THE COLLIER INTERACTIVE GROWTH MODEL (CIGM)

EXECUTIVE SUMMARY

Prepared for:

The Collier County Board of County Commissioners
And
The Collier County Comprehensive Planning Department

By:

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September 29, 2008

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September 29, 2008

Michael Bosi, AICP, Community Planning Manager
Collier County Comprehensive Planning Department
2800 North Horseshoe Drive
Naples, FL 34104

Re: Transmittal-The Collier Interactive Growth Model (CIGM) Executive Summary

Dear Michael:

We are pleased to submit this Executive Summary on the development, assumptions, conclusions and use of the Collier Interactive Growth Model (CIGM). Collier County now has this powerful and proactive planning tool along with an extensive database that can be used to update the County's Growth Management Plan and better assess the effects of future land use decisions. You will also be able to update data and other information easily through on-going access to our software and assess the implications of alternative "What-if" growth management scenarios.

We believe the hard work that went into the development of the CIGM will reap benefits beyond those contemplated in our original contract with the County. If the opportunity presents itself in the future, we would be pleased to continue offering similar services on an as-needed basis. A separate document, *The CIGM Technical Appendix* contains the data spreadsheets and other information that was used in the development of the CIGM and is found at the Collier County Comprehensive Planning Department.

Your steadfast participation and that of your fine staff, particularly Beth Yang, and other department heads, particularly the staff of the Property Appraiser who provided extensive parcel data queries, was greatly appreciated. We also want to thank The Horizon Study Committee for their valuable input, and the County Commissioners and the County Administration for their support throughout this important project and for their vision and understanding of its worth when its development was first discussed.

We wish continued success to you and to Collier County's planning efforts.

Sincerely,

Dr. Paul Van Buskirk, AICP, P.E.

Carleton Ryffel, AICP, MSP

Creators of the Interactive Growth Model™

Section 1

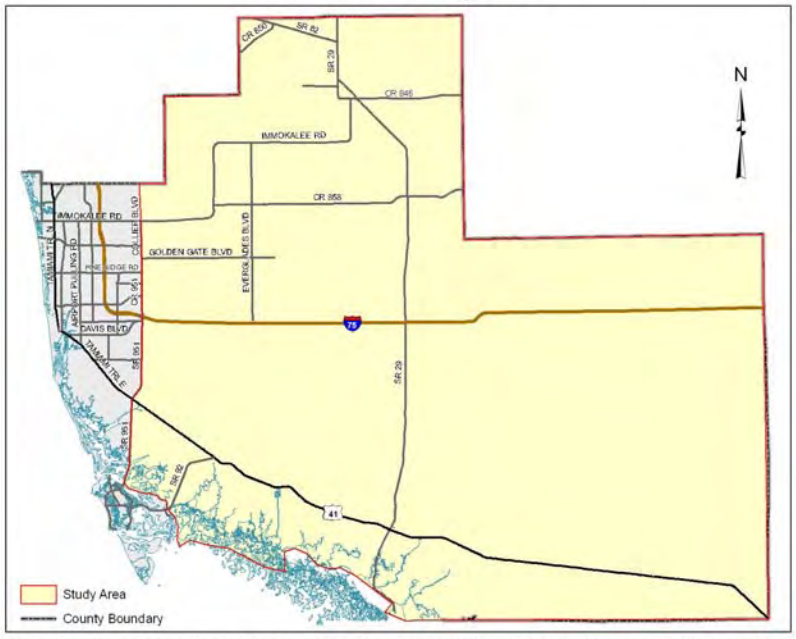
General Overview

Historical Background and Perspective

On May 24, 2006 the Board of County Commissioners (BCC) was presented the preliminary report of the East of County Road 951 Infrastructure and Services Horizon Study. The preliminary report was the identification of three levels of service options for public infrastructure and service outlays for the area east of CR-951. During the presentation, the BCC provided staff with the direction to incorporate a land use model, specifically a Collier County Interactive Growth Model **(hereafter CIGM)** into the study to refine infrastructure planning in all areas lying generally east of CR-951. At that time, staff was instructed to enter into contract negotiations with Van Buskirk, Ryffel and Associates, Inc. **(hereafter VBR)** to determine population and its distribution over time to build-out. This would integrate the findings of the studies cited above and create such a growth model to address the growth expected in that area in the future and to optimize the return on public investments.

The original study area is approximately 1,210,618 acres or 1900 square miles. This is an area slightly larger than the state of Delaware, and includes six distinct districts within that total. It includes all land east of CR-951, with the exception of Marco Island. (See Map 1) In subsequent discussions with County staff, it was agreed that all lands abutting CR 951 on its west side would be included in the interests of good and logical planning and at no additional cost to the County. The Everglades were also included as this represents a significant portion of the study area. The six districts include: Golden Gate Estates north of I-75 (51,200 acres); the Rural Fringe Mixed Use District (93,600 acres); the Rural Lands Stewardship Area (195,846 acres); the Immokalee Urbanized Area (16,992 acres); the South Golden Gate Estates Natural Resources Protection Area (NRPA) (16,992 acres); and federal and state lands (821,620 acres). Each of these districts contains specific regulations as to the manner, intensity and type of development permitted.

Map 1
The CIGM Study Area



Source: Collier County Comprehensive Planning Department

The 2005 Residential Build-Out Study, compiled by the Comprehensive Planning Department, projected a population of 688,489 for the study area. In 2005 it had a population estimated at 71,000. However, subsequent, and more current information, led VBR to forecast a build-out population of 442,537 persons. Collier County presently employs a population forecasting method characterized as traditional straight-line population projections. This heretofore accepted methodology had been sufficient until recently, when the County's 2005 Residential Build-out Study projected a build-out scenario, but did not forecast its timing. The study indicated *what* build-out conditions would be, but not *when* they would occur. The results of the build-out study underscored the need for Collier County to develop a more effective method to keep pace with its growth. An improved approach was needed to link population growth with capital infrastructure expenditures, while balancing the growing demand for public services with limited tax dollars available.

With the unique characteristics of the area's six sub-districts, and the number of residents projected in the future, capital infrastructure and public service decisions will shape the sustainability of future development and the efficiency in which infrastructure and public services are provided. To better gauge the timing and manner in which the area will develop and the necessary decisions related to public capital outlays for that development, the Board of County Commissioners directed Staff to incorporate a land use component into the study. In researching firms that provide land use studies to municipalities and counties, Staff identified, VBR as the only firm whose trademarked and copyrighted product, Interactive Growth Model™ (IGM), could provide the modeling needed to satisfy questions related to future growth in the study area.

VBR developed the technology in their Interactive Growth Model,™ that has proven effective in dealing with these growth management situations. This planning firm is the sole source provider of this specialized modeling application, staff training in its use, professional support and eventual proprietary licensing. Staff determined that the VBR product and its services are a unique planning model and the only one in the United States that is capable of meeting the County's requirements.

The Interactive Growth Model™ uses the population forecast as a key input element and **distributes** the population, in five-year increments, over time to build-out. It can also be applied to commercial corridor allocation models, comprehensive plan updates, economic development, and Traffic Analysis Zone updates. The Interactive Growth Model™ can be used to determine the timing and location of utilities, school facilities, park and recreation facilities, fire stations and the data for a community's budget allocations to mention just a few. It can also be used to demonstrate "What If?" scenarios of alternative growth management policies and decisions of the community, allowing the implications and results of different planning decisions to be studied.

This project, The Collier Interactive Growth Model, (CIGM) consists of developing, testing, and implementing a population forecasting model for accurate forecasting in five-year increments to build-out. Once a forecasting model is determined, the project proceeds to designing, developing and implementing a Collier County Interactive Growth Model to forecast when and where growth will take place, the apportionment of land uses to meet the needs of the population, and the characteristics of the population. This model is a tool for a comprehensive growth management strategy for the entire area.

Collier County also selected seven sub-models of the IGM, including: commercial, industrial/wholesale, school facilities, open space, fire/EMS, law enforcement, and affordable housing. These sub-models were used to determine the need and extent of each category, commensurate with population growth over time and their optimal locations.

There are numerous growth management implications associated with the Collier County Interactive Growth Model. The primary function was to identify land use issues before they become problematic. The CIGM can help ensure that the right parcels are available to meet the current and future demands for neighborhood, community, and regional shopping centers. This is a smart growth concept associated with sustainable development, which was the focus of the County's Community Character Plan, Toward Better Places. One fundamental aspect of "Smart Growth" and "Sustainable Development" is the concept that residents should not have to travel great distances outside their neighborhoods to shop. To do so increases demands on roadways, and infrastructure, and increases travel costs. The CIGM will be utilized by staff to ensure that the various subsets of land uses necessary to maintain a healthy sustainable economy is provided for within the future development for the East of CR-951 Study Area. Through this monitoring, the BCC can make appropriate demands upon petitions for future development and determine policy decisions to guide that development.

Another major function of the CIGM is better management of appropriations in future fiscal years. The CIGM can be used to pace timing and identify advantageous locations for expenditures and acquisitions of land for parks, water and sewer facilities, fire stations and the like. This allows Collier County to use their resources for the maximum benefit of its citizens. The CIGM will be a management tool to assist in updating the Annual Update and Inventory Report (AUIR) and Capital Improvement Element (CIE) of the Growth Management Plan. Further, as the population increases east of CR 951, the CIGM will help to formulate recommended Growth Management Plan amendments, in the Golden Gate Area Master Plan as well as the Future Land Use Element.

Incorporating the CIGM into Collier County's planning efforts places the County on firm statutory ground. Other governmental jurisdictions are using the Interactive Growth Model™ for comprehensive planning purposes. Bringing it into their decision-making processes has received no negative feedback from the Florida Department of Community Affairs (DCA). A change in population methodology as set forth in the Capital Improvement Element and Future Land Use Element may require a Growth Management Plan Amendment – which must be explained and supported by data and analysis. This could be provided for by the CIGM.

Section 2

Overview/Basics of the CIGM

The Purpose of the CIGM, Its Goals, Assumptions and Key Objectives

The purpose of the Collier Interactive Growth Model (CIGM) was to: forecast the spatial distribution of the County's population over time, to build-out and to forecast the apportionment of land uses to meet the needs of the population, in the most cost effective manner. The specific goals of the study included:

- Accurately forecast population over time to build-out in the study area
- Forecast when and where growth will take place;
- Determine if there will be sufficient land uses designated to support the characteristics of the population;
- Determine the need for supporting land uses by type and intensity;
- Forecast the timing and spacing of supporting facilities such as schools, parks, commercial centers and fire stations;
- Train staff on CIGM operations and annual updating procedures;
- Provide data for graphic interpretation of CIGM results.

To create the CIGM and have it become operational dealing with an immense area, numerous sub-area studies and complex interrelationships, assumptions had to be made with regard to the year 2007 baseline scenario which carried on throughout the model's development. These major assumptions included:

- The study area consists of all the land lying east of CR 951;

- The study area was divided into 172 zones (Traffic Analysis Zones). With some adjustments, each zone was inventoried for current development and built-out development based on the legal yield based on the Future Land Use Element (FLUE) of the County's Growth Management Plan;

- The CIGM applied a series of algorithms to solve problems. An algorithm is a procedure to solve a problem that may have many solutions. Once the parameters are defined, the algorithm will produce a solution;

- The parameters for the school sub-model are the current level of services, school plants by type, plant capacity, timing of plants and the students generated by school plant over time in order to determine the timing and location of facilities. (When sub-model parameters change, the CIGM is adjusted accordingly and all new data is processed through the software. The CIGM is therefore a dynamic model. The 2007 baseline scenario is based on current levels of service, and as these change, the CIGM data changes);

- The parameters for the recreation and park sub-model were the current level of service for community and regional parks;

- The parameters for the commercial sub-model were the ULI guidelines and the current market in the study area for neighborhood, community and regional commercial centers;

- The parameters for the fire station sub-model were the ISO standards and requirements of fire stations for a Class 1 rating;

- The demographic model was developed applying the ratio method and regression analysis to comparable counties in different stages of development;

- The service area for schools, parks and fire stations, and the market area for commercial faciltiies are the study area limits as of 2007.

The Interactive Growth Model,™ created by Dr. Paul Van Buskirk, and owned by VBR, was the planning tool used to create the CIGM. It consists of data and formulas that simulate and forecast the distribution of growth. It also describes and explains the relationship of key demographic and economic variables. The IGM™ is interactive, i.e., when one of the key variables is changed, it shows the influence on the other key variables.

The key objectives needed to address the goals of the study described above and the development of the CIGM included:

1. A current inventory of development and demographics by Traffic Analysis Zones (TAZ);

2. The creation of the build-out inventory of development by type and intensity and the forecasting of demographics by TAZ;

3. The disaggregation of the study area into 172 TAZ which comprise approximately 70,000 individual parcels of land, to enable the handling of over an estimated one million bits of data;

4. An accurate population forecast (the Population Forecast Model);

5. The design and development of sub-models selected by the County;

6. The design and development of criteria and formulas for the spatial distribution of development over time;

7. Data output by TAZ's in five-year increments to build-out.

The output data that resulted from the objectives described above were then translated into graphic interpretations (shown later in this report). These are for use by the County for presentation purposes to reach the widest possible audience with varying levels of technical expertise.

Section 3

Population Forecasting

The Importance of an Accurate Build-out Population Model

The starting point of any long range planning effort in a community begins with an accurate population forecast that is projected to build-out if possible. Through its consultants, Collier County prepared the aggregate population of the county to its build-out in five-year increments. Future land uses need to keep pace with population growth through time, as do the concurrency of the public services needed by that population. The fiscal costs associated with providing those services need to be known to protect and foster quality of life.

The aggregate projected population of Collier County in five-year increments was a key input to the Collier County Interactive Growth Model (CIGM). The CIGM had the capability to distribute that population over time to build-out. With the knowledge of the distribution of population over time comes the ability to determine when and where support services and land uses need to be, and to provide them in the most efficient manner. Collier County will reap the benefits of the CIGM as an important planning tool for long range planning. The County will also be able to consider alternative

"what-if?" growth scenarios using the CIGM to address changing times, values, circumstances and the fiscal requirements associated with them.

To summarize, the benefits of an accurate build-out population model includes:

• Creating a benchmark build-out population scenario based on current policies, i.e. zoning, land use plan in order to test and compare alternative scenarios.

• Disaggregating the study area into manageable sub-areas (172 TAZ (Traffic Analysis Zones, which consist of over 70,000 individual parcels of land) provided opportunities to test alternative scenarios to determine spatial development impacts.

• Having the ability to test the need at build-out and the intervening years, for the general apportionment of land uses, their amounts and distribution to meet the need of residents. For example, how many acres of parks are needed to meet park standards at build-out for the population? Or, how many acres of shopping areas are needed to meet the demands of the population and how should they be distributed to reduce vehicle trips and trip lengths?

• Possessing a planning tool to achieve and maintain that which is important to the County's residents. In effect, the desirable build-out scenario can be used translated into actionable goals and objectives in revisions to the County's Comprehensive Plan that can be measurable up to build-out.

• Acting as a clearinghouse to determine positive and negative effects, of most planning activities at build-out. For example, parks, schools, commercial centers, utilities, etc.

• The Population Forecast Build-out Model was a major first step and critical input into the development the Collier County Interactive Growth Model. The CIGM distributed the population as a function of time and is a valuable planning tool to help the County plan for its growth over time, such as the apportionment and reapportionment and distribution of land uses, consistent with population growth and the timing of a level of services consistent with growth and its accompanying fiscal implications.

Collier County Population Forecasting

Like many other counties in Florida, Collier County has experienced significant growth since 1980. During that 26-year period, Collier County grew from a population of 85,971 in 1980 to an estimated population of 314,649 in 2006, a 365 percent increase. In light of this reality, it was determined, by the Collier County Board of County Commissioners, that there was a necessity, to accurately forecast population over time for the short and long-term planning horizons. This ensures that infrastructure is

neither prematurely advanced nor allowed to fall behind population demand. Infrastructure can be the road network, utilities, schools, recreational facilities and public services. It is well known that the cost to "catch up" infrastructure far exceeds the cost of being proactive to more accurately meet the demands as they occur. For example, to invest public capital to replace infrastructure before the term of its useful life, i.e. 20 years due to over-utilization, can result in negative returns on public investment. Likewise, over-estimating population could result in large-scale capital investment that is underutilized with little beneficial returns.

There are more accurate applications and methodologies to forecast aggregate population growth than the typical linear extrapolation. The Collier Interactive Growth Model (CIGM) distributes the forecasted growth over time and provides for direct application of traffic models, for example, to forecast the need and location for current and future improvements. Similarly, the timing of utilities and a host of demands, i.e. retail and office space, recreational facilities, schools, fire stations, etc., can also be more accurately assessed as to size and location over time.

Forecasting Methods

The following methods were reviewed to determine which would be most applicable to forecasting the Collier County population and the study area, for the short and long term. These methodologies included:

- Cohort Component Model
- Simple Curve Fitting or Extrapolation Model
- Exponential Model
- Gompertz (Sigmoid or Logistic) model.

Cohort Component Model

This method "ages" the various age groups or cohorts in the population into the future and applies the appropriate birth and death rates. It also requires an estimate of the level of in-and-out migration. This method can be quite accurate when forecasting population up to 10 or 20 years into the future where in-migration is not the major growth factor.

In the cohort component population projections: births, deaths and migration are projected separately by applying cohort specific rates of population divided into age and gender cohorts. However, when high levels of in-migration and second homes are expected over long periods of time, this model becomes less relevant because it focuses on the aging of the current population, while providing little assistance in forecasting the critical rate of in-migration. This model is sophisticated and expensive and will not accurately forecast long-term growth for Collier County.

The Cohort Survival Method adjusts figures from the last census forward by age and gender groups year by year to the date of the forecast, with separate adjustments made for each of the three major components of deaths, births and net migrations. This method is used by the U.S. Census Bureau and many state agencies to forecast population. Research has shown that this method has historically underestimated growth. For example, the Census Bureau used this model in 1975 to forecast the population for Florida in the year 2000 and underestimated the population by three million. Its accuracy increases for large communities with slow growth and a shorter term. It disaggregates the population demographically but not spatially, and it has no upper limit of growth.

Research has demonstrated that the logistic (sigmoid) curve is accurate for long-term forecasting. For example, a Belgian mathematician named Verhulst, using this method, predicted in 1840 what the population of the United States would be in 1940. His forecast was off by less than 1 percent.

The CIGM Model does disaggregate the population spatially, and applies demographic and economic forecasts as well as the development of land resources by type and intensity.

