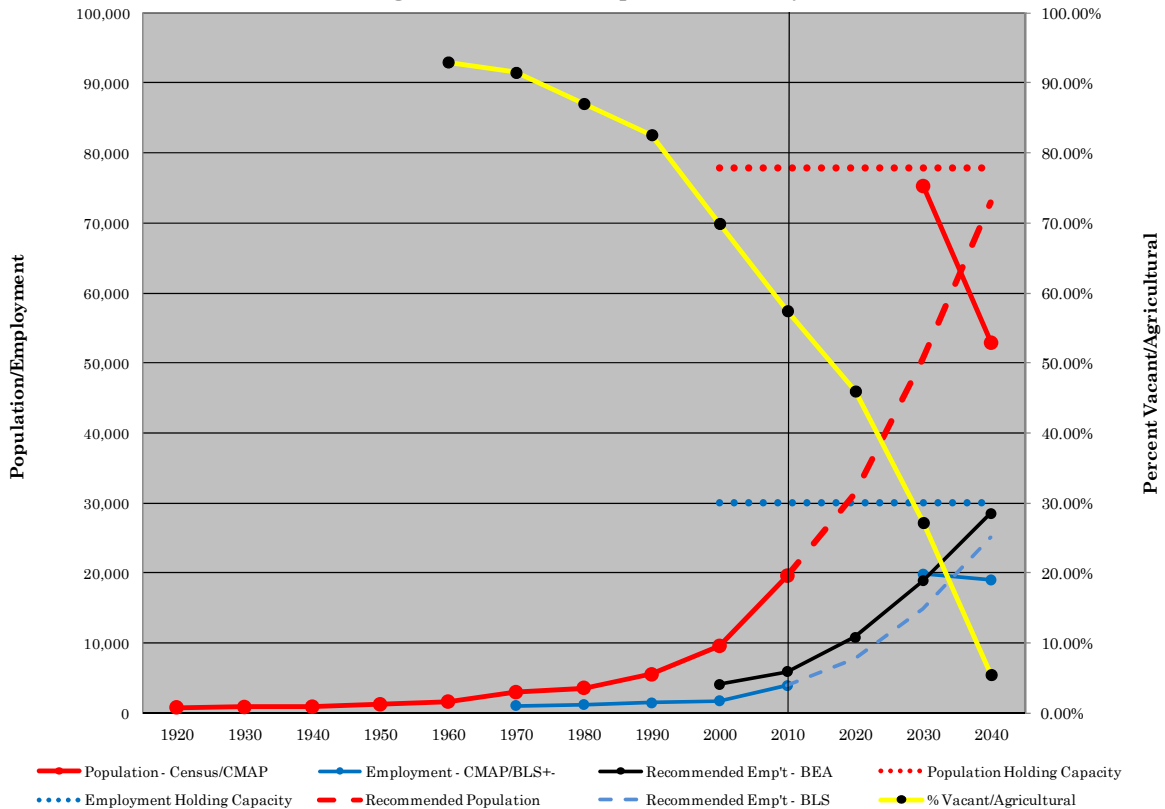


Exhibit 15
Sugar Grove Township - Kane County



E. The Abrupt Change: The Differences Between Forecasts

The NIPC/CMAP 2030 population forecasts were initially prepared and adopted by NIPC, in 2003; and were periodically revised and re-adopted. The last such revision and re-adoption was dated September 27, 2006. The population forecasts remained as the CMAP official forecasts (retrieved from the CMAP Website) until the “Go to 2040” forecasts were completed and posted. The NIPC/CMAP 2030 forecasts reflected market trends and forces, although it also adhered to accepted planning principles – e.g. promoting “in-fill”, higher densities near transit stations and no development on wetland or environmentally-sensitive areas (bogs, nature preserves, etc.). Prior to their adoption by NIPC, these forecasts were subjected to review by local elected and planning officials to ensure compatibility with local plans and community preferences. In mature or maturing areas, these forecasts represented the maximum desirable development (i.e. holding capacities).

The CMAP 2040 population forecast is the product of CMAP’s first comprehensive plan, Go to 2040: Comprehensive Regional Plan, produced in 2010, which adopted a strict Public Policy-Based approach to forecasting. It is a “wholesale shift to scenario-based evaluation and its intentional reliance on forecasts that reflect implementation of preferred regional planning strategies...The current official CMAP forecasts are for the year 2040 and reflect the expected outcome of the preferred regional scenario adopted by the CMAP Board.”¹

Recognizing that all intended Policy-Based results may not materialize, CMAP opted not to adopt its forecasts as the official forecasts to be used for infrastructure planning studies. The CMAP staff noted that such planning studies would be permitted to develop their own forecasts, provided that such forecasts use reasonable methodologies and acknowledge their differences from the CMAP forecasts (as stated on Page1).

The differences between the NIPC/CMAP 2030 and the CMAP 2040 forecasts are, themselves, the result of two different approaches to forecasting. The first, represents a quasi market-driven forecast reflecting local plans and preferences; whereas, the second, represents a policy-based forecast channeling development within the policies prescribed in the Go to 2040: Comprehensive Regional Plan.

As is stated in the Introduction, the 2040 Forecast prepared by the PB/ACG team for the I-290 No Build Scenario are more-closely related to extrapolations of the NIPC/CMAP 2030 forecast than to the CMAP 2040 forecasts, as both (NIPC/CMAP and ACG) share the same market approach to forecasting.

F. The Analytical Bases

The following summary describes the key factors and their sources analyzed in preparing the Market-Driven forecasts for each of the 124 townships in the CMAP region; and the 168 townships, in Illinois and Indiana, that are adjacent, but external, to the CMAP region.

¹ “CMAP Forecast Principles”, Internal Memorandum, April 2011.

1. Population Holding Capacity

The population holding capacity, represented by a red dotted line, in Exhibit 12 to 15 (and in all 124 CMAP township exhibits) was generated by ACG by selecting the higher of the following two numbers:

- The NIPC/CMAP 2030 population forecast. As noted earlier, this number for mature or maturing townships was derived by NIPC planners, working closely with local officials, to denote the maximum desirable development.
- The prevailing density of recent development (last 20 years) applied to the remaining available/developable land. In calculating densities, assumptions regarding the land use mix within the township had to be made. For mature or maturing townships, the assumption was to maintain the mix, unless known, realistic plans had been announced. For townships that are still primarily vacant, local plans or comparative analysis with comparable townships were used to establish the holding capacity.

