CITY OF MELBOURNE

COMPREHENSIVE PLAN
POPULATION PROJECTIONS

May 2009

DRAFT

Prepared For:
City of Melbourne
Planning & Economic Development Department
900 E. Strawbridge Avenue
Melbourne, Florida 32901

Prepared By:

LAND DESIGN INNOVATIONS Incorporated
140 North Orlando Avenue
Suite 295
Winter Park, Florida 32789
Phone: 407-975-1273
Fax: 407-975-1278
www.landbiz.com

Table of Contents

List of Tables

List of Figures

POPULATION PROJECTIONS AND METHODOLOGY

In order to plan for the future needs of the residents of the City of Melbourne it is important to define the demographics and how the population trends are anticipated to change over time. The historic, present and future demographic compositions of the City are described in this section.

Population estimates and projections are required for each locality submitting comprehensive plans in compliance with Chapter 163 of the Florida Statutes, and Rule 9J-5 of the Florida Administrative Code. Chapter 9J-5.005(2)(e), F.A.C., requires that the comprehensive plan be based on resident and seasonal population estimates and projections. Resident and seasonal population estimates and projections shall be either those provided by the University of Florida, Bureau of Economics and Business Research, those provided by the Executive Office of the Governor; or shall be generated by the local government. Melbourne has selected to prepare its own estimates and projections for the Comprehensive Plan. The projections were extended beyond the planning horizon, up to the year 2030, to more accurately depict the population and housing trends.

This report contains the estimates and projections and a description of the methodologies utilized to generate the figures. Population estimates and projections are essential for the various elements that comprise the Comprehensive Plan, including land use, housing, recreation and the various infrastructure related elements. Estimates and projections have been calculated using approved Florida Department of Community Affairs data sources and projection methods. The projections have been prepared for current city limits and are shown in tables at the end of this appendix.

1. Historic Population Trends 1960-2000

The City of Melbourne consists of 41 square miles and is located on the east-central Florida coast, in Brevard County. Major roadways connecting Melbourne to other cities include Interstate 95, U.S. 1 and U.S. 192. Most of Melbourne is located on the Florida mainland, except for a small portion that is located on the barrier island. The City of Melbourne was established as the “Village of Melbourne” in 1888. In 1969, Melbourne and Eau Gallie (a small community immediately north of Melbourne) were consolidated into the City of Melbourne.

Table P-1 and **Figure P-1** illustrate the historic population growth between 1960 and 2007. The City’s growth between 1960 and 1970 amounted to about 235.8 percent, slowed down between 1970 and 1980 to 15.7 percent, increased again between 1980 and 1990 to 28.2 percent and slowed between 1990 and 2000 to 19.7 percent. Overall, the City experienced a 496 percent increase from 1960 to 2000.

Table P-1 also shows the growth of the entire County. It can be observed that the County has also had ups and downs. The County’s population followed the same trend as the City of Melbourne’s population. The largest increase in population in the County as a whole also occurred between 1960 and 1970 (106%), slowed down between 1970 and 1980, grew again between 1980 and 1990 and slowed between 1990 and 2000 to 19.4 percent. Overall, the County population increased by approximately 327 percent between 1960 and 2000.

2. Recent Population Trends 2000-2007

The City has continued to experience growth after the 2000 Census, but slightly slower than before. The population grew by 5.15 percent from 2000 to 2005, and by 9.8 percent between 2000 and 2007. In comparison, the County grew by 16 percent from 2000 to 2007. **Table P-1** illustrates recent population growth, based on Bureau of Business Research (BEBR) population estimates.

3. Population Projection Techniques

Alternative population forecasts for Melbourne to the year 2030 were performed using four curve fitting/extrapolation techniques and three shift-share approaches. The extrapolation techniques were applied based upon City and County historical population data. The shift-share approach assumes that the growth of the City is directly related to the growth of the County.

a. Curve Fitting/Extrapolation Techniques

Curve fitting/extrapolation techniques rely on mathematical formulas to project growth (or decline) trends, as revealed by historic population data, into the future. Four types of extrapolation techniques were used to forecast the City's population:

Linear - Linear projections forecast a constant rate of population growth (or decline) in terms of additional (or fewer) residents; as a result, the relative population change in terms of percentage increase (or decrease) diminishes over time;