Simple Curve Fitting on Extrapolation Model

This method plots past population levels over time in a time series and then extends the line or curve by regression analysis into the future to forecast population levels. In the early stages of growing communities growth curves are often linear. Merely extending that linear curve into the future greatly underestimates future growth. Likewise, for communities in their mid-stage of growth, the extrapolation of the growth curve into the future greatly overestimates future growth. Another shortcoming of this method is that long-term limits to growth (build-out) are not factored in. Therefore, this model is not the most appropriate for Collier County.

Exponential Model

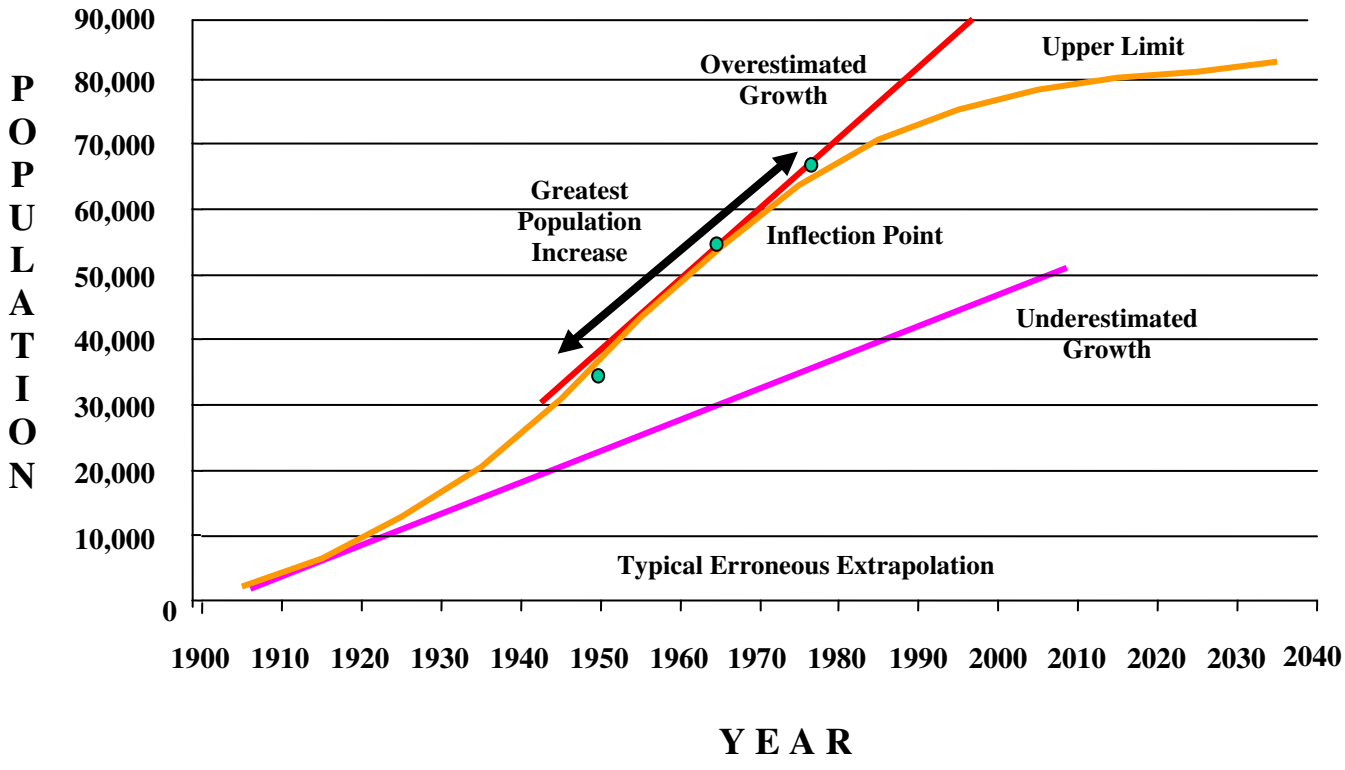
An exponential trend is one that is increasing at a constant rate of change each year. This compounding effect of a constant rate of growth can result in astronomical increases in forecasted population in the long term. While this type of trend in growth may exist for a period of 10 years or even 20 years, in fast growing communities it cannot sustain itself for long terms. This model would be misleading for forecasting long-term growth for Collier County.

Sigmoid Model

Many biological populations (like cities and counties) tend to grow at a rate over time that simulates a logistic or Sigmoid Curve. In the case of the Sigmoid Curve, population growth increases at an increasing rate over time until it reaches an inflection point, then the increase in population growth is at a decreasing rate until it reaches upper growth limit. One of the key variables in this growth equation is its upper growth limit (build-out). The upper limit for large-scale counties such as Collier County can be precisely defined by querying the parcel database and, then, calculating the total number of housing units that can be built. The number of housing units can be translated to population. The Sigmoid Model is a more scientifically sophisticated variation of an extrapolation model and should be more accurate than other methods for forecasting short and long-term growth for Collier County.

The Sigmoid Model, as illustrated in Figure 1, shows the upper limit, inflection point and the rate of growth. For example, the population increases at an increasing rate up to the inflection point, then the population increases at a decreasing rate to build-out. It should also be noted that the greatest increase in population takes place prior to and after the inflection point. The straight lines shown in that figure show what happens if a portion of the growth curve is extrapolated as is often done in unsophisticated population models. The results are an over or underestimate of growth which results in the "costs" associated with such extrapolations.

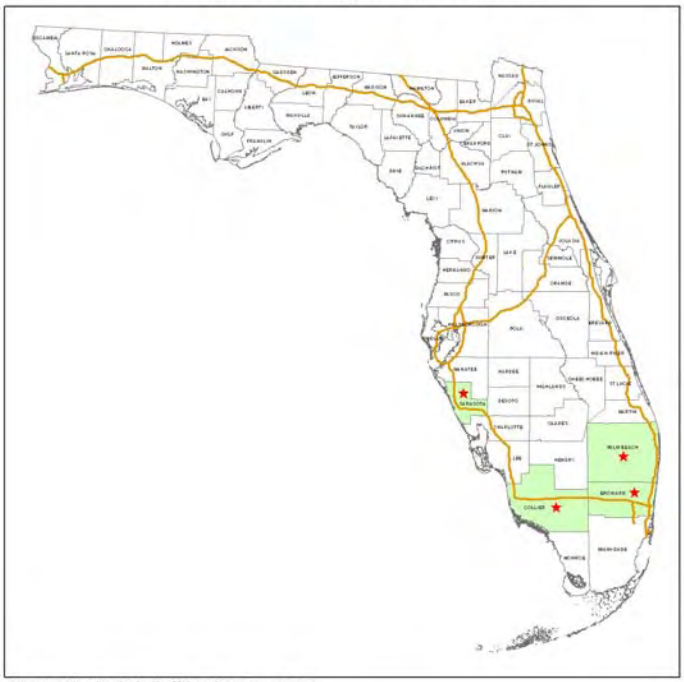
Figure 1
Typical Sigmoid Curve



Historical Analysis of Growth in Comparative Counties For Forecasting Future Populations

The Consultants researched several counties and selected three that were comparable to Collier County and constructed actual growth curves. These counties have build-out populations and other key characteristics that are somewhat similar to Collier County's. Simulation modeling was done to determine if the Sigmoid Model is relevant for Collier County and which growth curves would best simulate that which would be constructed for Collier County. To do this, VBR compared significant characteristics of Collier County to other counties that have striking similarities and were nearing build-out. The Florida counties of Broward, Sarasota and Palm Beach were best suited for this evaluation. (See Tables 1 and 2).

Figure 2
Location of Comparable Counties



Source: Van Buskirk, Ryffel and Associates, Inc.

Table 1
CIGM Historical Population of Comparative Counties

County	Year								
	1930*	**1940**	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**	**2006 ****
Collier	2,883	5,102	6,488	15,753	38,040	85,971	152,099	251,377	314,649
Sarasota	12,440	16,106	28,827	76,895	120,413	202,251	277,776	325,957	369,535
Broward	20,094	39,794	83,933	333,945	620,100	1,018,200	1,255,488	1,623,018	1,787,636
Palm Beach	51,781	79,989	114,688	228,106	317,909	535,409	863,518	1,131,184	1,274,013

*Began with 1930 Census because these counties were created between 1909 and 1923.
** Estimated population.

The growth of Collier County between 1980 and 2006 was 365 percent. By comparison, the growth of Sarasota, Broward and Palm Beach counties was 183 percent, 176 percent and 238 percent respectively. While all of these are significant in terms of population growth over the 26-year period of time, it should be understood that each of these counties are at different places in their growth curve. For example, as indicated in Table 2, Broward and Palm Beach counties are at 85 percent and 87 percent respectively of their build-out, while Sarasota County is at about 51 percent. Therefore, since they

have both passed their respective inflection points, the growth curve for Broward and Palm Beach counties, should flatten further, over the next 7 to 11 years. The growth curve for Sarasota should continue on its steepest slope and begin to flatten after it reaches its inflexion point.

Broward and Palm Beach counties were included as valuable comparables because they are beyond their respective inflection points and provide insights and lessons that were important in the development of the CIGM. Specifically, they provide a historical perspective of growth characteristics of nearly built-out counties.

Table 2
Characteristics of CIGM Comparative Counties Year 2000*

	County Name			
Facts	Collier	Sarasota	Broward	Palm Beach
Total Area in Square Miles	2,305	725	1,319	1,993
Year Established	1923	1921	1915	1909
Avg. Household Size (PPH)	2.39	2.13	2.45	2.34
Median Age	44.1	50.5	37.8	41.8
% Population 65+	24.5%	31.5%	16.1%	23.1%
Per. Cap. Income in 1999 Dollars	$31,195	$28,326	$23,170	$28,807
Median Household Income in 1999 Dollars	$48,289	$41,957	$41,691	$53,701
# Housing Units	144,536	182,467	741,043	556,428
Beachfront?	Yes	Yes	Yes	Yes
Nearest Large Airport Location	Fort Myers	Tampa	Ft. Lauderdale and Miami	Palm Beach
Build-out pop/yr. based on Land use plan or Zoning?	950,223/2055** /Land Use Plan	725,000/2050/Land Use Plan, Zoning and Property Appraiser	2,117,038/2015/ Zoning	1,600,000/2019/Land Use Plan
Current % of Build-out population	37%	51%	85%	87%
Park acreage/% of total unincorporated area	1,623 acres/ 0.1%***	25,558 acres/5%	14,023 acres/1.6%	6,107 acres/0.5%

Sources: U.S. Census, Van Buskirk, Ryffel and Associates, Inc. and Planning Departments of the cited counties.
*All facts year 2000 except as noted.
** The year 2055 is forecasted to be ninety percent of build-out.
*** For consistency of application, the percentage of 0.1 percent does not include the state and federal parklands such as The Everglades as part of park acreage, but does include its acreage when calculating park acreage as a percent of the total unincorporated area. This could be misleading if not understood. Sixty-three percent of the County land area is in state and federal lands.

While no two counties are mirror images of one another, the ones that were selected had key similarities to Collier County as shown in Table 2 above. Some of these included:

- Incorporation year
- Persons Per Household
- Per capita income
- Water/sewer availability
- Year 2000 median age
- Year 2000 percentage of the population over 65
- Similar R^2 values and similarity of coefficients
- Waterfront county

From the population growth of the various counties in Table 1, VBR plotted and performed a regression analysis on those individual historical populations that produced a curve for each of them. From each curve, coefficients were developed which to determine the total shape of the curve. If the coefficients of the growth curves of the various communities were reasonably close to Collier County's then it would validate the shape for Collier County. The coefficients for the counties were as follows:

Collier	.069143992
Sarasota	.050979349
Broward	.073516697
Palm Beach	.078490777

The R^2 value is a coefficient of correlation, which is the deviation of a population point off a perfect sigmoid curve. A value of 1.0 is a perfect curve with all points falling on it and the closer a community's R^2 value is to 1.0 the more reliable the curve. The values for these communities were as follows:

Collier	.8161
Sarasota	.9493
Broward	.9535
Palm Beach	.9071

These values were all close to 1.0 and were deemed reliable.

Figure 3 below shows graphically the actual growth curve for Collier County as it approaches a build-out population of 950,223. The growth of Collier County has followed the classic Sigmoid Curve.

Figure 3

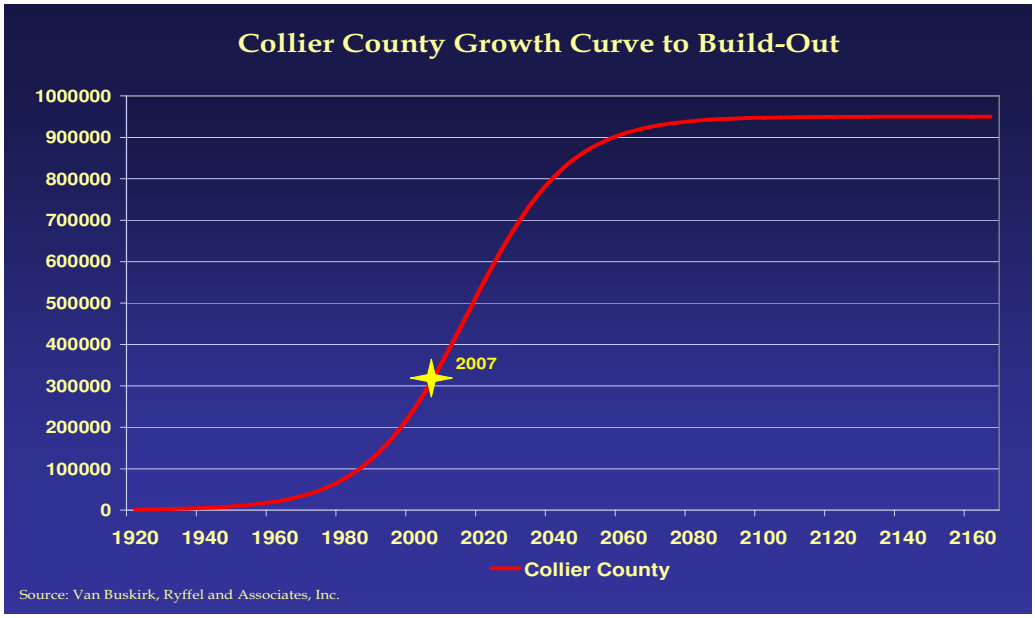
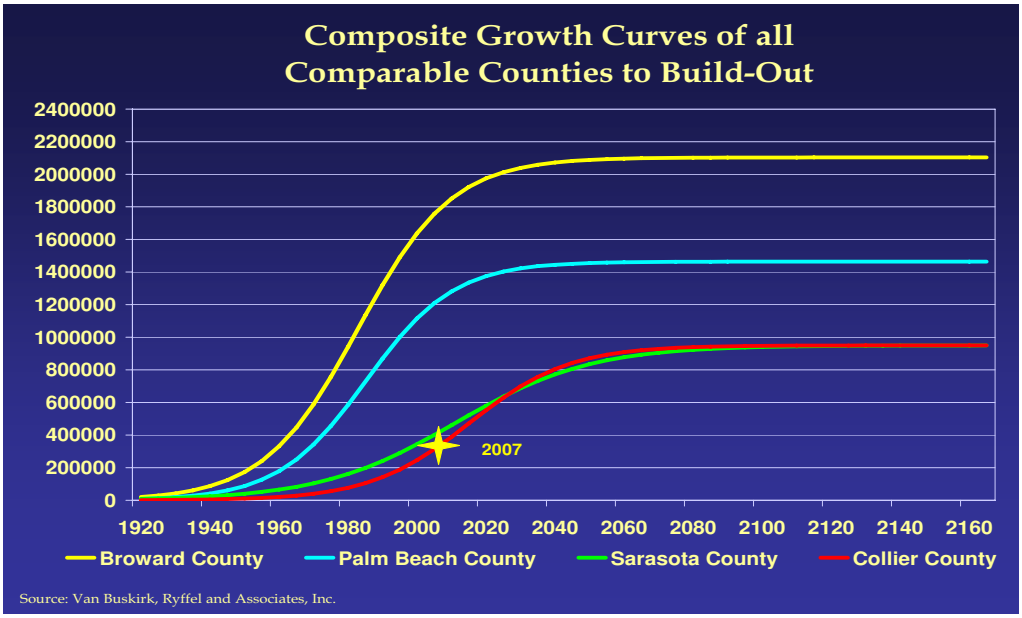


Figure 4 below shows the composite growth curves of all 4 comparative counties.

Figure 4



The growth curve for Collier County in Figure 3 looks different as it is shown in Figure 4. The explanation is that in Figure 4, which is a composite of four counties, all have different maximum populations. In order to portray the curves of these counties in one graphic in order to determine their general shape and accommodate all of their maximum populations, the result is a skewing of the curves. All of the growth curves are Sigmoid Curves and they are all accurate when compared to Table 1, that indicates the time period and the population at that time. The growth curve for Collier County in Figure 3 is its true curve, unencumbered by others.

Selection of Forecasting Method and Results of Forecast for Collier County

The Sigmoid Model has demonstrated its accuracy in forecasting population over time for fast-growing counties such as Collier County. As indicated above, the growth curves of comparable counties were all strong sigmoid curves. Further, the R^2 values and similarities of the coefficients support Sigmoid Curves. Other characteristics such as year of incorporation of the counties, persons per household, per capita income, water and sewer availability, median age, and population over 65, are not all exact but all have similarities. Taken together, they would indicate that in these counties, the Sigmoid Model is most appropriate for forecasting population over time.

The data collection and analysis of this study provided the information in support of the selection and application of the Sigmoid Model to accurately forecast future populations for Collier County. That information is as follows:

1. The estimated build-out permanent population of 950,223 persons as the upper limit of growth independent of other data;
2. The historic population data from the U.S. Census;
3. The estimated population from the parcel data bank for 2007;
4. The traditional growth pattern that is common in support of future growth.

Forecasting Results

The Sigmoid Model that illustrates the forecasted results of the population, over time for Collier County and applies the data outlined above is shown in Figure 1 above.

Table 3 shows the forecasted aggregate population of Collier County from 2000 to the estimated 90 percent of build-out year of 2045, and on to build-out, in five-year increments.

Table 3
Collier County Population Forecast to Build-out

Year	Population
2000	251,377
2005	313,358
2006	314,649
2010	389,700
2015	470,890
2020	552,327
2025	629,355
2030	698,274
2035	756,937
2040	804,785
2045*	842,475
2050	871,354
2055	893,019
2060	909,014
2065	920,684
Build-Out	950,223

Source: Van Buskirk, Ryffel, and Associates, Inc.
* 90 percent of Build-out.