2. Recommended Population Forecasts

This is the ACG-generated population forecast. With few exceptions, these forecasts approximate the standard logistics S-Curve. ACG generated this curve, individually, for each township using such factors as: holding capacity, take-off year, period during which fast growth would occur, maturity-approach year. The graphs for each of the townships were hand drawn to recognize the nuances associated with each township. However, Logistic S-Curves were calibrated for several classes of townships to ensure the theoretical basis for these forecasts. The equation used for generating each S-Curve is:

$$\text{Forecasted Population} = \frac{\text{Holding Capacity}}{(1 + \text{EXP}(-\alpha * (\text{Year} - \text{Year}_0)))}$$

Where:

$$\alpha = \frac{(\text{LN}(1/\text{Value}_1 - 1) - (\text{LN}(1/\text{Value}_2 - 1))}{(\text{Time}_2 - \text{Time}_1)}$$

$$\text{Year}_0 = \frac{(\text{LN}(1/\text{Value}_1 - 1))}{\alpha + T_1}$$

and

T1 = take-off year

T2 = leveling-off year

Value 1 = % of peak population at take-off year

Value 2 = % of peak population at leveling-off year

3. Employment Trends 1970-2010 – NIPC/CMAP Data (BLS Based)

This data is represented by a solid blue line. The source of this data is NIPC through 2000 and CMAP for 2010. NIPC compiled this data by geocoding the employment data from the Illinois Department Employment Security (IDES) to quarter-section and then

aggregating them to townships and municipalities. The IDES data does not include the government workers or industries not covered by unemployment insurance. NIPC undertook special surveys to obtain and to code government employment by quarter-section and adjusted the results so that its total employment, at the metropolitan level, matched that published by the Bureau of Labor Statistics (BLS). For its 2010 employment data, CMAP used the same IDES and government employment sources and processes; however, CMAP did not undertake the final adjustment process to equalize its estimate with the BLS total. Accordingly, some of the decline in employment, between 2000 and 2010, is due to not undertaking this adjustment; and some of the decline, if any, is due to the recent recession.

4. Employment Forecasts 2010-2040 – BLS Based

The dashed blue lines represent the ACG forecasts of the BLS-based definition of jobs, by decade, through 2040. These forecasts were developed to enable comparison of the NIPC/CMAP 2030 and the CMAP 2040 employment forecasts. The two forecasts are shown as blue dots for 2030 and 2040. Like their equivalent population forecasts, they are connected by a solid line (blue for employment) to document the shift in the forecasting approach of NIPC/CMAP of 2005/2006 to that of CMAP in 2010/2011. The procedures used for generating the employment are the same as those used for generating the population forecasts described earlier. The employment holding capacity (BLS based), by township, is shown as a dotted blue line.

5. Employment Forecasts: Trends and 2010-2040 Forecasts – BEA Based

The Bureau of Economic Analysis (BEA), of the U.S. Department of Commerce, publishes employment data, by county. The BEA employment data is the most-complete measure of all full-time and part-time jobs by place of work. Unlike the BLS employment data, it includes all proprietors, agricultural workers, household workers and miscellaneous workers (including those paid in cash). The BEA employment is almost identical to that produced by the National Income and Product Accounts (i.e. data used in Input/Output models); and in the Woods & Poole (W&P) Economics forecasts used by many regions and states, including Illinois.

BEA employment data are available, by County, for a period dating back to 1969. Recently, several commercial resources have started making this data available by township; and ACG has obtained such data for 2000 and 2010. ACG checked this data against official BEA data, by county, and undertook minor adjustments to ensure compatibility with county data. The BLS-based employment forecasts were generated first. The Market-Driven BEA-based employment forecasts were developed, next, to reflect the BLS-based employment forecasts, as well as to balance jobs with workers, which is described later.

The ACG 2000 and 2010 BEA employment, as well as its employment forecast (BEA based) for 2010 through 2040, are shown on the township graphs as a solid black line with black dots. For County graphs, the BEA trends go back to 1970.

6. Percent of Total Land Available for Development (Vacant/Agricultural)

The yellow solid line with black dots represents the percent of total land available for development. The source of this data is the NIPC land use surveys. The first quantitative land use survey was conducted by NIPC in 1964. The 1964 land use data (by township) were extrapolated to 1960 using the land use maps contained in the 1956, Planning the Region of Chicago, by the Chicago Regional Planning Association (NIPC's predecessor). The last completed land use surveyor data were for 2005; these were extrapolated to 2010 using past trends, 2010 population, 2010 employment estimates and, for selected townships, available satellite photography.

Forecasts of land available for development were derived from the population and employment forecasts. The S-Curve representing land available for development is the residual – the S-Curve for development minus existing population/employment.

G. Mathematically-Generated S-Curve Population and Employment Forecasts

As noted earlier, a graph was prepared for each of the 124 CMAP townships. Each of these graphs contained all the information listed in the preceding section – the only exception being the lack of pre-2005 land use (hence lack of vacant/agricultural land) for Kendall County townships. Exhibits 12 to 15, presented earlier, show the population and employment trends and forecasts for four townships in the I-290/I-88 Corridor. Each of these townships represent a different development take-off year. Again, as noted, the forecasts (2010-2040) in these graphs are generated individually for each township, reflecting the known market trends for each.

Exhibits 16 to 19, following, show the mathematically-generated S-Curves for population, employment and available vacant/agricultural land trends and forecasts for these four townships. The solid lines in these graphs represent the mathematically-generated S-Curves; whereas, the dashed lines represent the actual trends and I-290 forecasts, as described earlier. The ability of the mathematically-generated S-Curves to replicate actual 90-year trends and 30-year forecasts is a confirmation of the validity of these long-lasting market trends. To ensure that these long-lasting trends were not unique to those four townships, similar graphs for 25 additional townships were prepared. These additional townships were scattered throughout the region. The results were as convincing as those presented in the following graphs.