Geometric - Geometric projections forecast a constant relative increase in population over time; as a result, the absolute population increase (or decrease), in terms of additional residents, increases over time;

Parabolic - Parabolic projections tend to forecast population growth (or decline) at an increasing rate over time, both in absolute and relative terms; as a result, the parabolic technique usually produces a significantly higher net change in population than the geometric or linear techniques, and,

Gompertz - The Gompertz model or "s-curve" describes population growth with the assumption that population growth begins slowly with increasing momentum until it reaches an inflection point at which time there is continued growth but of decreasing size. A maximum limit will at some point be reached at the top of the curve.

b. Shift-Share Forecast

The shift-share forecast approach, a variation of the historic population trend forecast, was also performed using three of the four techniques identified above. The shift-share approach assumes that the growth of a community is directly related to the growth of a region. This approach forecasts a community's share of the region's growth into the future using historic population share rates. The forecasted share rates are applied to the region's forecasted population to derive the community's forecasted population.

4. Evaluation of Forecasts

The results of the population forecasts using the four techniques based on ***historic*** trends are shown in **Table P-2**. As shown in this table, the 2025 forecasts vary from a low of approximately 92,449 using the parabolic historic trend technique to a high-range of approximately 130,705 using the geometric trend technique. Of the four historic trend forecasts, the **linear** model, which projects a population of 99,949, seems to more accurately reflect the area's projected growth patterns.

Table P-2 also shows population forecasts using three ***shift-share*** methods: linear, geometric and parabolic. The 2025 forecasts vary from 63,379, using the parabolic shift-share method to 92,988 using the geometric shift-share approach. Of the three shift-share scenarios, the linear shift share forecast seems to better reflect the expected future growth trend. **Figure P-2** includes a graphical depiction of the population forecasts for each method. Historic actual population data are graphed for comparison purposes.

The alternative forecasts scenarios prepared for Melbourne were evaluated to determine the most likely forecast. Each forecast was evaluated based upon the following characteristics.

a. <u>Evaluation Statistics</u>

The appropriateness of each extrapolation technique, from a mathematical perspective, can be determined using evaluation statistics. Evaluation statistics measure the extent to which a given extrapolation technique corresponds to the historic population data. Two evaluation statistics were used to evaluate the City's population projections:

(1) Coefficient of Relative Variation (CRV)

The CRV is an input evaluation statistic. As such, it compares the underlying trends in the historic data to the assumed trend for each extrapolation technique. The more closely the extrapolation technique matches the historic data, the lower the CRV. **Table P - 3** shows the corresponding CRV for each method used. The Gompertz historic-trend had the lowest CRV, followed by the linear and geometric historic trends. The method furthest from matching the historic data trends was the shift-share linear measure forecast.

(2) Mean Absolute Percentage Error (MAPE)

The MAPE is an output evaluation statistic. The MAPE compares the underlying trends of the historic data to the forecasted trend for each extrapolation technique. The more closely the forecasted trend of a given extrapolation technique matches the historic pattern, the lower the MAPE. **Table P-3** shows the corresponding MAPE for each method used. The parabolic linear trend forecast had the lowest MAPE with the parabolic historic, shift-share linear and shift-share geometric close behind. The geometric historic forecast deviates the most from matching historic data trends.

b. Other Evaluation Characteristics

The input and output evaluation statistics described above measure the ability of each extrapolation technique to match and project the mathematical trend evident in the historic data. Based on these criteria, the most favorable extrapolation technique is the one that most accurately projects a historic trend into the future. Of course, the statistics are purely mathematical in nature and do not take into account other factors. For example, if a rapidly developing community has developed most of its residential land, then it will certainly not experience the same amount of growth in the future, neither in absolute nor relative terms. Conversely, communities that have significant potential for residential growth may experience a housing and population boom.

Almost always, developing communities experience a slowdown in growth, at least in relative terms, prior to the initial "boom." Further, some communities may implement policies to manage the magnitude, nature and timing of growth. The City of Melbourne experienced some of its largest growth between 1960 and 1970 when the population grew by 236 percent. Melbourne's population is still increasing but at a slower rate.