Findings

It may be concluded from the historic analysis of population growth of the Florida counties studied and from other data in this section that the Sigmoid Curve best represents the population growth of all four counties including Collier County over time to build-out. Further, given the upper limit of population (build-out), the scientific application of a Sigmoid Model can accurately forecast future population over the short and long term in Collier County.

The Role of the Population Model in the CIGM

The CIGM is population driven, and all other aspects of the model begin with the population over time to build-out in five-year increments. The role of the Population Model is best understood by considering the differences between it and the CIGM and its sub-models.

The Connection between the Population Forecast to Build-out Methodology, the Interactive Growth Model,™ and Sub-models

The Population Forecast to Build-out Model is the beginning step in the development of an Interactive Growth Model. The resultant product is a forecast of the *aggregate* population, in five-year increments to build-out and serves as a key input to an Interactive Growth Model and thereafter to any requested sub-models.

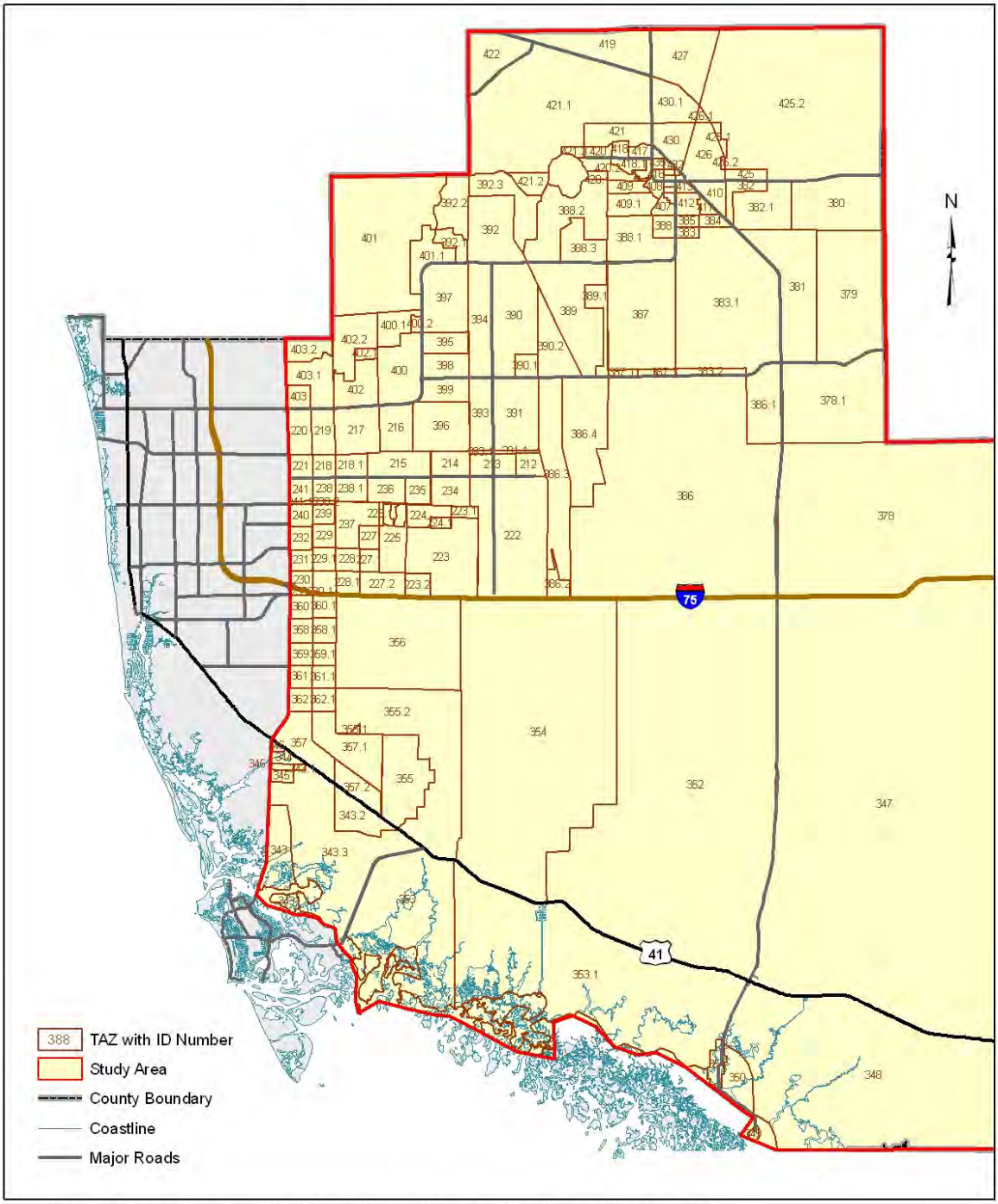
One of the end products of the Interactive Growth Model™ is the *distribution* of the aggregate population in five-year increments to build-out. The population distribution is by sub-areas of the community such as Traffic Analysis Zones (TAZ's) in Collier County's case. Moreover, the variables that were built into the CIGM were those that are important to the County. With the basic CIGM completed, it can be used later to develop "what if?" growth management scenarios. These can be used to demonstrate the effect of alternative land use decisions as input to short and long term budgetary considerations, to update the County's Land Use Plan as it relates to the study area, and as input to create additional sub-models in the future.

Section 4

Disaggregation of the Study Area

To properly manage the planning processes for an area as large and complex as this one, there was a need to divide it into smaller areas. The most logical division was Traffic Analysis Zones. These are areas used by the Metropolitan Planning Organization (MPO) as their basis for transportation modeling and collaterally as a basis of recommendation for distribution of federal funding of road projects. Thus, the use of TAZs serves to provide multiple benefits beyond its use in the CIGM. Map 2 below shows the location, identification number and extent of the 172 TAZs that comprise the study area.

Map 2
Disaggregation of the Study Area into TAZs



This map is for planning purposes only and does not represent any commitment by Collier County as to its policies or resources. There were several sources of data used both public and private and Collier County cannot attest as to its accuracy or validity. While every effort was made to accurately depict the information on this map, errors and omissions may occur. Therefore Collier County cannot be held liable for incidents that may result due to improper use of the information on this map. Please contact the Collier County Comprehensive Planning Department with any questions regarding this map or to review the data used to create it.

Source: Van Buskirk, Ryffel and Associates, Inc.

Section 5

Population Distribution to Build-out

Table 4
Study Area Population Forecast
2007-Build-out*

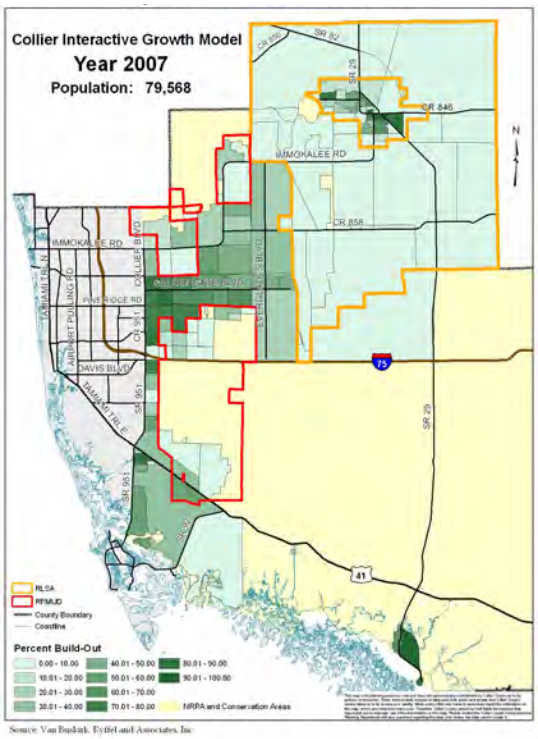
Year	Population
2007	79568
2010	89910
2015	117916
2020	153631
2025	191329
2030	230283
2035	269814
2040	308560
2045	343071
2050	371180
2055*	392562*
2060	407970
2070	418623
2075	430524
2080	433628
Build-out	442537

Source: Van Buskirk, Ryffel, and Associates, Inc.
*90% of Build-out.

In the interest of a clearer understanding, the population forecast output data shown above, was converted to visual representations that are more easily interpreted. By way of example, Maps 3 to 12 shows the population distribution and intensity in the years 2007, 2010, 2020, 2030, 2040, 2050, 2060, 2070, 2080, and Build-out, respectively for the entire study area. Likewise, Maps 13 to 22 show the RFMUD and GGE areas and Maps 23 to 32 show the RLSA and Immokalee areas during those same time intervals.

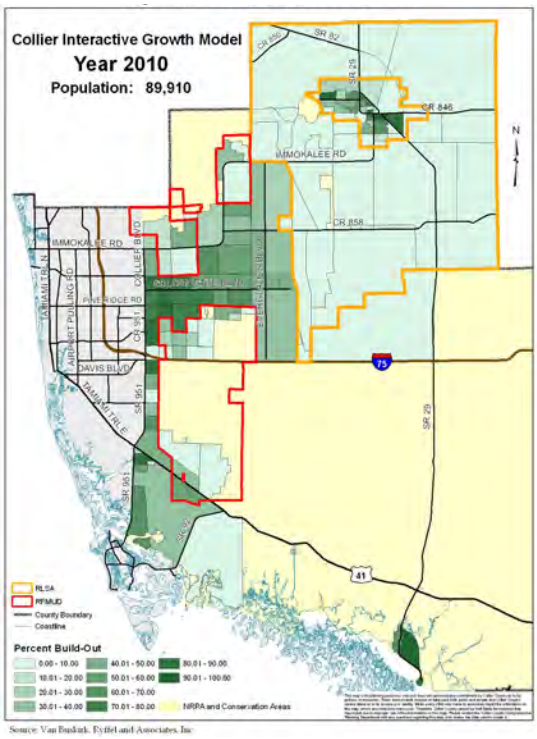
The various degrees of green shadings on these maps represent the percentage of build-out population of each TAZ at the particular 10-year interval. This was done in 10 percent increments with greater populations shown in darker shading.

Map 3
Population Distribution, Year 2007



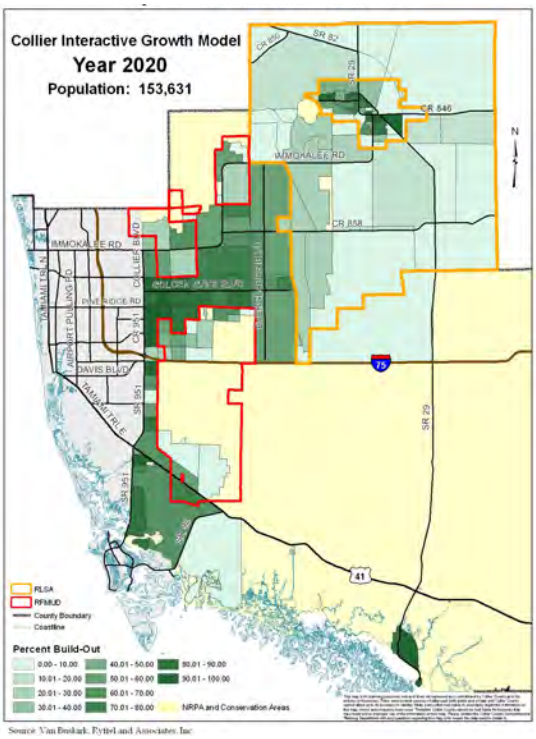
Source: Van Buskirk, Eyffel and Associates, Inc

Map 4
Population Distribution, Year 2010



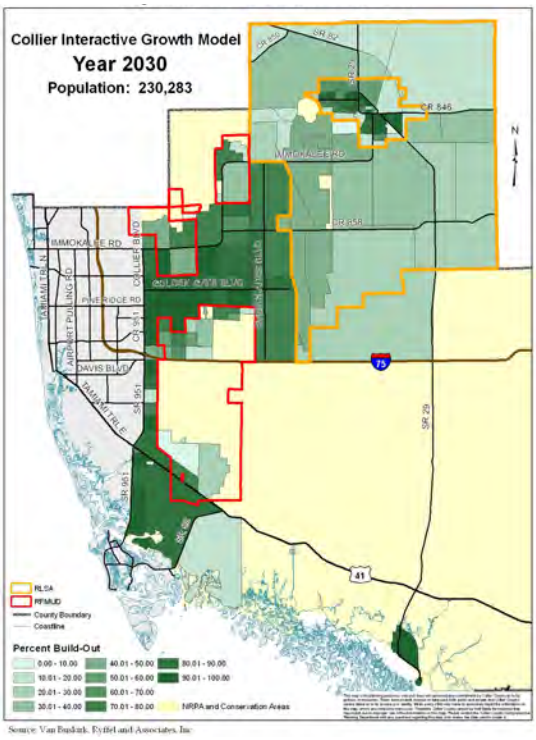
Source: Van Buskirk, Eyffel and Associates, Inc

Map 5
Population Distribution, Year 2020



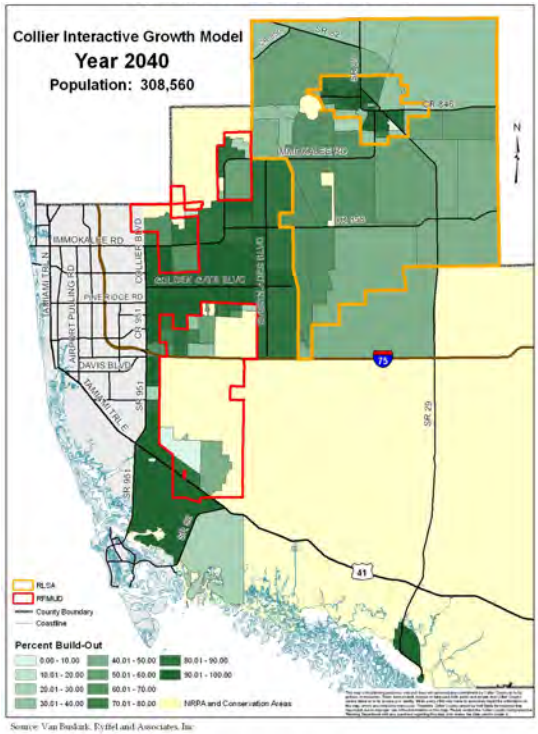
Source: Van Buskirk, Eyffel and Associates, Inc

Map 6
Population Distribution, Year 2030



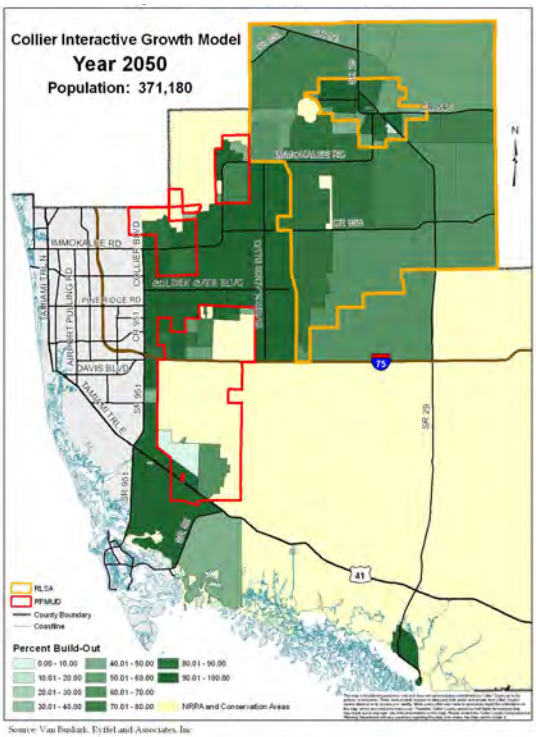
Source: Van Buskirk, Eyffel and Associates, Inc

Map 7
Population Distribution, Year 2040



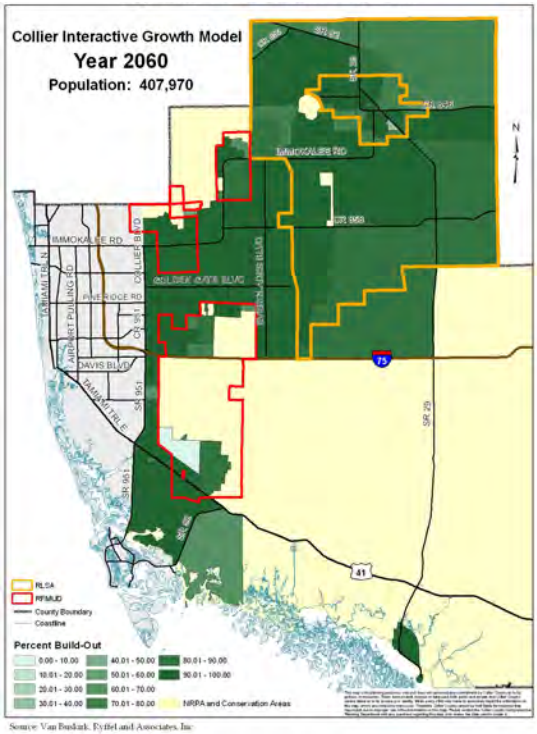
Source: Van Buskirk, Eyffel and Associates, Inc

Map 8
Population Distribution, Year 2050



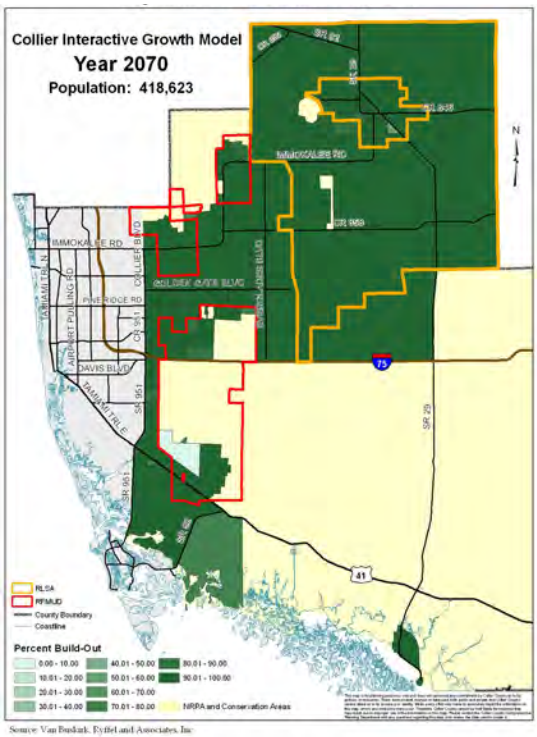
Source: Van Buskirk, Eyffel and Associates, Inc