The mathematically-generated S-Curves attempt to duplicate 120 years of trends and forecasts given the following input data for population and employment.

- Holding capacity.
- Take-off year.
- Approaching maturity year.
- Percent of capacity at take-off and approaching maturity years.

For townships with take-off years in the far past – that is, prior to the 1950's (e.g. Proviso and York), the mathematically-generated S-Curves provide good predictions for

2040 forecast, but may miss intermediate anomalies. Examples of such anomalies are the high birth rates during the 1950-1970 period and the recent great recession. For townships with more recent or future take-off, past anomalies are not as visible; however, confidence in the future accuracy of the forecast is less. The holding capacities are not fully known, yet; and future anomalies cannot be predicted.

Exhibit 16
Proviso Township - West Suburban Cook

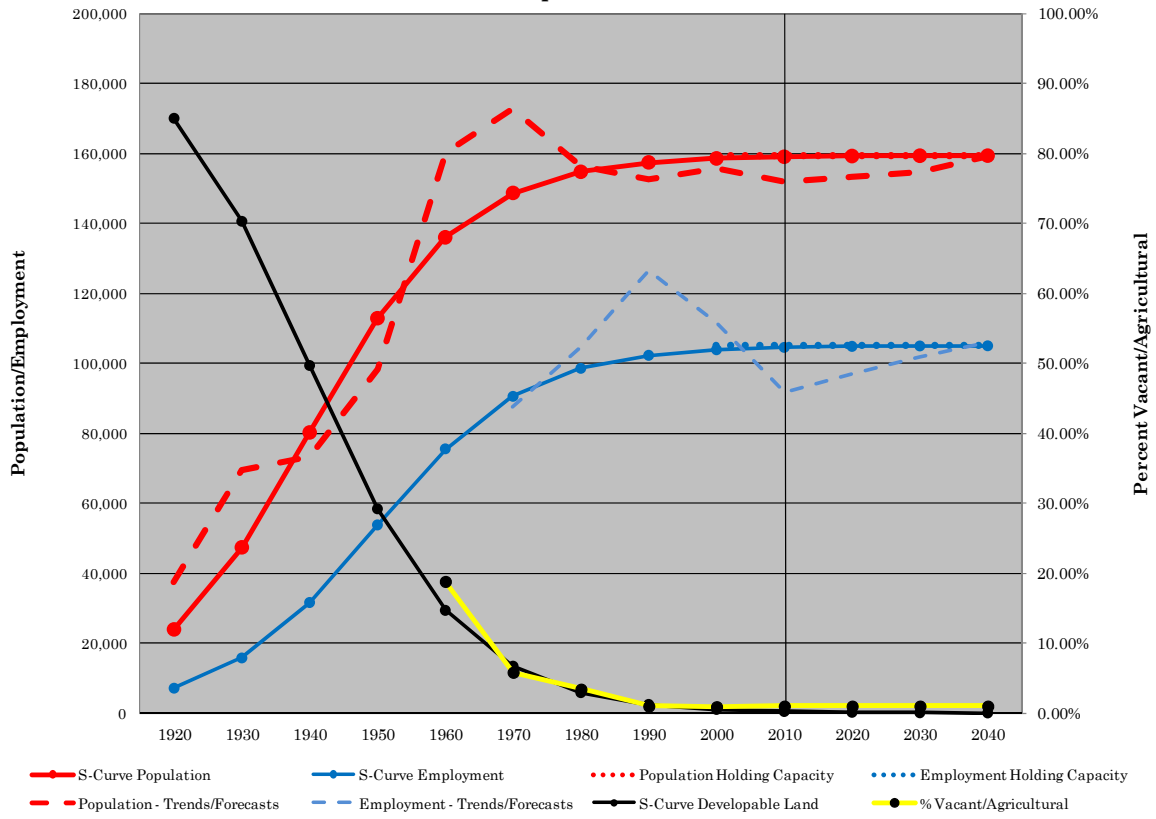


Exhibit 17
York Township - DuPage County

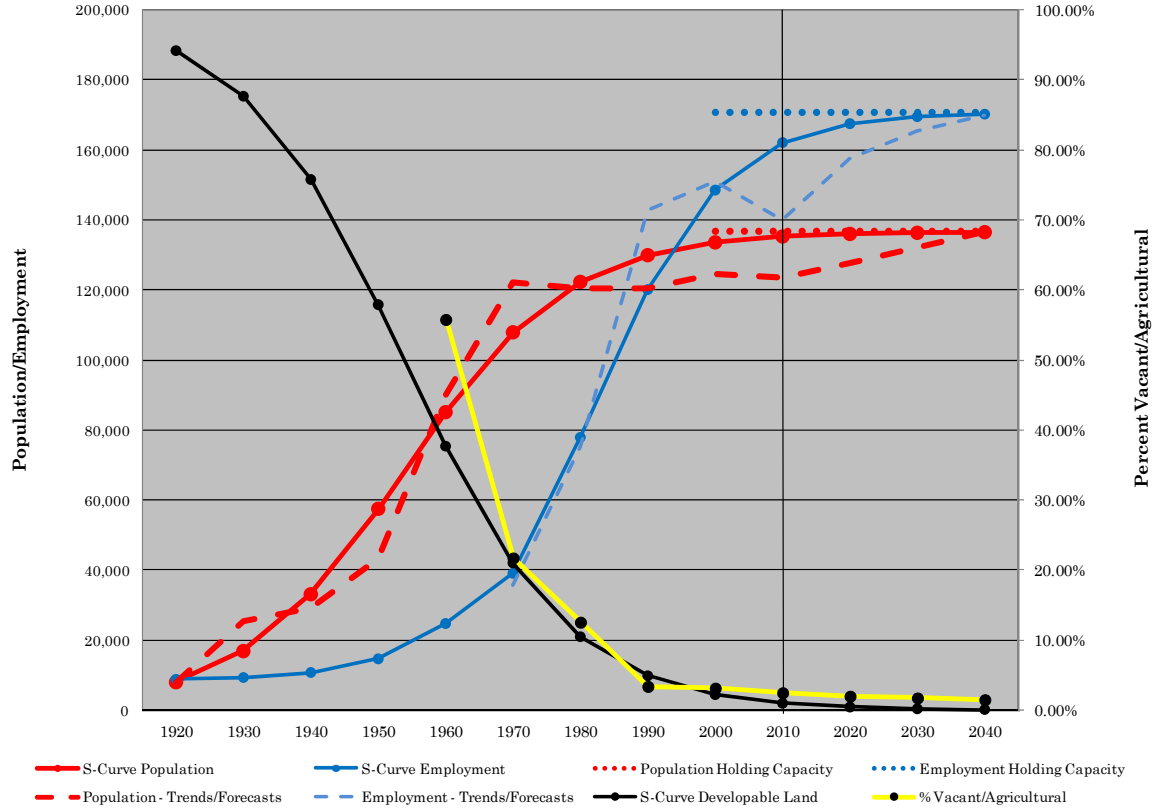


Exhibit 18
Naperville Township - DuPage County

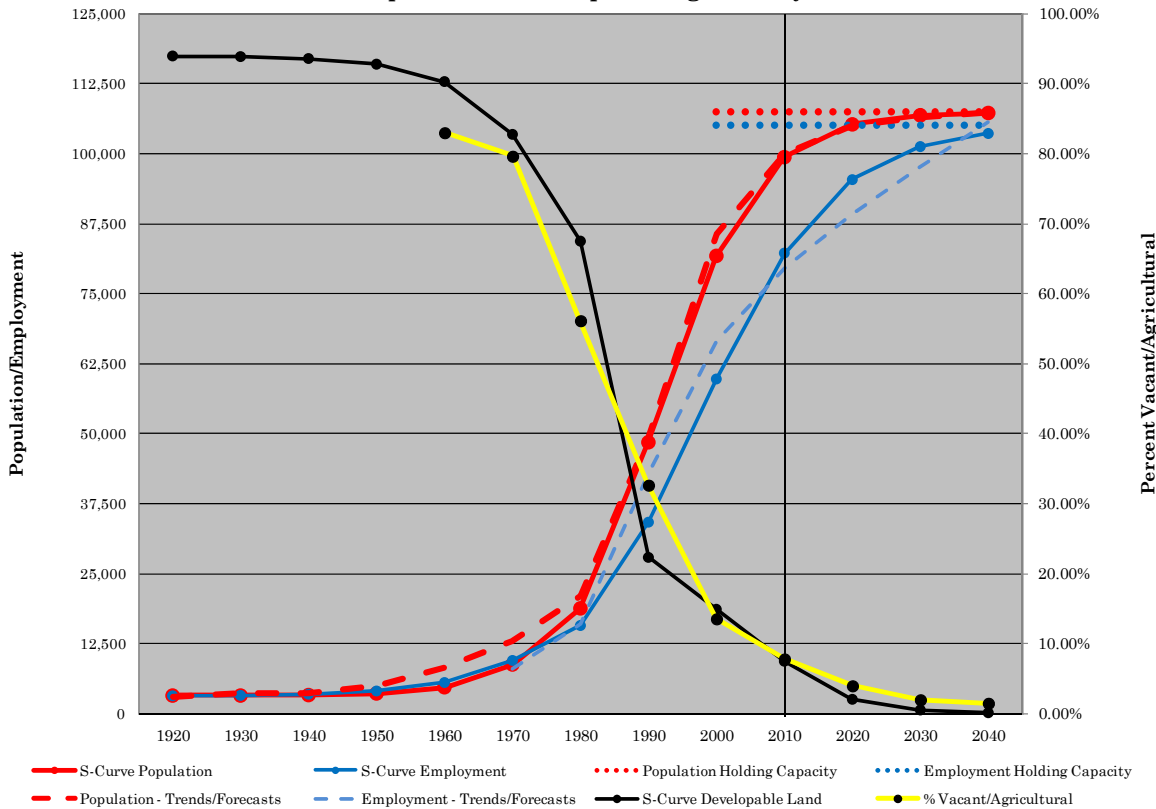
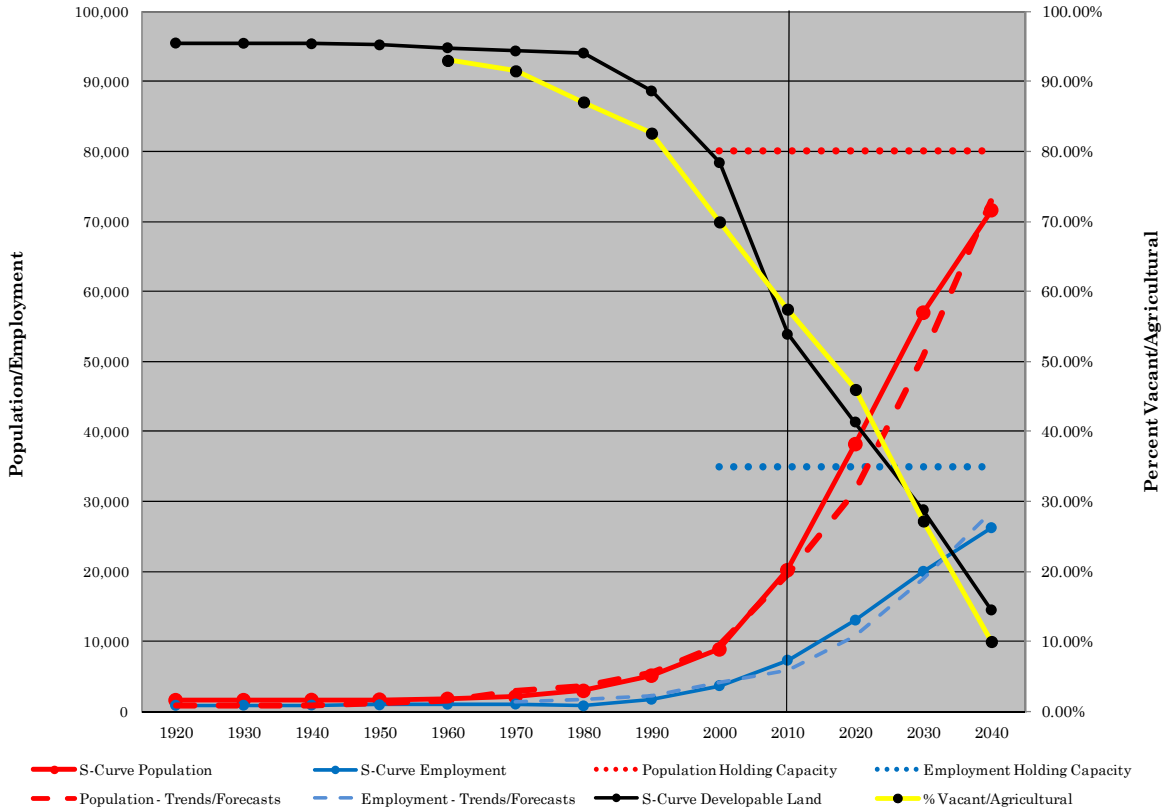