In light of the inherent inability of evaluation statistics to take these external factors into account, an additional set of evaluation characteristics were developed for each alternative forecast. These characteristics serve as a reasonableness check to balance the forecasted trends with rational expectations about how the City of Melbourne will likely grow. They include:

(1) Total Population Change

The 2030 population forecast for each extrapolation technique was compared to the 2000 population count to determine the total population change, both in absolute and relative terms. This characteristic measures the total magnitude of change for each forecast.

The population change over the 30-year planning period varied among the various forecast approaches used. As **Table P-3** shows, the City would have an increase in population of as high as 75,618 residents (106%) from 2000 to 2030 using the Geometric historic population trend forecast. On the other hand, the parabolic shift-share population trend forecast shows the City's population declining by 16,188 residents (23%) from 2000 to 2030.

Figure P-1 shows that the City experienced a steep increase in the sixties but after that it has experienced a constant growth rate. Considering the growth trends since the 2000 Census, approved development and the amount of vacant developable land within the City, it is most likely that the City will continue to experience an increase in population with a constant growth rate over the next 30 years. These observations render the geometric historical population and parabolic shift-share trend approaches unreasonable as these figures portray a very high incremental growth rate or negative population growth rate.

As noted on **Table P-3**, very high CRV values render the linear and geometric shift-share trends unreasonable as these trends are not significant from a mathematical perspective. The linear historic trend and Gompertz historic trend approaches seem to more closely resemble past population growth trends.

(2) Average Annual Growth Rate

The average annual (compound) growth rates between the 2000 population count and the 2030 forecast were calculated for each extrapolation technique. The numbers would typically be compared with the average annual growth rate for the City between 1960 and 2000, which was 4.6. However, since the City experienced very high population growth between 1960 and 1970 (235.8 percent change) the forecasted average annual growth rates were compared to the historic annual average growth rate for the period between 1970 and 2000 instead, which was 1.9 percent.

The linear historic approach showed an average annual growth rate of 1.3 percent, the geometric historic model revealed an annual growth rate of 2.4 percent, and the Gompertz and parabolic historic trend forecasts showed average annual growth rates of 1.3 and 1.0, respectively. In the shift-share forecasts, the linear and geometric forecasts showed an average annual growth rate of approximately 1 percent and the parabolic forecast showed a negative average annual growth rate.

Based on the annual growth rate experienced in the last thirty years (1970-2000), which was 1.9 percent, it can be observed that all models, except the Geometric Historic trend, show a slightly lower growth rate than in the past. The linear historic and Gompertz models represent the more accurate future growth pattern.

(3) Gross Population Density

The gross residential density in the City was calculated to determine the reasonableness of each forecast. Gross population density, in terms of persons per square mile, was calculated by dividing the 2030 population forecasts by the size of the City, which is currently 41 square miles.

The gross residential density within the City in 2000 was approximately 1,741 persons per square mile based on the population count of 71,382. **Table P-3** indicates the projected gross residential density under each of the forecast scenarios. The forecasts range from 1,346 persons per square mile using the parabolic shift share forecast to 3,585 persons per square mile using the geometric historic forecast. These figures do not account for seasonal population or any future annexation/de-annexation of residential lands and assume that the City would remain at 41 square miles.

Public preference in the past has been for lower-density residential; however, as the public realizes that jurisdictions cannot continue depleting open space and clogging up the roads, they have started accepting and even preferring medium and higher densities in specific activity nodes within their jurisdictions. It is a fact that future gross residential densities will be higher than the 2000 citywide gross residential density, and three of the forecasts predict a residential density closer to 3,000 persons per mile, which seems reasonable considering the expected intensification of the downtown and activity areas.

(4) Building Permits

The actual number of building permits issued within the City between the years 2000 and 2008 was compared to the average annual number of building permits that would need to be issued for each extrapolation technique.

Table P-4 shows the number of residential permits issued by the City between 2000 and 2008. As shown in **Table P-4**, the number of residential building permits issued annually between 2000 and 2008 varied from 320 in 2003 to 1,218 permits in 2005. Between 2000 and 2008, the City issued an average of approximately 631 permits per year.