Map 9
Population Distribution, Year 2060



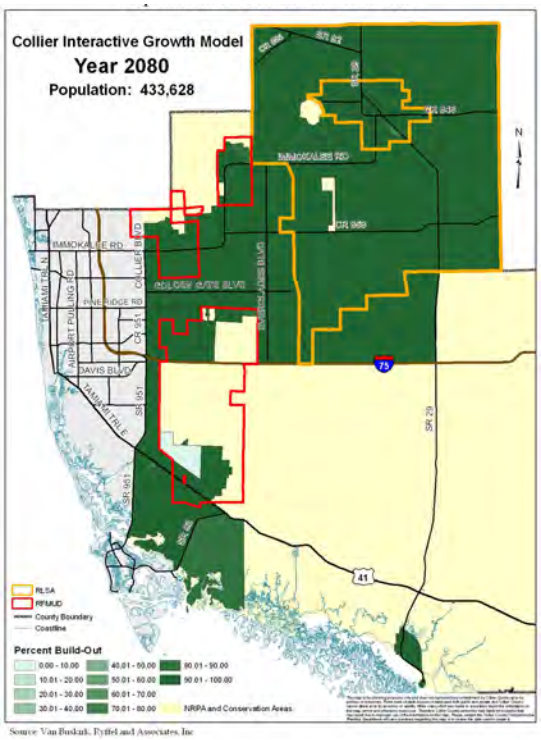
Source: Van Buskirk, Eyffel and Associates, Inc

Map 10
Population Distribution, Year 2070



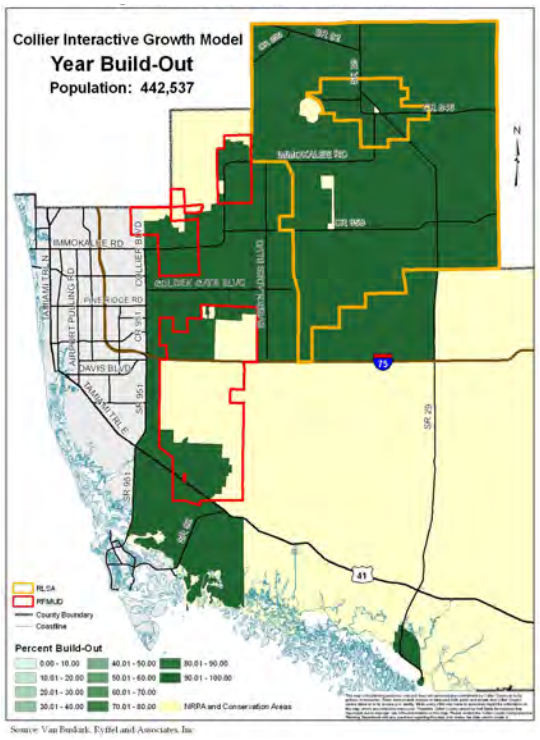
Source: Van Buskirk, Eyffel and Associates, Inc

Map 11
Population Distribution, Year 2080



Source: Van Buskirk, Fyffel and Associates, Inc

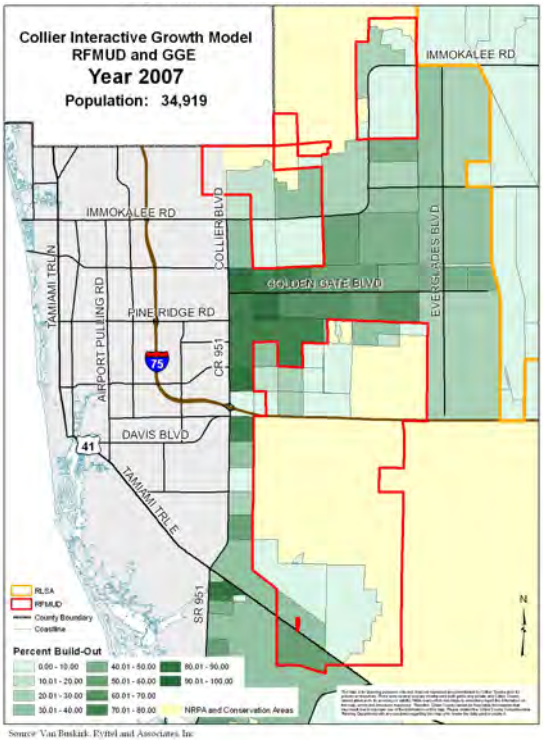
Map 12
Population Distribution, Year Build-Out



Source: Van Buskirk, Fyffel and Associates, Inc

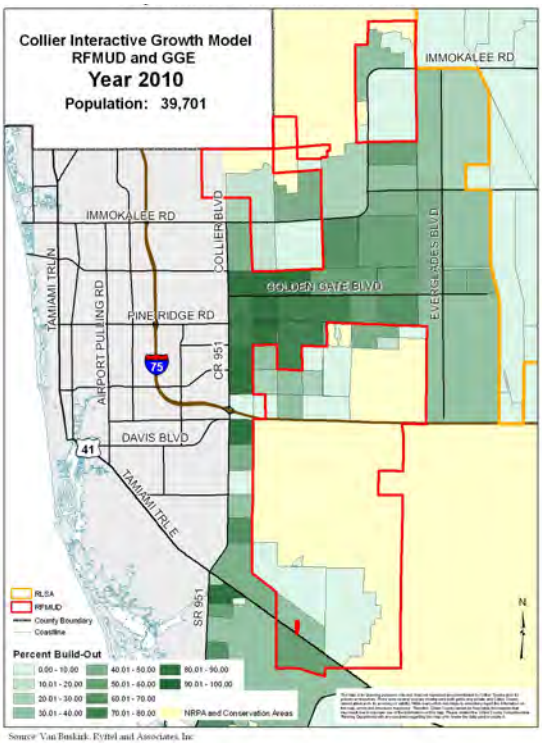
The following maps show the RFMUD and GGE areas.

Map 13
Population Distribution, Year 2007



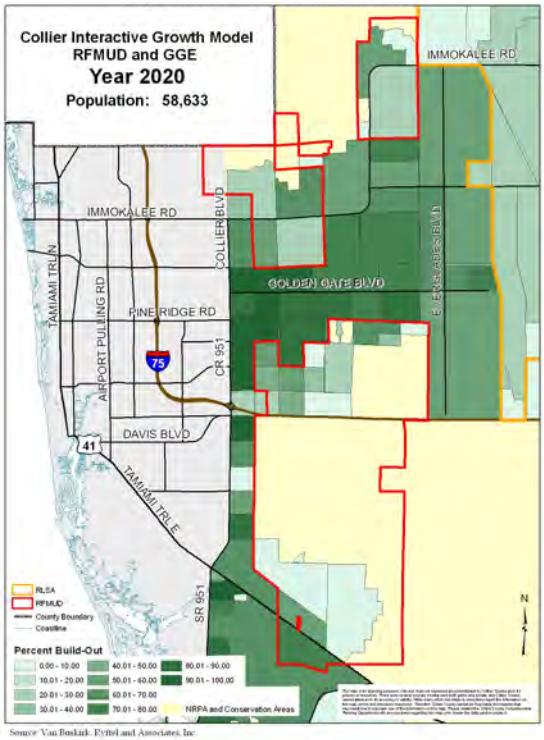
Source: Van Buskirk, Fyffel and Associates, Inc

Map 14
Population Distribution, Year 2010



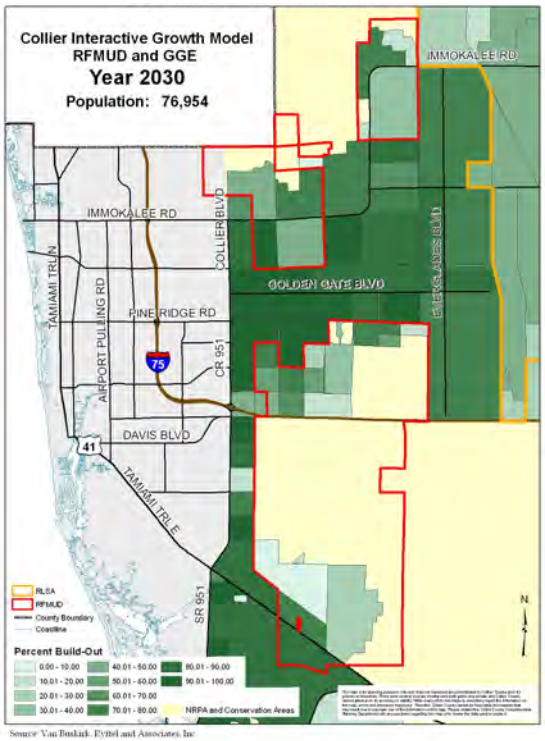
Source: Van Buskirk, Fyffel and Associates, Inc

Map 15
Population Distribution, Year 2020



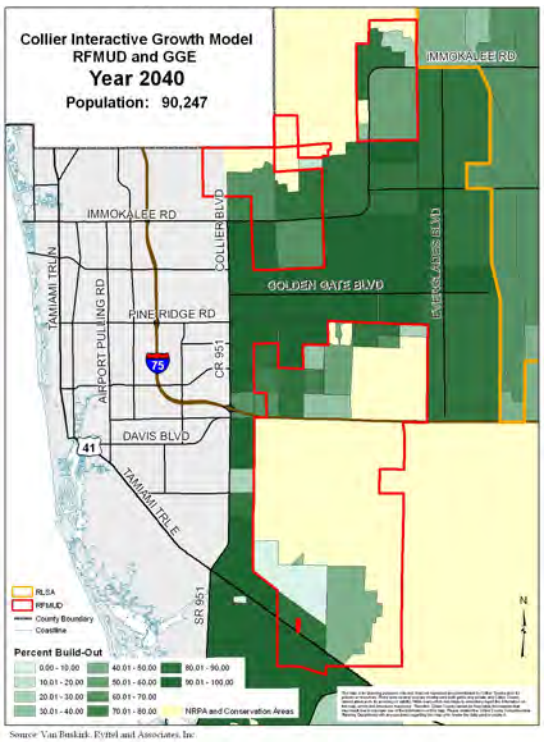
Source: Van Buskirk, Eyttel and Associates, Inc

Map 16
Population Distribution, Year 2030



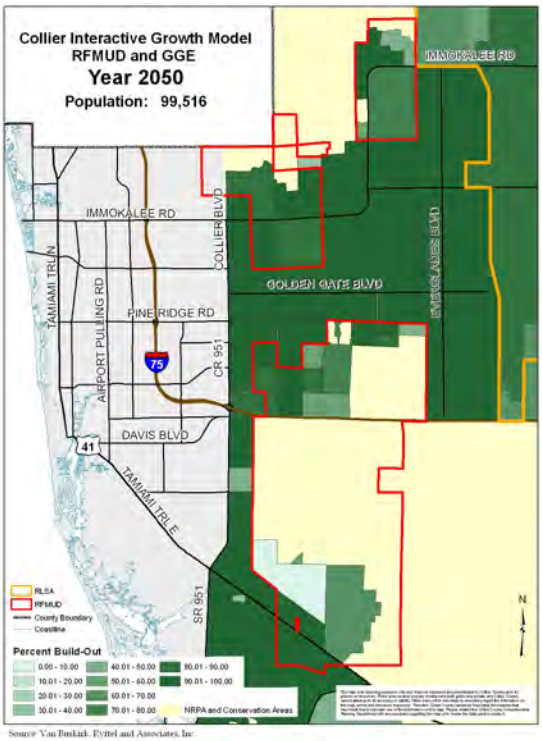
Source: Van Buskirk, Eyttel and Associates, Inc

Map 17
Population Distribution, Year 2040



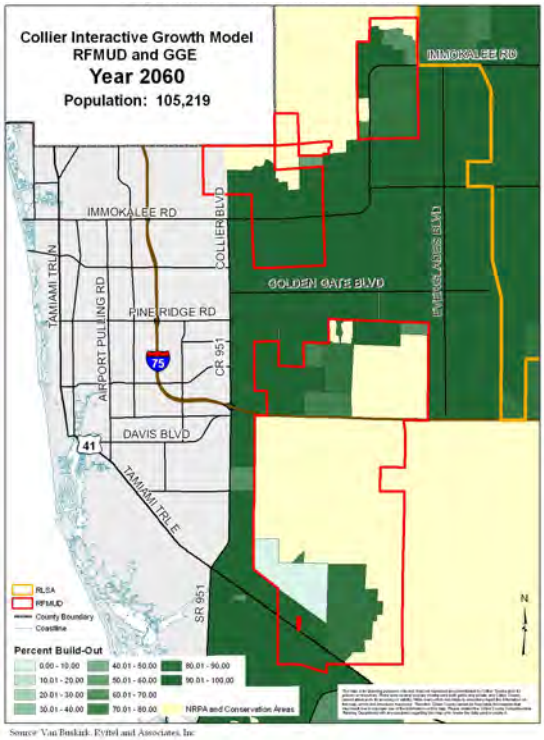
Source: Van Buskirk, Eyttel and Associates, Inc

Map 18
Population Distribution, Year 2050



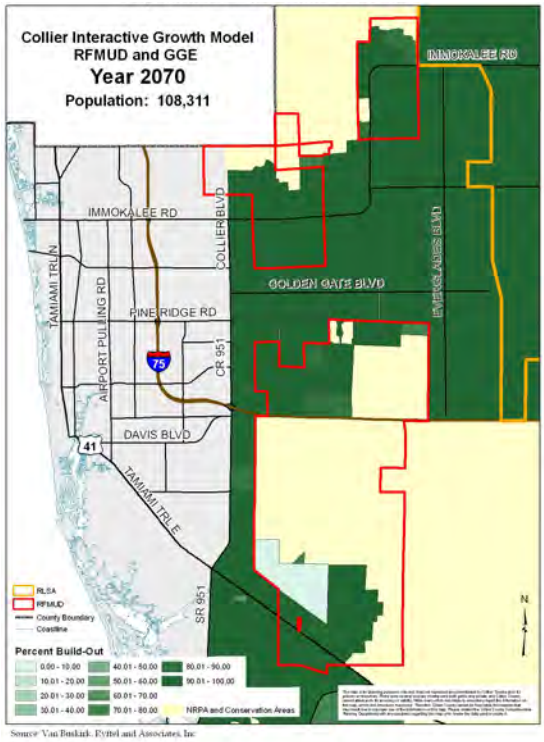
Source: Van Buskirk, Eyttel and Associates, Inc

Map 19
Population Distribution, Year 2060



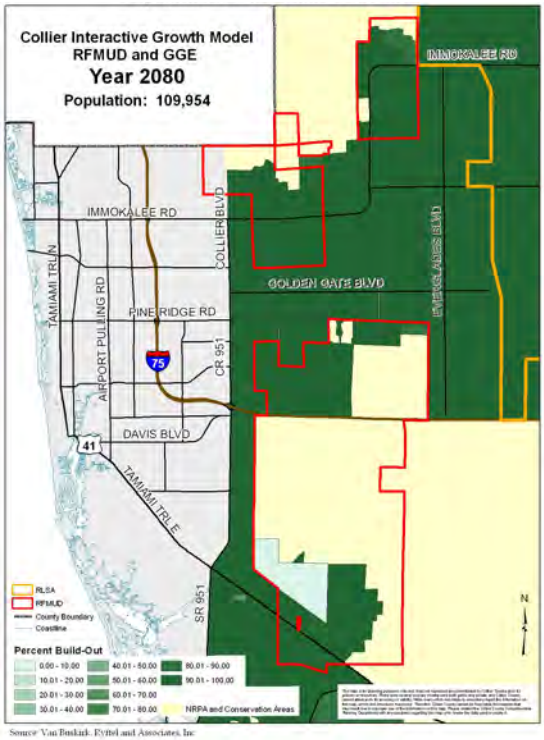
Source: Van Buskirk, Eytbel and Associates, Inc

Map 20
Population Distribution, Year 2070



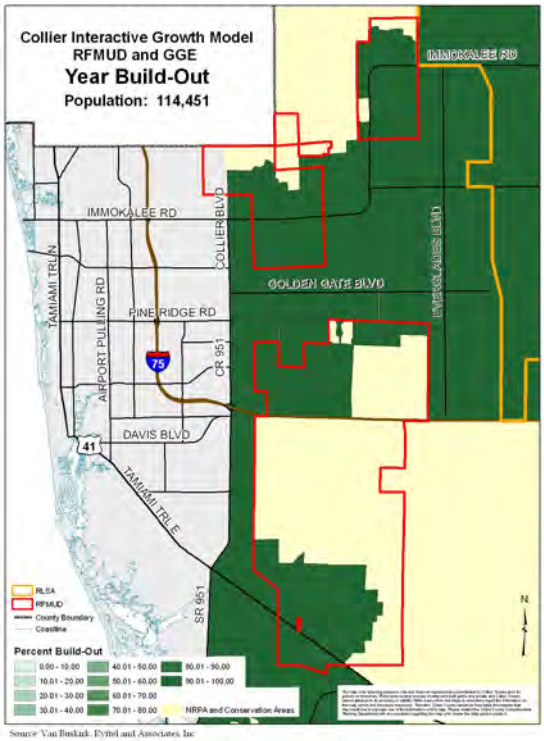
Source: Van Buskirk, Eytbel and Associates, Inc

Map 21
Population Distribution, Year 2080



Source: Van Buskirk, Eytbel and Associates, Inc

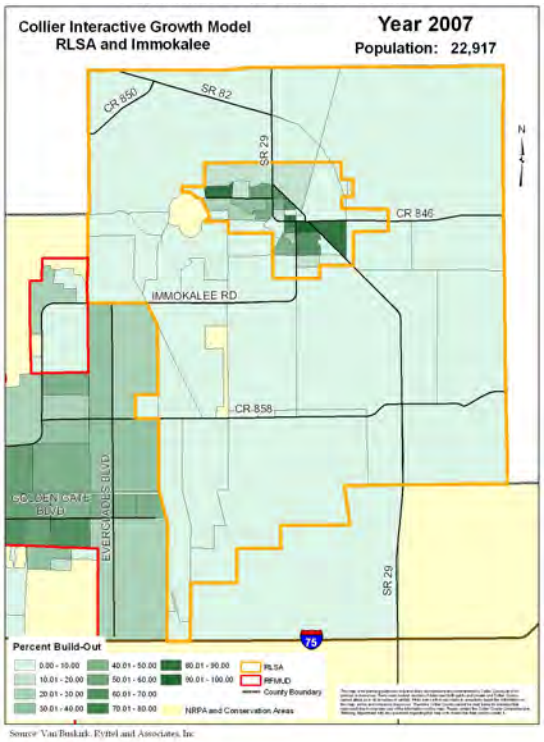
Map 22
Population Distribution, Year Build-Out



Source: Van Buskirk, Eytbel and Associates, Inc

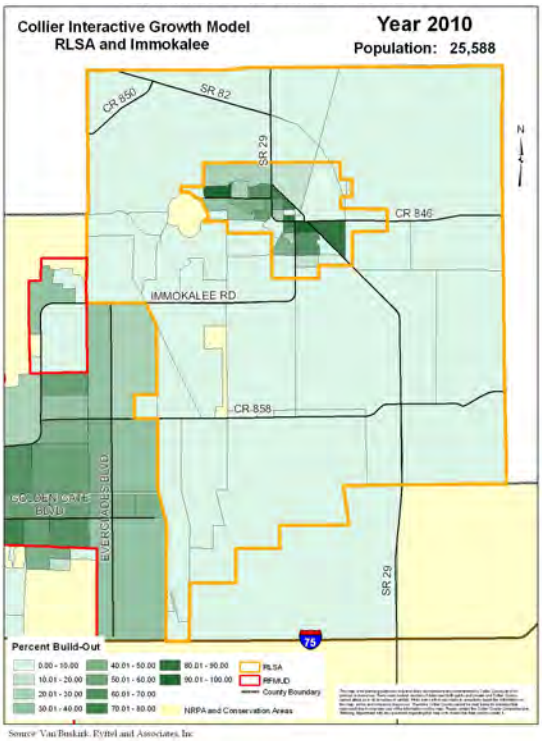
The following maps show the RLSA and Immokalee areas.