Exhibit 19
Sugar Grove Township - Kane County

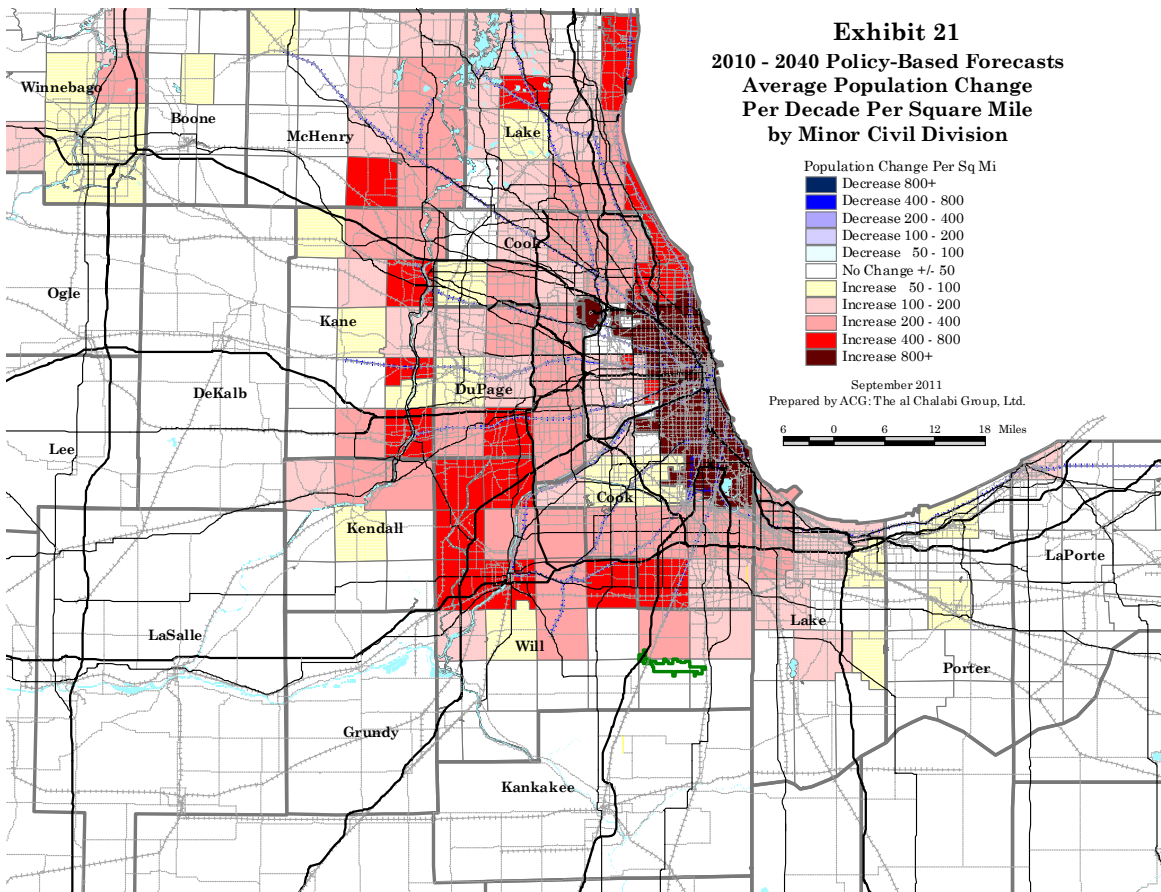
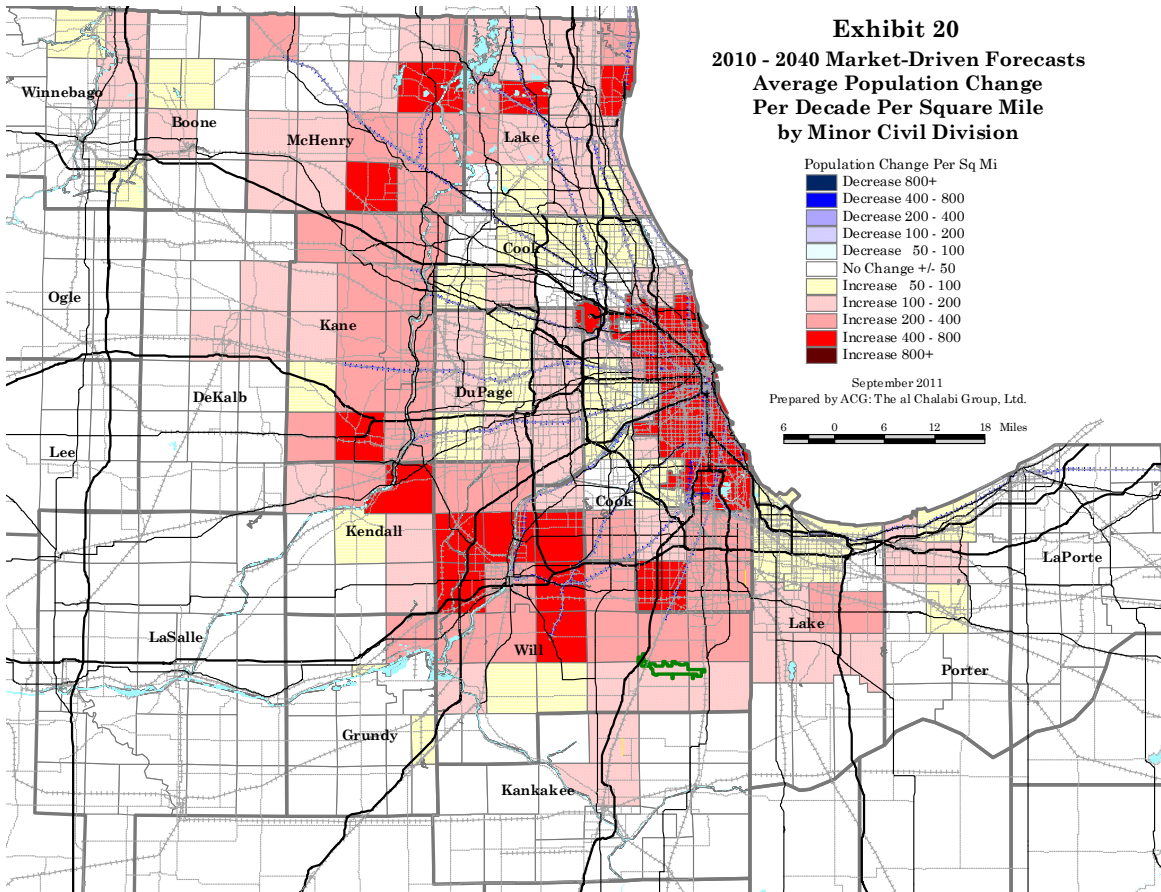