The average number of permits per year that would be necessary to accommodate the projected population for each method is identified in **Table P-3**. The average annual number of new units varies from 848 for the parabolic shift share forecast to 2,258 for the geometric historic forecast. All the models project that more than 800 building permits will be needed per year. The average person per dwelling unit figure used in the calculations was 2.17 (total persons per occupied unit), as estimated by the BEBR for the year 2005.

5. Seasonal Population

The population figures discussed above do not include seasonal population. Seasonal population figures are derived by calculating the number of housing units held for occupancy only during limited portions of the year, such as winter residents, the number of hotel and motel rooms, and migrant worker units in the City. Anticipating this component of the population can be important for infrastructure planning.

Melbourne has minimal seasonal and tourist population compared to other areas of Florida. The Census Bureau has been tabulating seasonal units (units held for occasional use), but does not tabulate tourist units (hotel/motel units).

The US Census tabulates seasonal housing units under vacant housing for seasonal, recreational or occasional use, housing for migratory workers and "other". The 2000 Census indicated that there were 1,088 seasonal housing units in Melbourne, accounting for approximately 3.3% percent of the City's total housing stock.

6. Recommended Population Forecast

a. <u>Permanent Population</u>

After evaluating the annual growth rates, the mathematical model projections and margins of error, residential population, and building permit increases, it was determined that only a few of the several models reflect the City's expected projected population growth. The permanent population section highlights that the **linear historic model** show the most accurate population forecast figures for Melbourne.

Table P-6 shows the recommended forecasts. Forecasts developed by the Florida Housing Data Clearinghouse (University of Florida, Shimberg Center for Affordable Housing) are included for comparison purposes. The table shows how much growth is anticipated.

b. Seasonal Population

Based on historical growth, projections were calculated for the years 2010, 2015, 2020, 2025 and 2030. Seasonal population and housing estimates are not anticipated to greatly impact Melbourne during the Comprehensive Plan horizon, as only additional 451 seasonal dwelling units are anticipated by 2030. The seasonal population was included with the permanent population, as required by the State, for the purpose of calculating future public service and infrastructure (see **Table P-6**).

Table P - 1: Melbourne Historic Population Trends

Year	City of Melbourne	Net Change	Percent Change	Brevard County	Net Change	Percentage Change	City to County
1960	11,982			111,435			10.7
1965	26,109	14,127	117.9	170,721	59,286	53.2	15.3
1970	40,236	14,127	54.1	230,006	59,286	34.7	17.5
1975	43,219	2,983	7.4	246,700	16,694	7.3	17.5
1980	46,536	3,317	7.7	272,959	26,259	10.6	17.1
1985	52,664	6,128	13.2	334,810	61,851	22.7	15.7
1990	59,646	6,982	13.3	398,978	64,168	19.2	14.9
1995	66,350	6,704	11.2	444,992	46,014	11.5	14.9
2000	71,382	5,032	7.6	476,230	31,238	7.0	15.0
2005	75,060	3,678	5.1	531,970	118,571	11.7	14.1
2006	76,742	1,682	2.2	543050	75,980	2.1	14.1
2007	78,386	1,644	2.1	552109	42,953	1.7	14.2
1960 to 1970		28,254	235.8		118,571	106.4	
1970 to 1980		6,300	15.7		42,953	18.7	
1980 to 1990		13,110	28.2		126,019	46.2	
1990 to 2000		11,736	19.7		77,252	19.4	
2000 to 2007		7,004	9.8		75,879	16.0	
Total Change (1960 to 2000)		59,400	495.7		364,795	327.4	
Average Annual Change		1,485	4.6		9,120	4.1	

Notes: 1965 population estimated as an average between 1960 and 1970.
Source: University of Florida, Bureau of Business and Economic Research, US Census Bureau, City of Melbourne, and Land Design Innovations, Inc., October 2008.