Map 23
Population Distribution, Year 2007



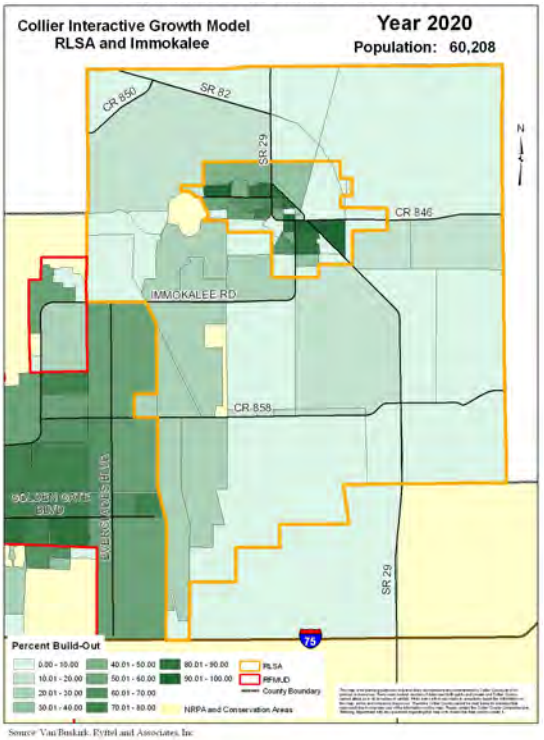
Source: VanBuskirk, Eyrtel and Associates, Inc

Map 24
Population Distribution, Year 2010



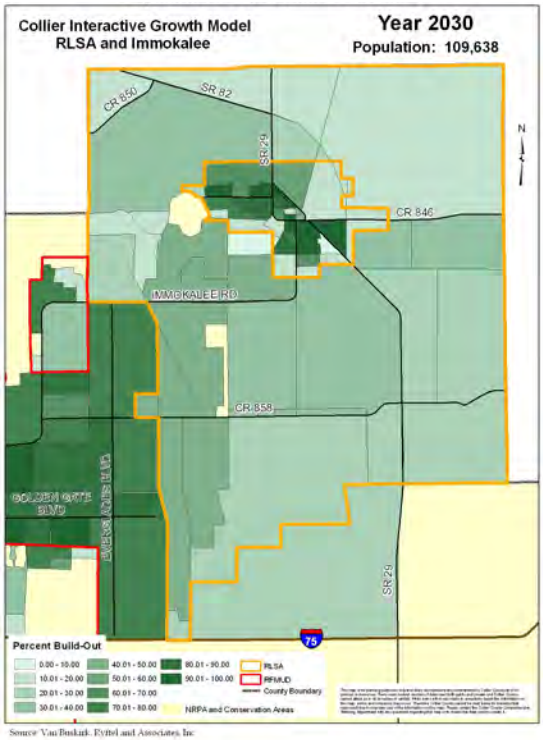
Source: VanBuskirk, Eyrtel and Associates, Inc

Map 25
Population Distribution, Year 2020



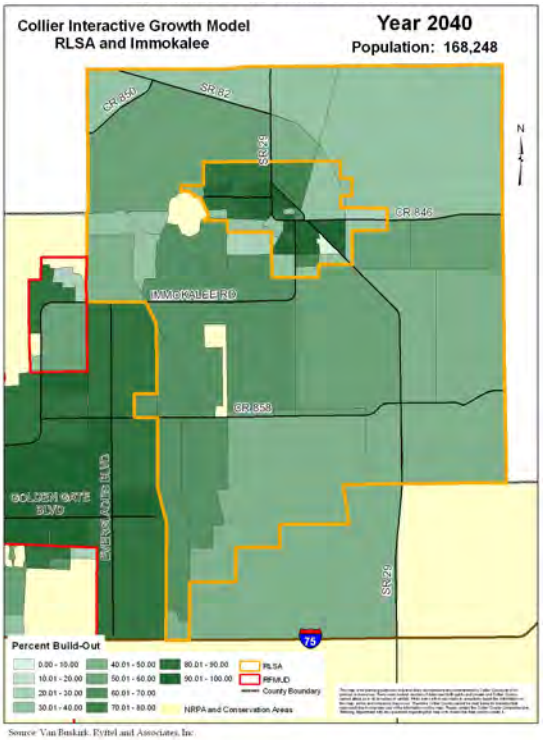
Source: VanBuskirk, Eyrtel and Associates, Inc

Map 26
Population Distribution, Year 2030



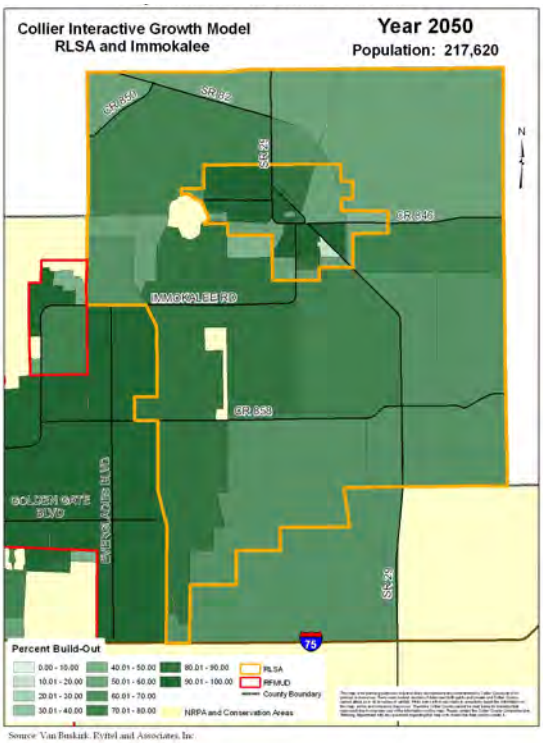
Source: VanBuskirk, Eyrtel and Associates, Inc

Map 27
Population Distribution, Year 2040



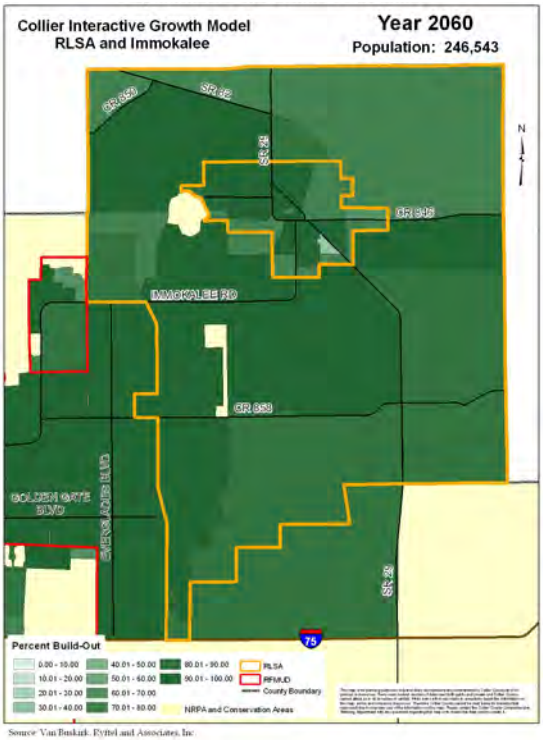
Source: Van Buskirk, Eyttel and Associates, Inc

Map 28
Population Distribution, Year 2050



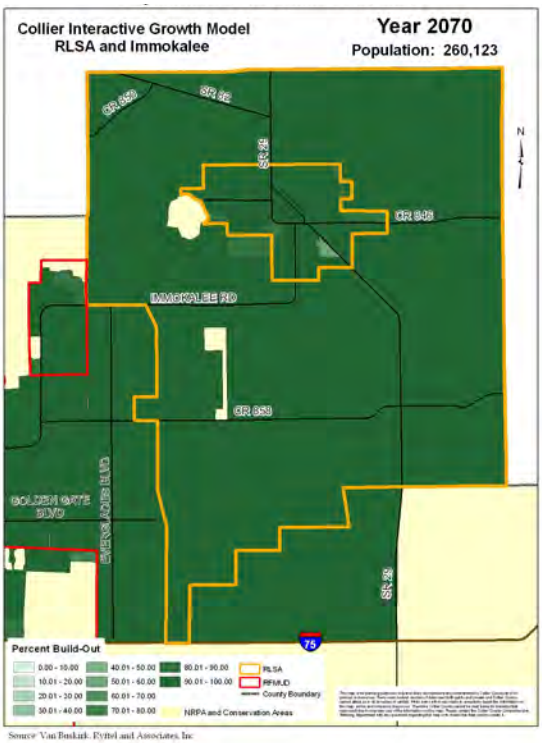
Source: Van Buskirk, Eyttel and Associates, Inc

Map 29
Population Distribution, Year 2060



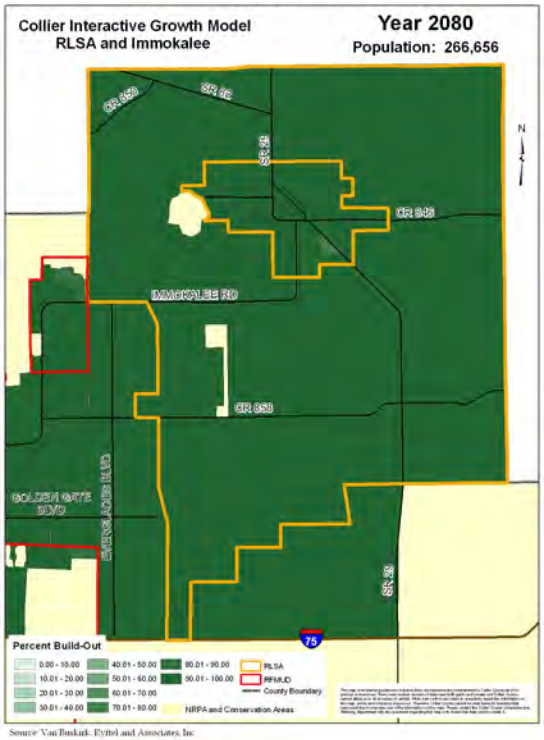
Source: Van Buskirk, Eyttel and Associates, Inc

Map 30
Population Distribution, Year 2070



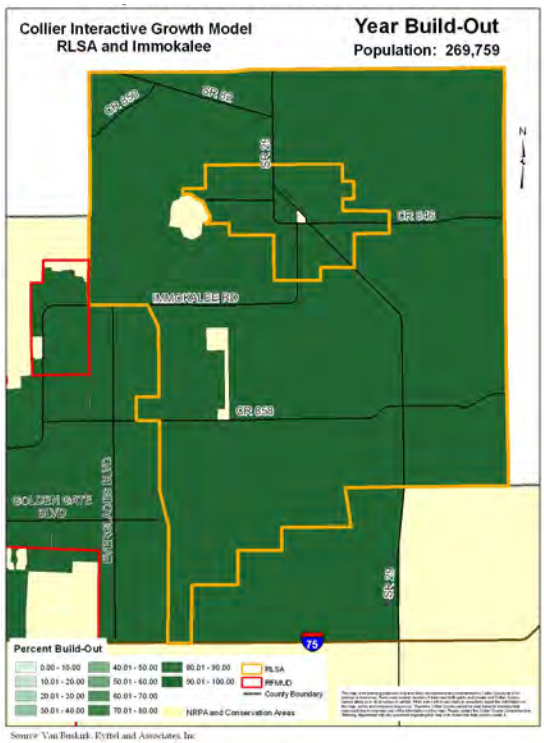
Source: Van Buskirk, Eyttel and Associates, Inc

Map 31
Population Distribution, Year 2080



Source: Van Buskirk, Eyttel and Associates, Inc

Map 32
Population Distribution, Year Build-Out



Source: Van Buskirk, Eyttel and Associates, Inc

Section 6

Existing (Baseline) and Build-out Land Use Inventory

The Collier County Future Land Use Element (FLUE) was the basic tool for forecasting future development. Over recent years, the County's planning staff developed a series of growth management tools including studies, strategies, overlays and area master plans that further subdivided the FLUE into the following sub-areas:

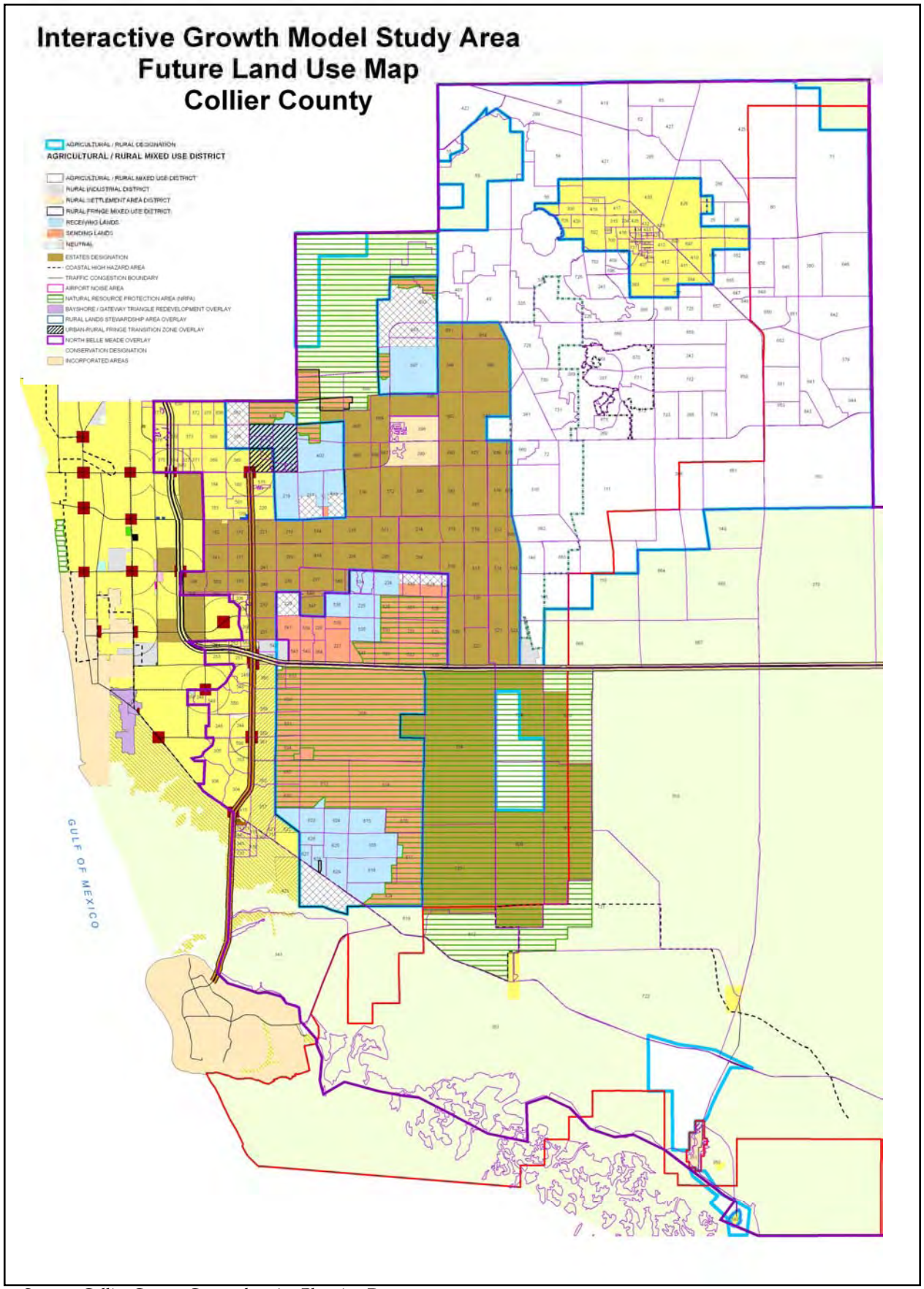
- Rural Fringe Mixed Use District
- Rural Lands Stewardship Area
- Immokalee Area Master Plan
- Ave Maria Town Master Plan
- Golden Gate Estates Master Plan (Estates)
- Mixed Use and Interchange Activity Center Sub districts
- Davis Blvd Mixed Use District
- Industrial District
- Urban Residential Fringe Sub district
- Urban Residential Sub district
- Existing Zoning Consistent with FLUE
- Rural Settlement Area Sub district
- Residential Density Band
- South Golden Gate Estates NRPA
- Conservation Designation
- Crew Natural Resources Protection Area (NRPA)
- Corkscrew Swamp Sanctuary

When taken together, these districts and sub-districts were intended to cover all of the land in the study area and its potential use for future development. The development of the Collier Interactive Growth Model (CIGM) took these studies into account and divided the geographic areas they represent, into TAZ's so that they could be queried for a build-out analysis.