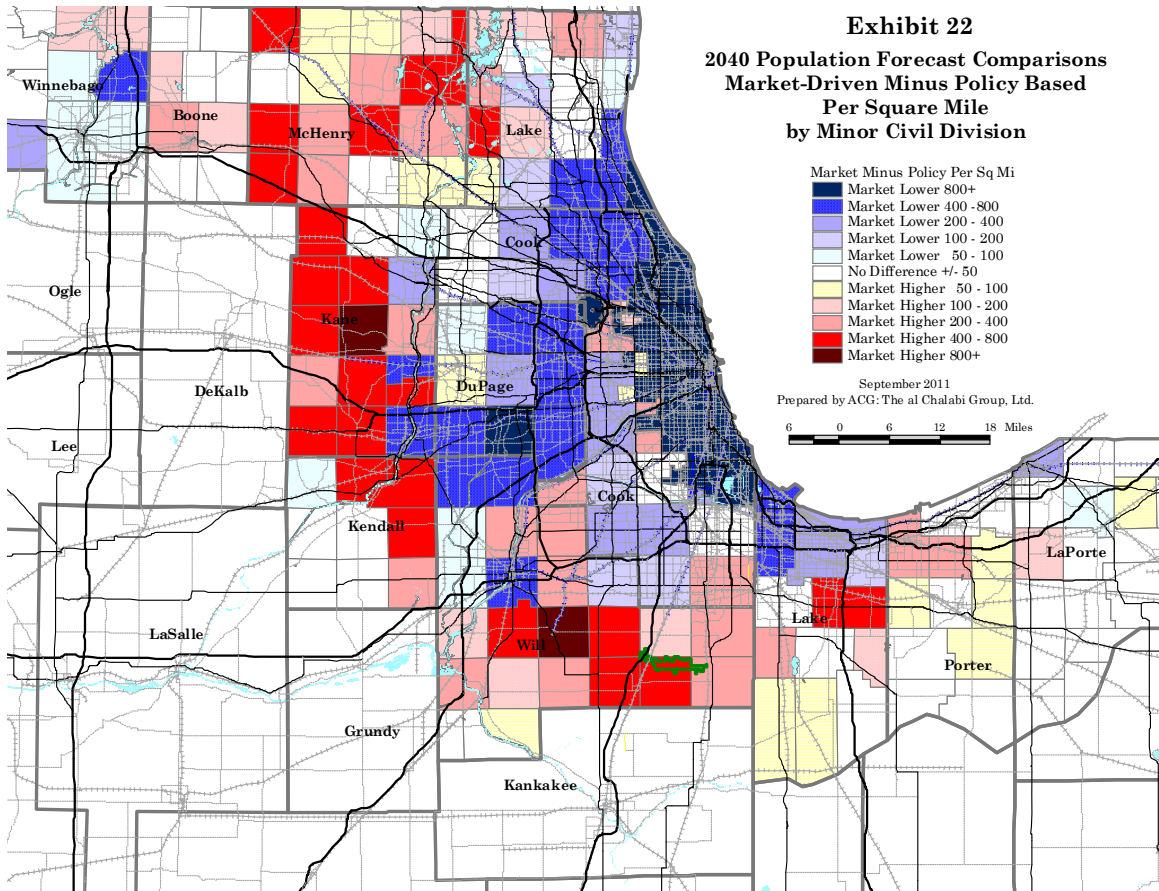
H. Population and Employment Forecast Results with Comparison to CMAP 2040 Forecasts

Exhibit 20 shows the total population change between 2010 and 2040 of the Market-Driven forecasts for the I-290 Study. The data is presented as change per decade per square mile, by township, to provide a more-consistent basis for comparison with prior exhibits. The general picture is of a central city (Chicago) remaining vibrant and growing; a south portion of the region growing to levels previously experienced in the north and west sections of the metropolitan area; substantial growth, creating higher densities, at the region’s edges; and an inner suburban area with moderate growth.

Exhibit 21 shows the CMAP Policy-Based forecast distribution of population for 2010-2040. Under this scenario, the City of Chicago and the North Shore lakefront provide a major part of the region’s growth. These areas and close-in counties (DuPage, North Cook) are allocated growth which would appear to require substantial increases in density, which, to materialize, would require considerable replacement of existing stock since many already are at mature levels. The City of Chicago grows to 3,303,768 by 2040. This increase, of 608,170 persons, is nearly double the increase of the Market-Driven forecast. There are major population increases in the close-in townships of Will, McHenry, Kane and Kendall Counties; but, growth beyond these areas is limited or contained. Exhibit 22 shows the difference in forecasts of the two population forecast alternatives.