Table P - 2: Population Projections

Year	Actual	County	Shimberg Forecast	Historic Population Trend Forecast				Shift Share Approach		
				Linear	Geometric	Parabolic	Gompertz	Linear	Geometric	Parabolic
2000	71,382	476230	-	-	-	-		-	-	-
2010		568,500	80,180	82,518	91,879	80,120	83,051	81,701	81,942	73,989
2015		612,700	84,739	88,328	103,333	84,491	88,904	85,805	86,287	72,540
2020		653,300	88,767	94,139	116,216	88,601	94,605	89,573	90,365	69,106
2025		692,500	92,120	99,949	130,705	92,449	100,127	92,811	93,988	63,379
2030		729,000	95,066	105,759	147,000	96,035	105,447	95,422	97,058	55,194
Total Change		657,618	23,684	34,377	75,618	24,653	34,065	24,040	25,676	-16,188
Percent Change		138.09%	33.18%	48.16%	105.93%	34.54%	47.72%	33.68%	35.97%	-22.68%
Average Annual Change		21,921	789	1,146	2,521	822	1,136	801	856	-540
Annual Growth Rate		1.43%	0.96%	1.32%	2.44%	0.99%	1.31%	0.97%	1.03%	-0.85%

Source: County population forecast: BEBR medium forecast; Florida Housing Data Clearinghouse; Land Design Innovations, Inc., October 2008.

Table P - 3: Evaluation of Forecasts

Characteristic	Actual Population	Historic Population Trend Forecasts				Shift Share Approach		
		Linear	Geometric	Parabolic	Gompertz	Linear	Geometric	Parabolic
Evaluation Statistics								
Coefficient of Relative Variation (CRV)	--	0.55	0.88	-4.30	0.49	6.77	6.16	3.05
Mean Absolute Percentage Error (MAPE)	--	4.30	6.90	3.95	4.54	4.07	4.07	4.17
Other Evaluation Characteristics								
1960 Population	11,982	---	---	---	---	---	---	---
2000 Population	71,382	---	---	---	---	---	---	---
Population Forecast (2030)	--	105,759	147,000	96,035	105,447	95,422	97,058	55,194
Total Population Change (1960-2000; 2000-2030)	59,400	34,377	75,618	24,653	24,653	24,040	25,676	-16,188
Percentage Change (1960-2000; 2000 - 2030)	495.74%	48.16%	105.93%	34.54%	34.54%	33.68%	35.97%	-22.68%
Avg. Annual Pop. Change (1960-2000; 2000-2030)	1,485	1,146	2,521	822	822	801	856	-540
Avg. Annual Growth Rate (1960-2000)	4.56%							
Avg. Annual Growth Rate (1970-2000; 2000-2030)	1.93%	1.32%	2.44%	0.99%	1.31%	0.97%	1.03%	-0.85%
Residential Land Use (Sq. Miles)	41							
2000 Gross Residential Density (pop./sq. mile)	1,741	---	---	---	---	---	---	---
2030 Gross Residential Density (pop./sq. mile)	---	2,579	3,585	2,342	2,572	2,327	2,367	1,346
Annual Building Permits (Actual 2000-2007)	631							
Annual Building Permits Needed per Methodology	---	1,625	2,258	1,475	1,620	1,466	1,491	848

Note: The City of Melbourne comprises 41 square miles.
Source: Land Design Innovations, Inc., October 2008.

Table P - 4: Residential Building Permits 2000-2008

Year	Single Family	Multi Family	Total
2000-01	396	352	748
2001-02	396	-	396
2002-03	346	307	653
2003-04	320	-	320
2004-05	371	506	877
2005-06	575	643	1,218
2006-07	315	197	512
2007-08	205	115	320
Total	**2,924**	**2,120**	**5,044**
Annual Average			**631**

Source: City of Melbourne and US Census Bureau, October 2008.

Table P - 5: Seasonal Population Forecast 2000-2030

Year	Population*	Total DU	Persons per Household	Seasonal Units	Seasonal Units PPH	Seasonal Population
2000	71,382	33,678	2.17	1088	2.59	2,818
2005	75,060	36,672		1,185		3,068
2010	82,518	38,564		1,246		3,227
2015	88,328	41,085		1,327		3,438
2020	94,139	43,502		1,405		3,640
2025	99,949	45,709		1,477		3,825
2030	105,759	47,629		1,539		3,985

***** Not including seasonal
Notes:
Persons per household in 2005 –2.17 (BEBR)
Percentage of seasonal units based on total number of units (2000 Census – Housing Data)
2000 Census Average USA Household Size – 2.59