Where it was logical to do so, VBR further consolidated these areas into the final categories that were used throughout this study (shown in Tables 5 and 6 below), and included:

- Urban Residential Subdistrict
- Urban Residential Fringe Subdistrict
- Urban Coast Fringe Subdistrict
- Rural Settlement Area
- Rural Lands Stewardship Area (RLSA)

Map 33



Source: Collier County Comprehensive Planning Department

- Rural Fringe Mixed Use District (RFMUD)
- Mixed Use Residential Subdistrict
- Industrial
- Immokalee
- Golden Gate Estates
- Golden Gate Estates Natural Resources Protection Area (G.G.E. NRPA)
- Conservation

Table 5 indicates the results a consolidated current existing inventory. The data sheets of the current inventory by individual TAZs may be found in the Collier County Comprehensive Planning Department in the document entitled *CIGM Technical Appendix.*

Similarly, the results of a consolidated build-out inventory are shown in Table 6 based on the limits of the Future Land Use Element (FLUE) of the Growth Management Plan. The data sheets of the build-out inventory by the individual TAZs may also be found in the Collier County Comprehensive Planning Department in the same document.

The amount of data from which the CIGM was created, numbers in an estimated over one million parts. This data is now in the hands of the County Comprehensive Planning Department and from it, all the visuals contained in this report were created. This data is in tabular and spreadsheet form. It is necessary to recognize that as the variables change, the population forecast and various distributions will change. The CIGM is therefore, not a static model, but rather a dynamic one.

Table 5

CIGM 2007 Baseline (Existing Conditions)

	Master Plan/Overlay												
	Urban Resid. Subdistrict	Urban Resid. Fringe Subdistrict	Urban Coast Fringe Subdistrict	Rural Settlement Area	RLSA	RFMUD	Mixed Use Resid. Subdistrict (MRS)	Industrial	Immokalee	Golden Gate Estates	G.G.E. NRPA	Conservation	Total
Data													
Acres	1308	12385	17124	2804	208563	88302	524	1165	16811	54241	50048	641114	1094388
#SF	647	802	903	1115	193	983	270	0	2791	10614	92	144	18554
#MF	933	2744	5755	0	122	533	683	0	3362	0	0	514	14646
SF/MF Total	1580	3546	6658	1115	315	1516	953	0	6153	10614	92	658	33200
#Elem. Schools	0	0	1	1	0	0	0	0	4	3	0	0	9
Elem. Acres			10	12					67	65			154
#Mid. Schools	0	0	1	1	0	0	0	0	1	1	0	0	4
Mid. Acres			92	80					23	76			271
#High Schools	0	0	0	1	0	0	0	0	1	0	0	0	2
High Acres			0	80					44	0			124
Community Parks Acres	0	0	0	17	0	0	0	0	63	30	0	0	110
Retail Acres	4	15	50	0	0	61	5	0	162	8	0	12	317
Retail Ft^2	10081	28733	234590	0	0	235532	67475	0	1093133	40607	0	12046	1722197
Office Acres	8	9	12	2	0	2	0	0	34	0	0	0	67
Office Ft^2	24321	4001	54645	8021	0	18618	0	0	203723	0	0	0	313329
Commercial Total Acres	12	24	62	2	0	63	5	0	196	8	0	12	384
Commercial Total SF^2	34407	32734	289235	8021	0	254150	67475	0	1296856	40607	0	12046	2035526
Industrial Acres	11	34	9	28	50	13	1	30	117	4	0	0	297
Industrial SF^2	58108	372671	421	10776	68273	11971	3959	221292	1203213	363	0	0	1951047
Hotel/ Motel Units	0	0	0	0	0	0	52	0	8	0	189	0	249
Hotel/ Motel Acres	0	0	0	0	5	0	6	0	1	0	10	0	22
Hotel/Motel FT^2							15711		2206		56958		74875
#Fire Stations	0	1	1	0	0	1	1	0	2	3	0	0	9
Fire Station Acres	0	2	1	0	0	4	1	0	2	10	0	0	20
Fire Station FT^2	0	12949	4639	0	0	3357	7726	0	14833	30035	0	0	73539
# Sheriff Stations							1		1				
Sheriff Station Acres							3		3				
Sheriff Station FT^2							38000		38000				

Abberviations Used in Table Above and Elsewhere

#SF	Number of single family
#MF	Number of multifamily
SF/MF Total	Single family and multifamily total units
#Elem. Schools	Number of elementary schools
#Mid. Schools	Number of middle schools
#High Schools	Number of high schools
Retail FT^2	Retail building floor area
Office FT^2	Office building floor area
Commercial FT^2	Combined retail and office floor area

Table 6

CIGM Build-out

	Master Plan/Overlay												
	Urban Resid. Subdistrict	Urban Resid. Fringe Subdistrict	Urban Coast Fringe Subdistrict	Rural Settlement Area	RLSA	RFMUD	Mixed Use Resid. Subdistrict (MRS)	Industrial	Immokalee	Golden Gate Estates	G.G.E. NRPA	Conservation	Total
Data													
Acres	1308	12385	17124	2804	203589	88302	524	1165	21784	54241	50048	641114	1094388
#SF	2280	4825	4704	3548	48343	12435	385	0	10393	25392	127	597	112957
#MF	1712	4548	10415	0	53800	6680	919	0	10345	0	0	514	88859
SF/MF Total	3992	9373	15119	3548	102143	19115	1304	0	20738	25392	127	1111	201816
#Elem. Schools	0	0	1	1	7	3	0	0	4	3	0	0	19
Elem. Acres	0	0	10	12	105	45	0	0	67	65	0	0	304
#Mid. Schools	0	0	1	1	7	3	0	0	1	1	0	0	14
Mid. Acres	0	0	92	80	217	93	0	0	23	76	0	0	581
#High Schools	0	0	0	1	7	2	0	0	1	0	0	0	11
High Acres	0	0	0	80	420	120	0	0	44	40	0	0	704
Community Parks Acres	0	0	0	17	604	90	0	0	63	30	0	0	804
Retail Acres	15	144	46	14	351	76	4	18	335	23	5	8	1028
Retail Ft^2	162806	1571427	495495	155727	3822390	828185	42471	198198	3652506	254826	56628	84942	11198187
Office Acres	8	78	25	8	189	41	2	10	181	13	3	4	554
Office Ft^2	87665	846153	266805	83853	2058210	445946	22869	106722	1966734	137214	30492	45738	6029793
Commercial Total Acres	23	222	70	22	540	117	6	28	516	36	8	12	1582
Commercial Total SF^2	250407	2417580	762300	239580	5880600	1274130	65340	304920	5619240	392040	87120	130680	17227980
Industrial Acres	11	61	14	28	350	145	0	812	1231	0	0	0	2652
Industrial SF^2	143748	797148	182952	365904	4573800	1894860	0	10611216	16086708	0	0	0	34656336
Hotel/ Motel Units	0	0	0	0	1300	150	52	0	31	0	189	0	1722
Hotel/ Motel Acres	0	0	0	0	43	5	6	0	1	0	10	0	65
#Fire Stations	0	1	1	0	6	4	1	0	2	3	0	0	18
Fire Station Acres	0	2	1	0	18	13	1	0	2	9	0	0	46
Fire Station FT^2	0	12949	4639	0	240000	15357	7726	0	14833	30035	0	0	109539
# Sheriff Stations					2	3							
Sheriff Station Acres					6	9							
Sheriff Station FT^2					76000	114000							

Abbreviations Used in Table Above and Elsewhere

#SF	Number of single family
#MF	Number of multifamily
SF/MF Total	Single family and multifamily total units
#Elem. Schools	Number of elementary schools
#Mid. Schools	Number of middle schools
#High Schools	Number of high schools
Retail FT^2	Retail building floor area
Office FT^2	Office building floor area
Commercial FT^2	Combined retail and office floor area

Section 7

The Sub-Models

One of the unique features of the IGM™ is the ability to create a myriad of sub-models and to incorporate those that are of importance to a specific community. In Collier County's case, the seven sub-models below were selected. These sub-model results are based on current levels of service.

The objective of the sub-models was to forecast the timing and spacing of facilities (schools, parks, commercial centers, industrial parks, law enforcement and fire and Ems stations.) and to determine if sufficient land has been allocated in accordance with the guidelines of the Future Land Use Element (FLUE) of the Growth Management Plan.

The strategy is to optimize the opportunities in the planning and development of the Towns, Villages and Hamlets of the Rural Land Stewardship Areas (RLSA) and the Villages of the Rural Fringe Mixed Used District (RFMUD) as well as the Activity Centers.

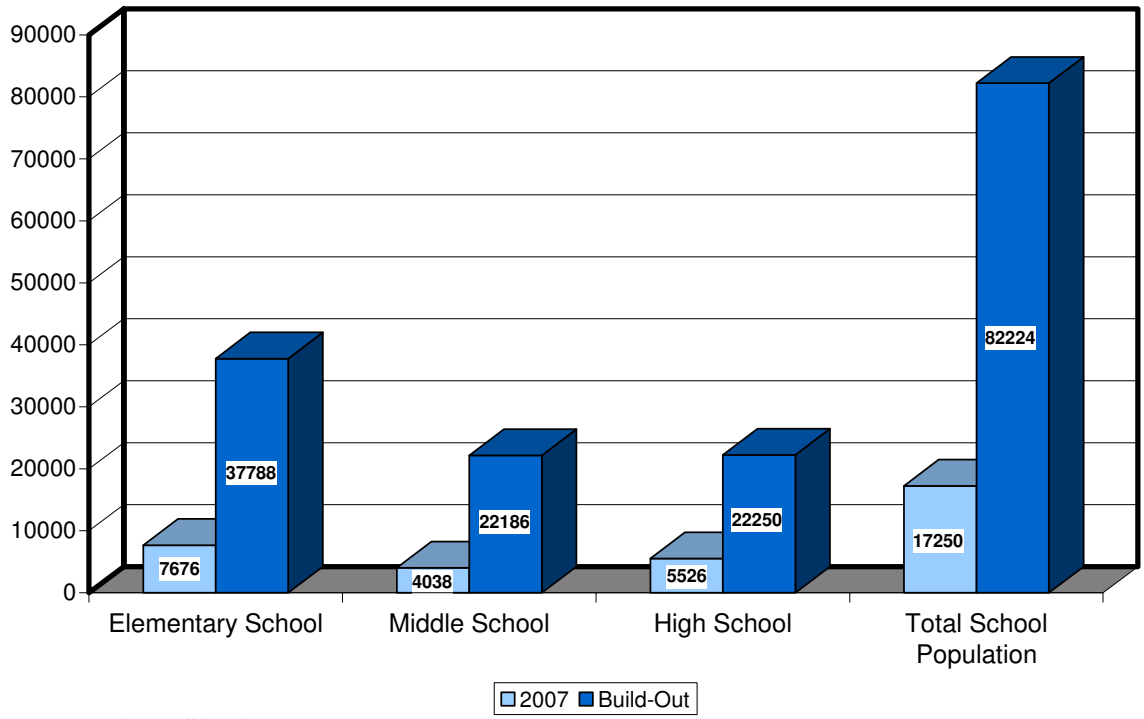
It should be noted in the Map series 34 through 57 below that only the baseline year of 2007 and the build-out year for a particular sub-model are shown and they are graphic representations of the locations of various facilities at those two time intervals. They are graphic representations of the information in Tables 7 through 12. For those interested, the maps of the intervening years may be found in the *CIGM Technical Appendix* located at the County's Comprehensive Planning Department.

School Facility Sub-Model

This sub-model was developed to determine the optimal placement and number of future school and plant facilities to meet the needs of the population over time. The CIGM determined the optimal spatial distribution of future schools based on zones, time, and demographics. The supply model was in accord with local levels of service for school plants by type and enrollment.

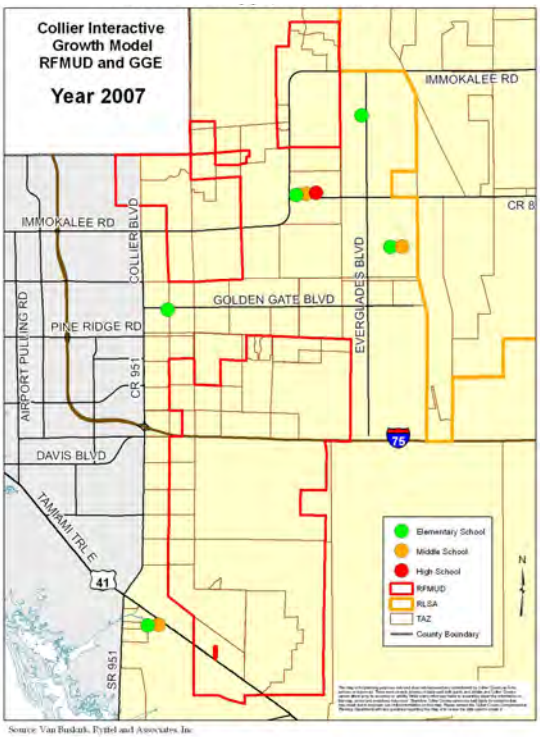
Figure 5 below indicates the student population at elementary, middle and high schools from the year 2007 to build-out.

Figure 5
Public School Population 2007 and Build-Out

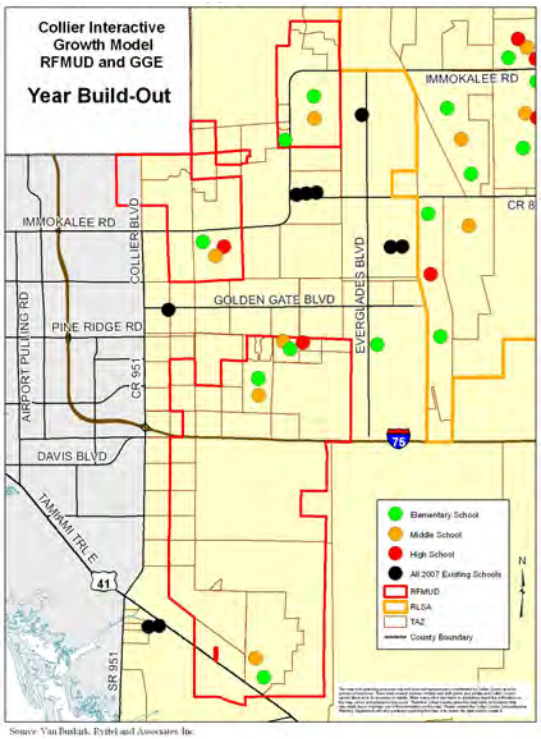


Source: Van Buskirk, Ryffel and Associates, Inc.

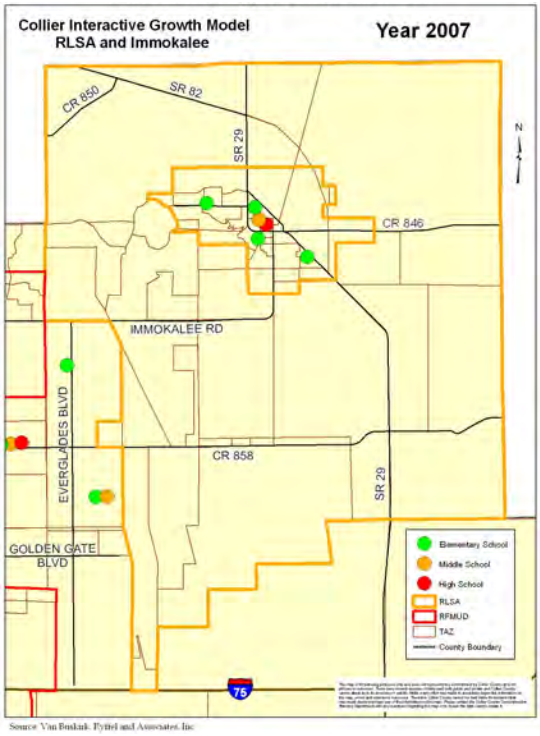
Map 34
Public School Type/Distribution 2007 - RFMUD/GGE



Map 35
Public School Type/Distribution at Build-Out – RFMUD/GGE



Map 36
Public School Type/Distribution
2007 – RLSA/Immokalee



Map 37
Public School Type/Distribution
at Build-Out – RLSA/Immokalee

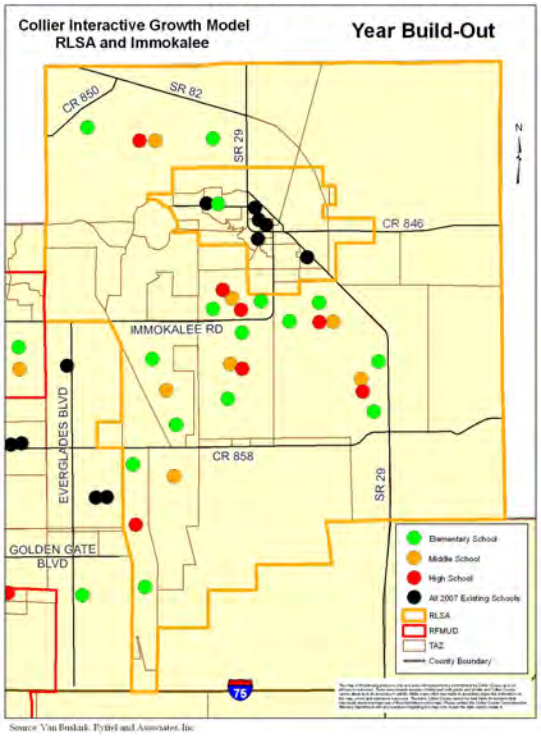


Table 7 below indicates the timing of schools facilities from 2007 to build-out, by school type and by their optimal locations (TAZ) of those facilities. It also indicates the aggregate shortfall of facilities over time.