Table 1 compares these two forecasts for 18 counties and 4 sub-county areas in the extended Chicago region.





I. Township Forecasts of Other Socio-Economic Variables

The transportation models, used by CMAP and PB for the I-290 require, as input, ten socio-economic variables by subzone (quarter-sections within the CMAP seven-county region). All these variables are derived from total population and total employment. These ten variables are:

- Households
- Adults per household
- Workers per household
- Children per household
- Children 12-15 years old as percent of total children
- Median household income as percent of the region's median household income
- Workers in non-institutionalized group quarters
- Non-workers in non-institutionalized group quarters
- Retail employment
- Total employment

**I-290/Eisenhower Corridor Study
Forecasts for the Region of Chicago
Market-Driven Socio-Economic Forecasts 2010 - 2040**

	Final Market -Driven Population Forecasts					Initial* I-290 Population	Final Market-Driven Employment Forecasts (BEA)					Initial* I-290 Employ'nt	CMAP/NIRPC/RMAP Population Forecasts		CMAP/NIRPC/RMAP Employment Forecasts		I-290 Minus Local Population			
	2000	2010	2020	2030	2040	2040	2000	2010	2020	2030	2040	2040	2030	2040	2030	2040	2030	2040		
County Summary: CMAP Region																				
City of Chicago	2,896,014	2,695,598	2,900,000	2,950,000	3,000,000	3,009,104	1,748,373	1,607,833	1,630,000	1,650,000	1,715,000	1,787,695	3,261,464	3,303,768	1,779,852	1,537,982	(311,464)	(303,768)		
Suburban Cook - North	1,047,250	1,062,657	1,087,039	1,112,134	1,125,001	1,143,996	834,534	824,795	874,052	901,486	921,342	916,523	1,106,516	1,257,047	839,391	793,552	5,618	(132,046)		
Suburban Cook - South	789,353	793,789	865,798	934,175	973,809	977,908	344,617	334,789	388,187	437,335	468,026	441,641	936,353	985,682	369,853	352,447	(2,178)	(11,873)		
Suburban Cook - West	644,124	642,631	651,635	661,564	674,800	674,818	394,079	358,303	393,271	418,509	430,386	430,398	648,459	692,700	350,757	303,653	13,105	(17,900)		
Cook County	5,376,741	5,194,675	5,504,472	5,657,873	5,773,610	5,805,826	3,321,603	3,125,720	3,285,510	3,407,330	3,534,754	3,576,257	5,952,792	6,239,197	3,339,853	2,987,634	(294,919)	(465,587)		
DuPage County	904,159	916,924	963,362	998,729	1,022,108	1,022,295	696,726	689,770	773,722	824,359	851,700	851,703	1,003,704	1,160,364	830,293	770,940	(4,975)	(138,256)		
Kane County	404,119	515,266	632,678	796,695	953,423	923,709	239,975	255,778	351,782	433,261	509,567	478,163	718,464	804,249	352,207	368,496	78,231	149,174		
Kendall County	54,544	114,736	168,607	224,269	262,192	223,048	n/a	29,462	50,038	74,460	94,472	81,612	n/a	207,780	n/a	73,189	n/a	54,412		
Lake County	644,356	703,462	793,486	881,852	941,221	963,121	415,337	427,450	508,143	586,502	638,025	637,478	841,860	970,959	463,509	470,937	39,992	(29,738)		
McHenry County	260,077	308,760	381,303	566,698	692,028	711,189	110,734	134,274	173,528	261,706	321,495	311,050	457,593	527,649	168,575	187,829	109,105	164,379		
Will County	502,266	677,560	868,986	1,146,722	1,366,456	1,366,804	184,449	249,681	376,427	536,548	672,961	667,975	1,076,447	1,217,879	415,550	481,883	70,275	148,577		
Total: Seven-County CMAP Region	8,146,262	8,431,383	9,312,894	10,272,838	11,011,038	11,015,992	n/a	4,912,135	5,519,150	6,124,166	6,622,974	6,604,238	n/a	11,128,077	n/a	5,340,908	(2,291)	(117,039)		
County Summary: NIRPC Region																				
Lake County (IN)	484,564	496,005	537,419	584,068	625,000	583,204	242,849	229,563	255,486	283,500	309,598	310,107	504,808	625,019	n/a	282,844	79,260	(19)		
LaPorte County	110,140	111,474	114,827	119,026	123,229	126,082	n/a	54,402	58,878	63,354	67,830	66,001	n/a	123,229	n/a	68,106	n/a	0		
Porter County	146,798	164,343	185,303	203,933	222,563	233,585	70,218	71,768	83,634	95,500	107,060	102,584	164,582	190,768	n/a	82,131	39,351	31,795		
Total: Three-CountyNIRPC Region	741,502	771,822	837,549	907,027	970,792	942,871	n/a	355,733	397,998	442,354	484,488	478,692	n/a	939,016	n/a	433,081	118,611	31,776		
Summary: Other Illinois Counties																				
Boone	41,786	54,165	64,877	75,676	86,973	80,004	-	19,849	23,658	27,493	31,499	27,002	-	68,516	-	27,319	-	18,457		
Dekalb	88,969	105,160	122,413	139,201	155,000	139,822	-	52,772	58,837	64,898	70,963	70,000	-	-	-	-	-	-		
Grundy	37,535	50,063	61,265	72,463	83,665	78,719	-	21,873	26,907	31,941	36,975	35,009	-	-	-	-	-	-		
Kankakee	103,833	113,449	125,632	137,817	150,000	155,005	-	55,231	61,820	68,411	75,000	74,998	-	-	-	-	-	-		
LaSalle	111,509	113,924	118,178	121,928	125,686	117,440	58,303	52,676	56,658	60,643	64,414	69,262	-	-	-	-	-	-		
Lee	34,590	36,031	35,274	36,411	37,548	n/a	17,958	15,381	17,932	19,091	20,150	n/a	-	-	-	-	-	-		
Ogle	51,032	53,497	58,839	63,025	67,214	n/a	25,385	22,404	25,944	29,481	31,795	n/a	-	-	-	-	-	-		
Winnebago	278,418	295,266	315,259	335,654	356,250	371,037	-	155,293	168,449	181,600	194,756	191,103	-	380,506	-	187,654	-	(24,256)		

* Dated March 15, 2010 and used for the I-290 transportation modeling of the I-290 "No-Build" Scenario.