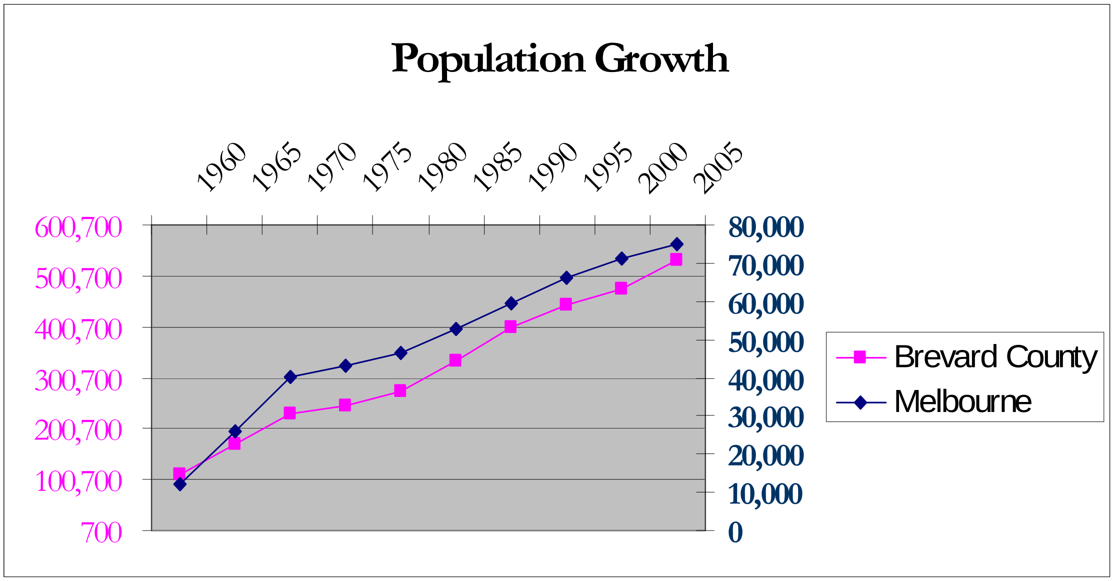
Source: 2000 permanent and seasonal units from Census 2000; Land Design Innovations, Inc., October 2008.

Table P - 6: Recommended Population Forecast Including Seasonal

Year	Shimberg	Adopted Forecast Linear Historic Trend	Seasonal Population Forecast	Total Population
2010	80,180	82,518	3,227	85,745
2015	84,739	88,328	3,438	91,766
2020	88,767	94,139	3,640	97,779
2025	92,120	99,949	3,825	103,774
2030	95,066	105,759	3,985	109,744

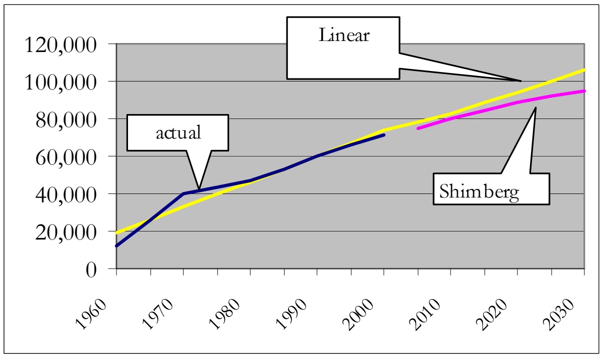
Source: Land Design Innovations, Inc., October 2008.

Figure P - 1: Historical Population Growth, 1960 – 2005

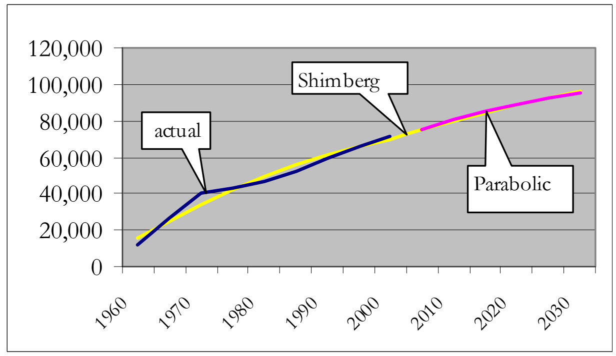


Source: Land Design Innovations, Inc. and U.S. Census Bureau, October 2008.