Table 7
Study Area Schools 2007-Build-out by TAZ Location

Year	TAZ	Elem.	Middle	High
2007	433			HS*
2007	434		MS*	
2007	435	ES*		
2007	418	ES		
2007	411	ES		
2007	408	ES		
2007	398	ES	MS	HS
2007	394	ES		
2007	391	ES	MS	
2007	343a	ES	MS	
2007	241	ES		
2010	217	ES	MS	HS

Year	TAZ	Elem.	Middle	High
2010	222	ES		
2015	387	ES		
2015	418	ES		
2015	400b	ES		
2015	224		MS	HS
2020	387	ES	MS	HS
2020	224	ES		
2020	386d		MS	
2025	386c	ES		HS
2025	397	ES	MS	
2025	225	ES		
2025	389		MS	
2030	389	ES		
2030	386c	ES		
2030	388a		MS	
2030	225		MS	
2035	389	ES		
2035	388a	ES		HS
2035	355	ES	MS	
2040	388a	ES		HS
2040	383a	ES		
2040	383a	ES	MS	
2045	383a	ES	MS	
2050	383a	ES		HS
2050	421a	ES		
2050	421a	ES	MS	
2055	383a			HS
2070	421a			HS
Build-out	No Additional After 2070			
Total		31	16	11
Need		42	22	11
Shortfall		11	6	0

Source: Van Buskirk, Ryffel and Associates, Inc.
*ES Elementary School, MS Middle School, HS High School

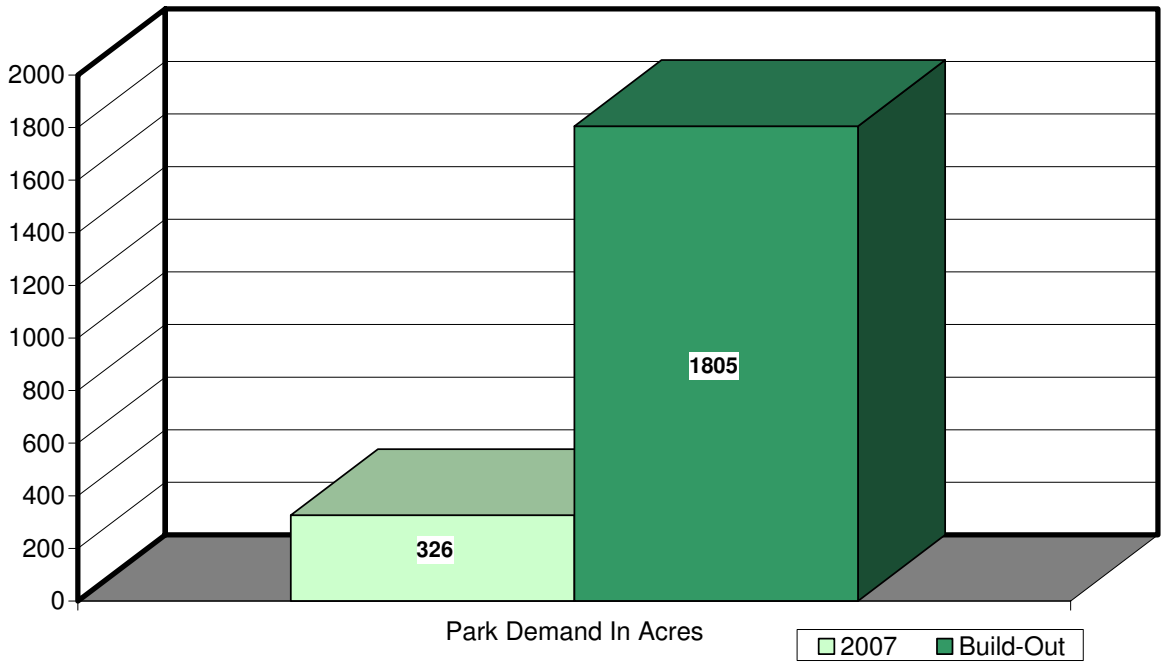
The current school facilities in the study area, future sites designated by the school district, designated land uses in the future towns in the RLSA and opportunities in the villages in the RFMUD, have the potential to provide for 31 elementary schools out of 42 needed to serve the population at build-out. Likewise, there would be provisions for 16 middle schools out of the 22 needed. There are sufficient high school sites to meet the need for 11 high schools. The shortfall in elementary and middle schools are in the Immokalee and Golden Gate sub-districts of the FLUE. The CIGM produces the data of school age children by school plant spatially and over time to determine the optimal selection of sites for the shortfall.

Park/Recreation Sub-Model

The park sub-model forecasts the demand for park and recreational space by the various park classifications of community and regional parks. It also forecasts the timing of facilities and their optimal locations in five-year increments to build-out. The CIGM determined the best spatial distribution of parks based on service area, time and demographics. This model may be updated every five years for scheduled capital improvement programs.

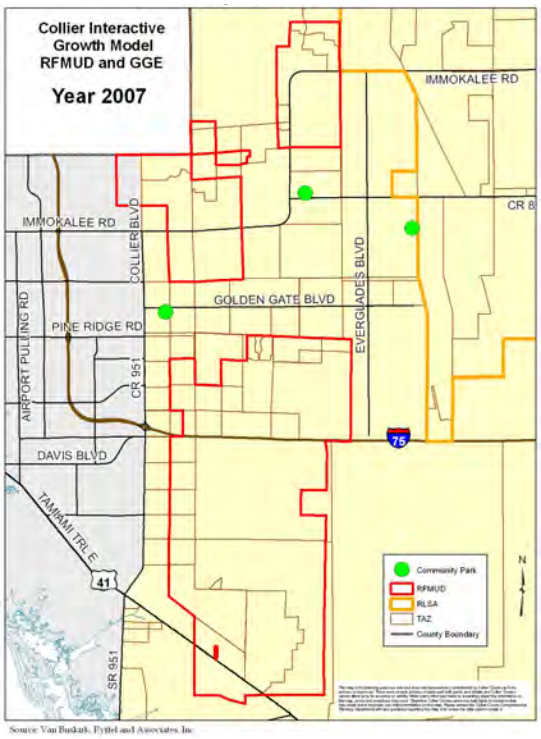
The CIGM provides the tool to help determine whether sufficient land has been allocated, consistent with the population over time, to determine any deficiencies, and to then suggest any future land use plan amendments for future acquisitions. The CIGM can also provide input for a master recreation plan and can test or revise existing master plans. Demographic trends from the CIGM can then be used as inputs to design recreation programs.

Figure 6
Park Demand Acreage 2007 and Build-Out



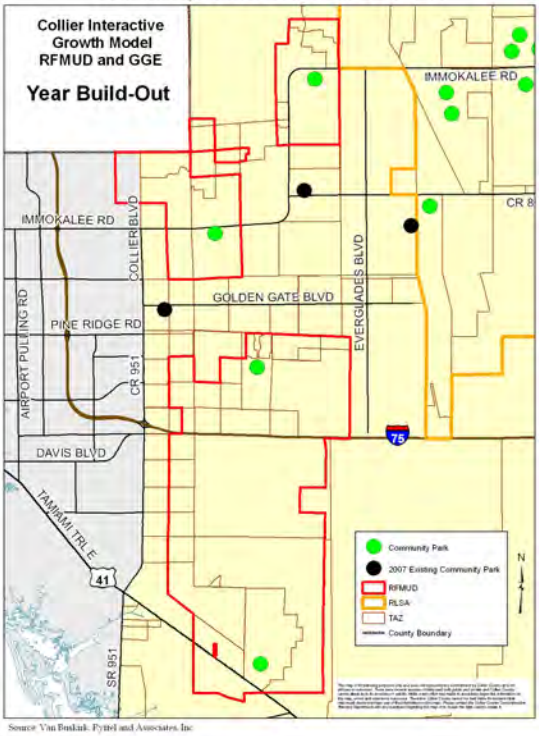
Source: Van Buskirk, Ryffel and Associates, Inc.

Map 38
Community Park Locations
2007 - RFMUD/GGE



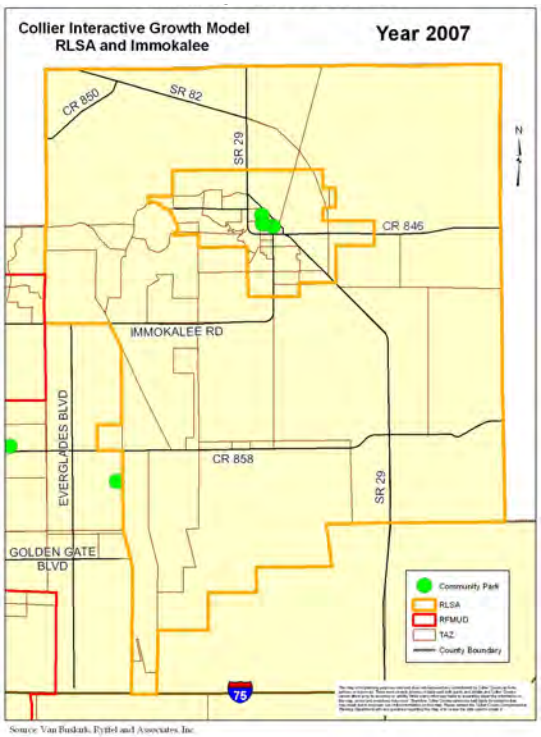
Source: Van Buskirk, Fyffel and Associates, Inc.

Map 39
Community Park Locations
at Build-Out - RFMUD/GGE



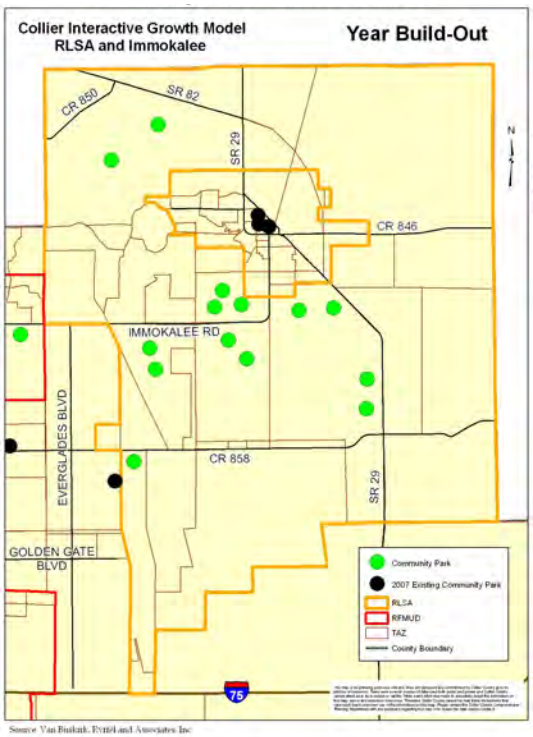
Source: Van Buskirk, Fyffel and Associates, Inc.

Map 40
Community Park Locations
2007 – RLSA/Immokalee



Source: Van Buskirk, Fyffel and Associates, Inc.

Map 41
Community Park Locations
at Build-Out – RLSA/Immokalee



Source: Van Buskirk, Fyffel and Associates, Inc.

Table 8 indicates existing and new parks to build-out, by type, timing and their optimal locations by TAZ. It also indicates the shortfall of facilities over time

Table 8
Study Area Parks 2007-Build-out
by TAZ Location

Year	TAZ	Community Park	Regional Park
2007	241	CP*	
2007	391	CP	
2007	399	CP	
2007	432	CP	
2007	433	CP	
2007	433	CP	
2020	387	CP	
2025	388a	CP	
2030	389	CP	
2030	387	CP	
2035	388a	CP	
2035	386c	CP	
2035	217	CP	
2040	383a	CP	
2040	389	CP	
2040	225	CP	
2045	383a	CP	
2045	388a	CP	
2045	397	CP	
2050	421a	CP	
2050	383a	CP	
2050	355	CP	
2055	383a	CP	
2060	421a	CP	
Build-out	No Additional After 2060		
Total		24	0
Need		29	4
Shortfall		5	4

Source: Van Buskirk, Ryffel and Associates, Inc.
*CP = Community Park

The County is required to provide community and regional park facilities to serve the population. The standard of 1.2 acres per 1000 population for community parks and 2.9 acres per 1000 population for regional parks has been established. However, there

are no standards for a community or regional park module. The CIGM applied a community park module of 18 acres, which is the average community park size of the current community parks in the study area. The results of the CIGM indicate that there is a shortfall of 5 community parks in the study area needed to serve the Immokalee and Golden Gate sub-districts of the FLUE.

As indicated in Table 8, currently there are no regional parks in the study area with the exception of a 2.3 acre boat ramp at the end of Lake Trafford Road. The FLUE and its guidelines do not provide a land uses category for regional parks. The CIGM provides the data for the distribution of the population, over time, to determine the future optimal location and timing of regional parks. However, a module or standard for the size of a regional park needs to be established. The state of Florida has suggested a regional parks guideline of 250 acres as a standard**.**

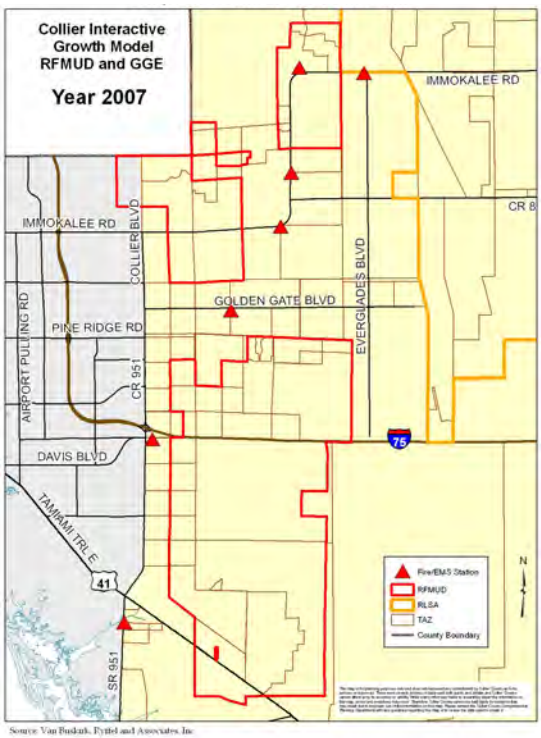
Fire/EMS Stations Sub-Model

This sub-model of the CIGM determined the optimal timing and location of fire/EMS stations. The CIGM forecasted the distribution of the population over time as well as the location of other facilities such as schools, commercial centers and industrial parks, and their proximity to fire stations. The criteria for the location of fire stations were those established by the Insurance Service Office (ISO) for service area and response times.

This sub-model can also be used to develop a Fire station/EMS master plan for the acquisition of future sites and to explore other acquisition opportunities (i.e. the location of commercial centers in which the developer can provide adequate space for dual usage).

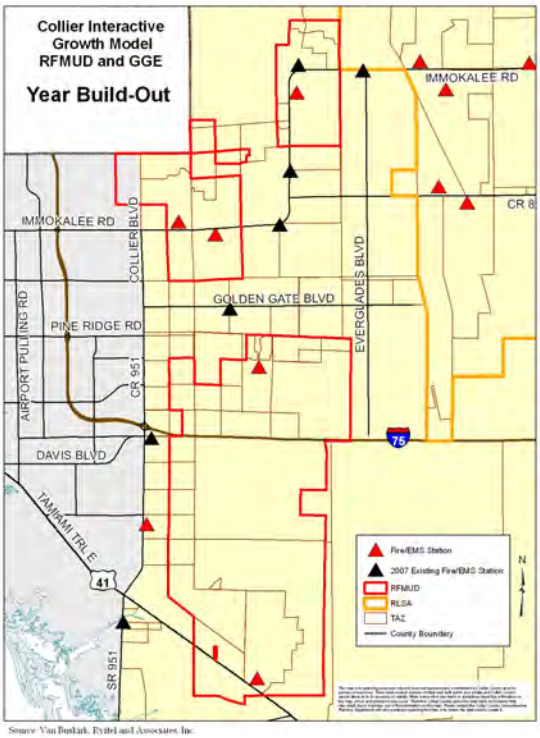
Also, a utility master plan can be overlaid on a fire station/EMS sub-model graphic to determine the timing of distribution of water lines for fire fighting. This will aid in the timing and location of schools, commercial uses, and other facilities in relation to the adequacy of fire protection.

Map 42
Fire/EMS Station Locations
2007 - RFMUD/GGE



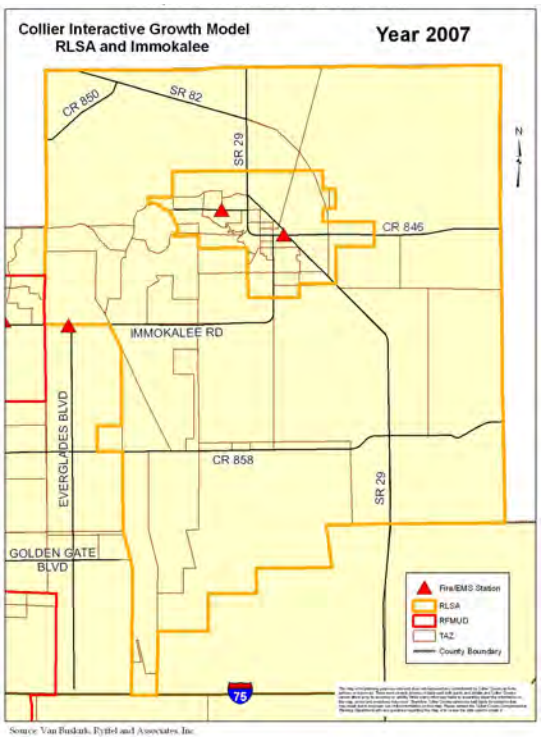
Source: Van Buskirk, Fyffel and Associates, Inc.

Map 43
Fire/EMS Station Locations
at Build-Out - RFMUD/GGE



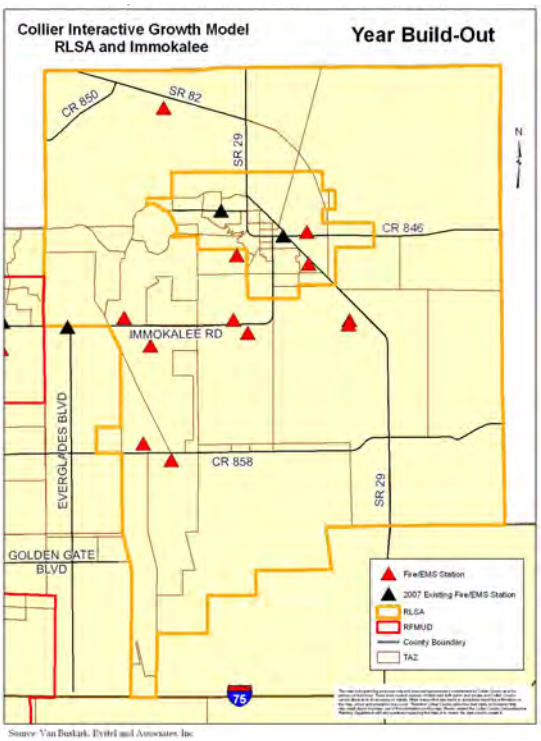
Source: Van Buskirk, Fyffel and Associates, Inc.

Map 44
Fire/EMS Station Locations
2007 – RLSA/Immokalee



Source: Van Buskirk, Fyffel and Associates, Inc.

Map 45
Fire/EMS Station Locations
at Build-Out – RLSA/Immokalee



Source: Van Buskirk, Fyffel and Associates, Inc.

Table 9 indicates the location of existing fire and EMS stations by the TAZ in which they are located. It also indicates the optimal location of future fire stations, by year and the TAZ where they would be optimally located. It also indicates that a shortfall should not occur.