Five of the above variables are rates (i.e. per household or as percent of region or as percent of another variable). However, prior to generating these rates, the numbers for each of these variables (e.g. number of children, number of workers, median income) were generated. Township level data for 2000 and 2010 and forecasts for 2040 were generated and compared with independently-generated regional and county trends and forecasts. Trends and forecasts results were checked for reasonableness, in terms of relationship of the variables to each other, as well as comparison of township sums to the independently generated county and regional totals. The process was iterative. Following, is a summary of the process used for generating each variable.

1. Households

For historical data, the numbers of households were derived from Census data. For forecast years, the numbers of households were derived from total population in households and average household size. Population in households equals total population minus population in group quarters. Unless there is specific information to the contrary, population in group quarters and their characteristics in 2040, are assumed to be the same as those in 2010.

Average household size is forecasted (by township, county and region) from historic trends. Forecasted county and regional household size were compared to independent forecasts (e.g. Woods & Poole, State of Illinois, CMAP). Use of historic trends to generate future average household size is reasonable for mature or mostly-developed townships. For townships which will experience fast population growth during the forecast period, comparisons with comparable townships are used as the basis for forecasting 2040 average household size. Several forecast iterations are used to ensure reasonable household size at the township, county and regional level.

2. Number of Adults and Adults per Household

Trend data are derived from Census files. The 2040 split of the average household size to adults and children, by township, is based on analysis of historic trends and assumed future birth rates. The number of adults and adults per household, by township, are summarized by county and region. These county and regional rates were compared to the implied rates as generated by Woods & Poole and CMAP. No significant differences were observed; and minor adjustments were made.

3. Number of Workers and Workers per Household

The trends of workers per adults (reflecting labor force participation rates) are derived from Census data and were forecasted to 2040 taking into consideration not only such trends, but also the future demographic composition (e.g. aging population and therefore lower participation). Total number of 2040 workers by township were summed by county and region and compared to the total forecast of total employment.

At the regional level, total workers, including workers living in group-quarters, must equal approximately 94 percent of total employment. The 6 percent difference between workers and total employment represents the number of workers holding two or more jobs. Balancing workers with jobs, at the regional level, while maintaining reasonable and logical

relationships between workers and adult population, at the township and subzone levels, required several balancing iterations.

4. Number of Children and Children per Household

The number of children per household is derived by subtracting the adults per household from average household size. However, the resulting rate must reflect historic trends. Furthermore, it is not logical, at the subzone level, to have a large number of households (more than 5-10 households) with no children. Accordingly, logical checks were applied and adjustments were made, where necessary.

5. Children 12-15 Years Old as Percent of All Children

The historic trends are derived from Census data. The 2040 forecasts are derived from trends analysis and the assumption that, at the 2040 regional level, birth rates would stabilize at the replacement level. Township data were summarized, by county; and the region and results were compared to Woods & Poole and CMAP forecasts. Very few, and only minor, adjustments were necessary to balance the forecasts for this variable.

6. Median Household Income as Percent of the Region's Median Household Income

Historic trend data are derived from Census data. The 2040 Median Income forecast for the region is from the Woods & Poole forecast (2010 edition). The basic assumption of the median household income, by township, is that an equilibrium (all township will have the same median income as the regional average) would be achieved by 2080. Accordingly, the 2040 township forecast for variable is:

$$(2010 \text{ percentage} + 100) / 2$$

Once the 2040 township percentage of regional average was forecasted, it was converted to dollars, using the Woods & Poole regional median. Summaries of county median were then compared to Woods & Poole county forecasts and CMAP county forecasts. Adjustments, as necessary, were made to reflect reasonable county forecasts.

7. Workers in Non-Institutionalized Group-Quarters

and

8. Non-Workers in Non-Institutionalized Group-Quarters

As noted earlier, population in group-quarters and its characteristics, are assumed to remain unchanged from their 2000/2010 levels, unless specific information to the contrary were known. It should be noted, that population in group-quarters is a very small fraction of total population. Accordingly, this assumption, which has been a standard forecast assumption for decades, should not have significant impact on the results of the output of the transportation model.

Although not required for the transportation model, historic data forecasts were also generated for total population in institutionalized group-quarters. This variable, when added to above total variables, generated the total population in group-quarters. Total

population in group-quarters is needed to generate population in households from the total population.

9. Retail Employment

Retail employment (BEA based), by township for 2000 and 2010, are derived from tabulations purchased from Nielsen Inc./Claritas Inc. via Tetrad Computer Applications Inc. The township data were summarized by county and results were compared to Woods and Poole and BEA data; adjustments were undertaken as needed.

The 2040 forecast of retail employment, by township, is a function of the forecasted increases of population and employment, as well as the role of the township as a retail center. Using historical relationships of population and total employment to retail employment, initial forecasts by townships were made. These initial forecasts were adjusted to reflect anticipated future development, if any, of major shopping centers. Township forecasts were summarized by county and compared to Woods & Poole and CMAP forecasts. Adjustments were made and results were tested for reasonableness.

10. Total Employment

The forecast of this variable has been previously presented.

J. Allocation of Township Forecast to Subzones

As noted earlier, there are considerable similarities between NIPC/CMAP 2030 forecasts and the Market-Driven 2040 forecasts generated by ACG/PB for the I-290 Study. Accordingly, ACG used the NIPC/CMAP 2030 forecast distribution, within a township, as the bases for generating the distribution of its 2040 forecasts. In studying the NIPC/CMAP 2030 distribution, special attention was paid to development densities by subzone. Wherever the ACG 2040 forecast, by township, exceeded the NIPC/CMAP 2030 forecasts, special care was taken to use the latter's densities and development patterns.

The mathematical processes for generating non-population and total employment variables, by subzones within a township, are similar to those described in the preceding section. Sub-zone forecasts were then summed by township and adjusted to the township control totals. The same logical and reasonableness checks were applied; these checks required iterative adjustments.