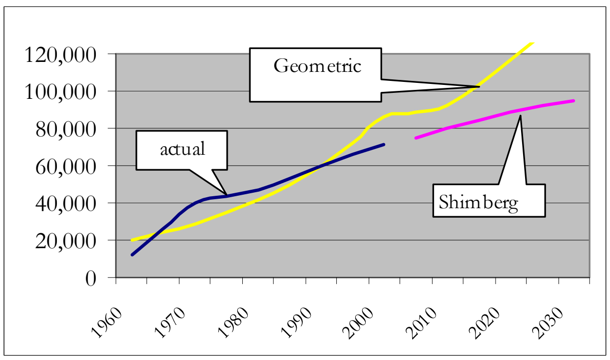
Figure P - 2: Forecast



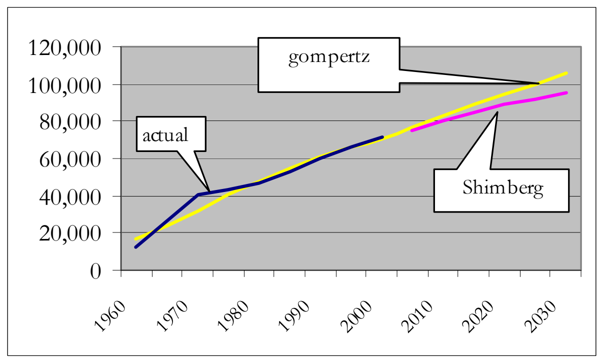
LINEAR



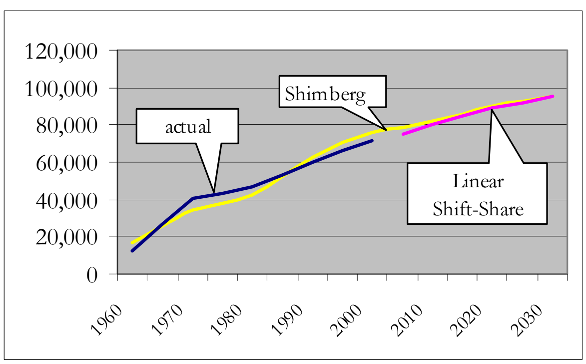
PARABOLIC



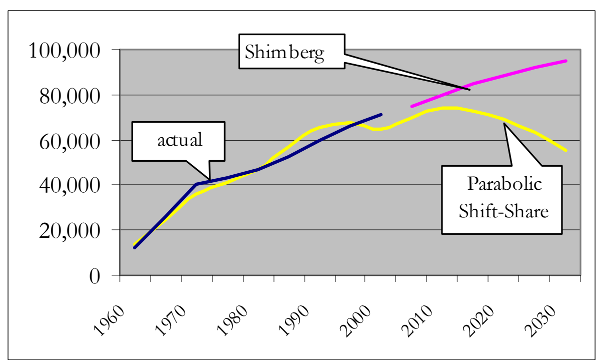
GEOMETRIC



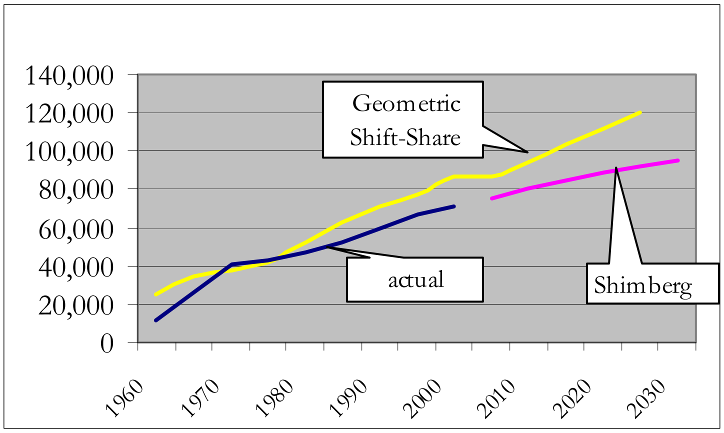
GOMPERTZ



LINEAR SHIFT SHARE



PARABOLIC SHIFT SHARE



GEOMETRIC SHIFT SHARE

Source: Land Design Innovations, Inc. October 2008.