Table 9
Study Area Fire/EMS Stations 2007-Build-out
by TAZ Location

Year	TAZ	Fire/EMS Station
2007	236	Fire Station EMS Station
2007	345a	Fire Station
2007	351	Fire Station EMS Station
2007	360	Fire Station
2007	394	Fire Station
2007	396	Fire Station EMS Station
2007	401a	Fire Station
2007	418	Fire Station
2007	426	Fire Station EMS Station
2010	387	Fire/EMS Station
2015	426	Fire/EMS Station
2015	403a	Fire/EMS Station
2020	390b	Fire/EMS Station
2020	388a	Fire/EMS Station
2020	217	Fire/EMS Station
2020	361	Fire/EMS Station
2025	386d	Fire/EMS Station
2025	389	Fire/EMS Station
2025	411	Fire/EMS Station
2030	388b	Fire/EMS Station
2030	225	Fire/EMS Station
2035	409a	Fire/EMS Station
2035	397	Fire/EMS Station
2040	383a	Fire/EMS Station
2040	355	Fire/EMS Station
2045	383a	Fire/EMS Station
2050	421a	Fire/EMS Station
Build-out	No Additional Required After 2050	
Total		27
Need		27
Shortfall		0

Source: Van Buskirk, Ryffel and Associates, Inc.

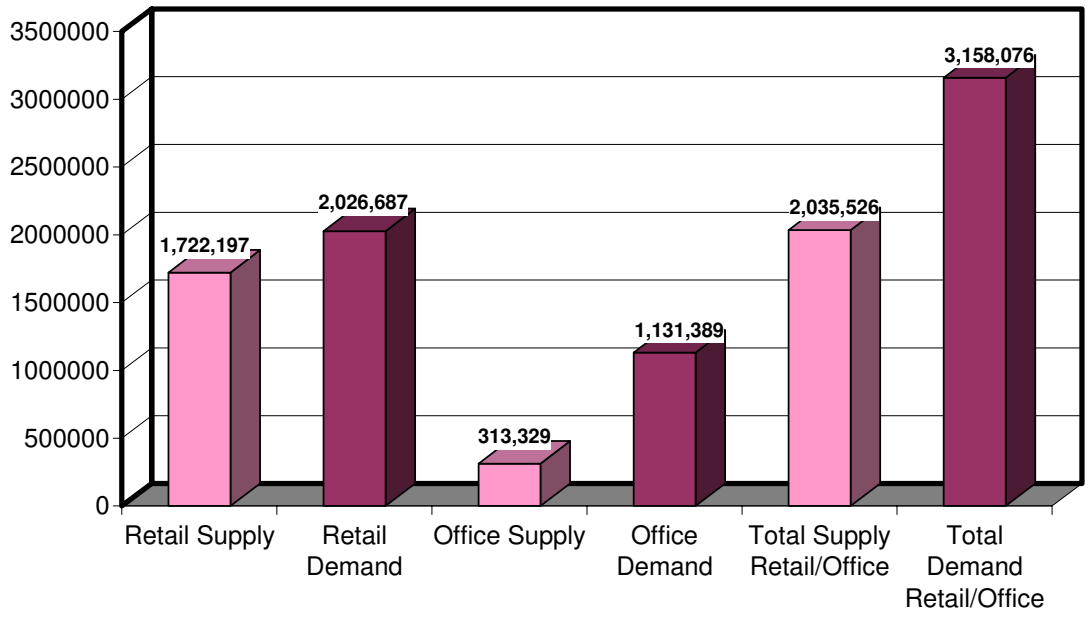
For a Class 1 rating, according to the Insurance Services Office (ISO), all sections of the study area with hydrant protection should be within 1.5 miles of a fully equipped engine company. The distance is measured along an all-weather road. At build-out, most areas in the study area with the exceptions of Preservation, Conservation and Golden Gate Estates, would be served by a public water supply. There are sufficient land uses in the towns and villages in the RLSA, in the villages of the RFMUD and in the activity areas to meet the needs for 27 fire stations for a Class 1 rating. However, those areas without a public water supply like Golden Gate Estates, have a Class 9 rating. There are several options available to provide them with fire protection, but in all probability they can be raised to a Class 8B rating.

Most communities are co-locating their Fire Stations and their EMS Stations. The service area of a fire station on average in the study area, has a similar population size as an EMS station, therefore it makes good sense to co-locate. The CIGM co-located all future fire and EMS stations.

Commercial/Service Sub-Model

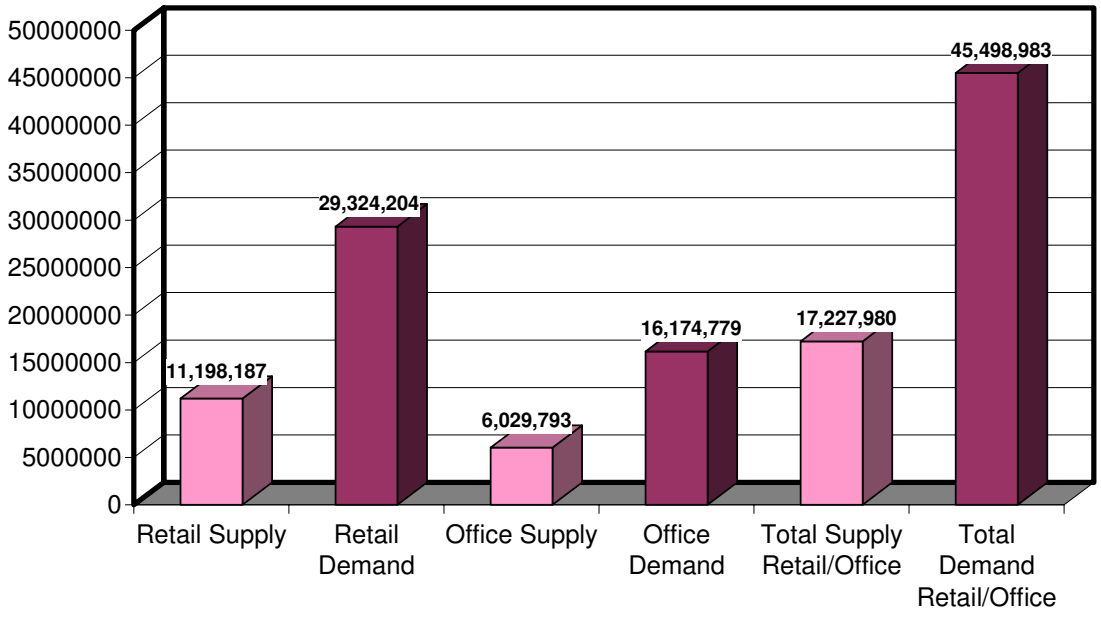
The commercial/service model was created to determine the demand for neighborhood community, and regional commercial centers, which includes retail and office space. This helps determine their optimal locations, required as a function of time and population and as a result of disposable incomes of the population. This sub-model provides guidelines for the apportionment of future land uses for commercial services and office space, and identifies deficiencies or surpluses of land designated for commercial use. This sub-model also provides important inputs to any revisions of the County's Land Use Plan and can be updated annually from data queries.

Figure 7
Commercial/Office Floor Area
Supply And Demand - 2007



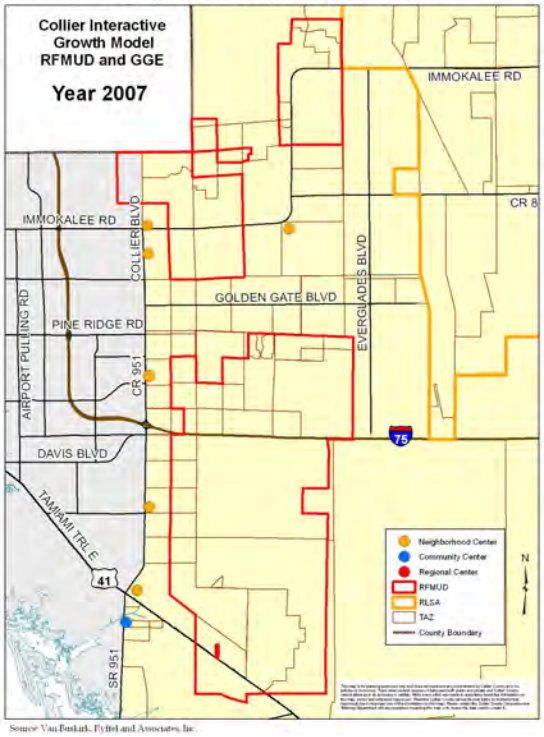
Source: Van Buskirk, Ryffel and Associates, Inc.

Figure 8
Commercial/Office Floor Area
Supply And Demand – Build-Out



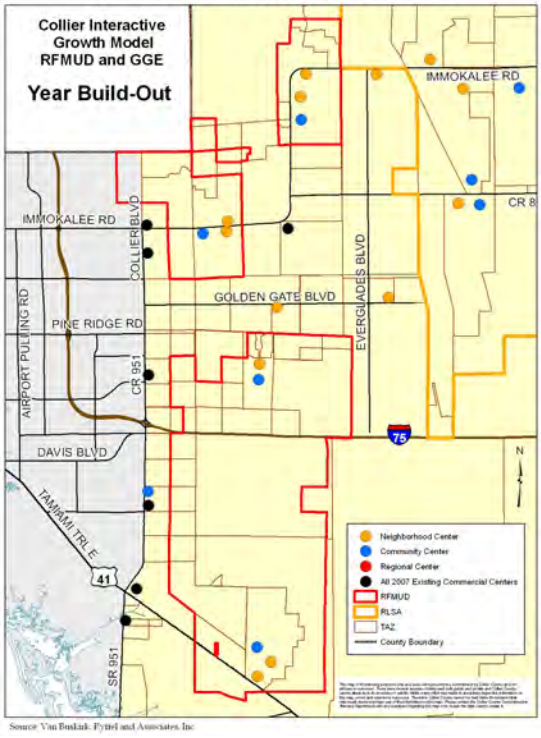
Source: Van Buskirk, Ryffel and Associates, Inc.

Map 46
Commercial Centers By Type/Location – 2007– RFMUD/GGE



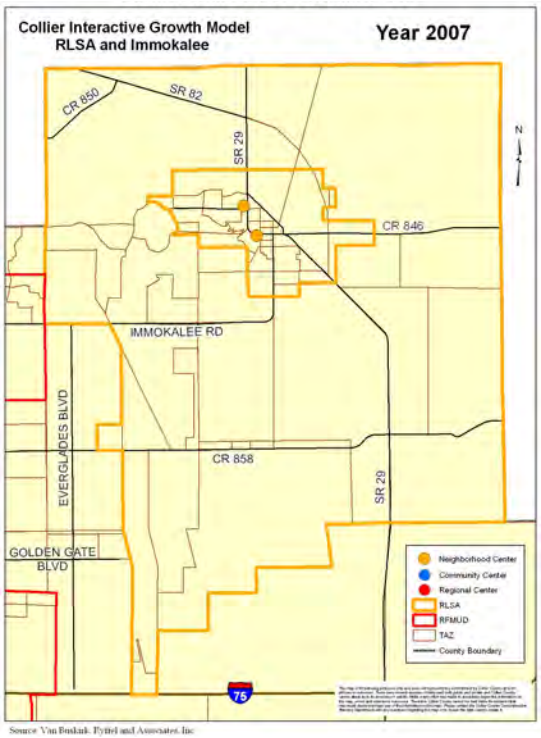
Source: Van Buskirk, Fyfitel and Associates, Inc.

Map 47
Commercial Centers By Type/Location at Build-Out – RFMUD/GGE



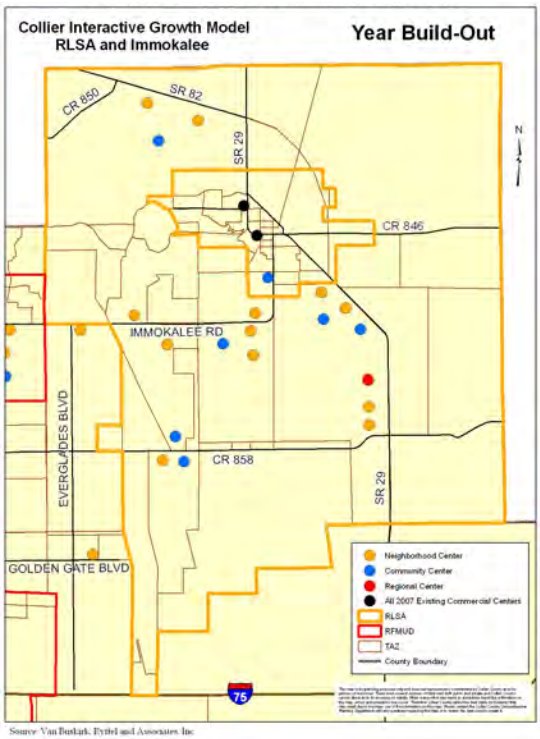
Source: Van Buskirk, Fyfitel and Associates, Inc.

Map 48
Commercial Centers By Type/Location – 2007– RLSA/Immokalee



Source: Van Buskirk, Fyfitel and Associates, Inc.

Map 49
Commercial Centers By Type/Location – at Build-Out – RLSA/Immokalee



Source: Van Buskirk, Fyfitel and Associates, Inc.

Table 10 indicates the location, by TAZ, of existing and future, optimally located commercial centers by type and the timeframe in which they will be needed to serve the growing population.

Table 10

Study Area Commercial Centers 2007-Build-out
By Type and TAZ Location

Year	TAZ	Neighborhood	Community	Regional
2007	417	NC*		
2007	396	NC		
2007	359	NC		
2007	408	NC		
2007	357	1/2 NC*		
2007	403	1/2NC		
2007	232	1/2NC		
2007	220	1/2NC		
2007	345a		CC*	
2010	387	NC		
2010	217		CC	
2015	217	NC		
2015	235	NC		
2015	387		CC	
2020	387	NC		
2020	386d	NC		
2020	402	NC		
2020	359		CC	
2025	213	NC		
2025	390	NC		
2025	225	NC		
2025	386d		CC	
2030	389	NC		
2030	388a	NC		
2030	225		CC	
2035	388b	NC		
2035	383a	NC		
2035	397	NC		
2035	389		CC	
2035	383a			RC*
2040	397	NC		
2040	383a	2 NC*	CC	
2040	388		CC	
2045	383a	NC	CC	

Year	TAZ	Neighborhood	Community	Regional
2045	355	NC		
2045	421a	NC		
2045	397		CC	
2050	355	NC		
2050	421a	NC		
2050	355		CC	
2050	421a		CC	
2055*				
Total		28	13	1
Need		33	14	1
Shortfall		5	1	0

Source: Van Buskirk, Ryffel and Associates, Inc.
*NC = One Neighborhood Center, ½ NC = One half of a Community Center, 2NC = Two Neighborhood Centers, CC = One Community Center, RC = One Regional Center

The categories of neighborhood, community and regional centers describe the commercial centers that serve the population. The size of the site and the market to support them was determined from an analysis of these commercial centers in Collier County. The CIGM demonstrates that the FLUE guidelines can provide 28 neighborhood commercial centers, 13 community commercial centers and 1 regional center. However, for the towns in the RSLA and the Villages in the RFMUD the spatial location of these centers need to be addressed as to specificity, in order to meet the needs of the market. The shortfalls have been identified to be in the Immokalee and Golden Gate areas by the CIGM.

The commercial centers account for 30% of the commercial land to meet the needs of the population. As Figure 8 demonstrates, there is a demand for 45.5 million square feet of commercial building area at build-out for the study area and a designated supply of 17.3 million square feet at built-out for the study area. However, the Towns in the RLSA have designated large town centers to include commercial uses but not the amount. If an amount was specified, it could meet a substantial part of this shortfall.

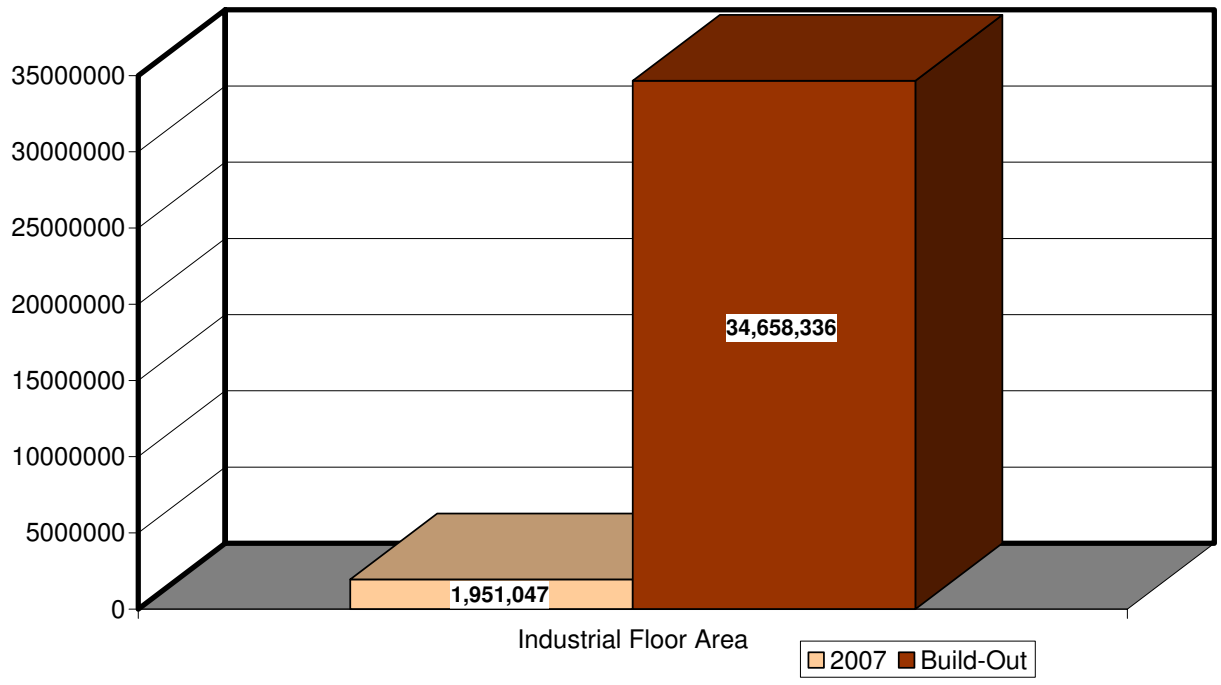
Industrial Sub-Model

The industrial sub-model is not a demand model based on the demand of the population. Rather, it is a design model determined by the community's policy makers. The CIGM design is one scenario based on economic diversification.

One economic objective is to insure employment opportunities for future residents. In the early and intermediate stages, a community is developing a large portion of its labor force in construction and construction related business. As the community matures, construction opportunities diminish and are replaced with opportunities in manufacturing, research and development and services. In order to meet this objective, industrial or tech parks are needed.

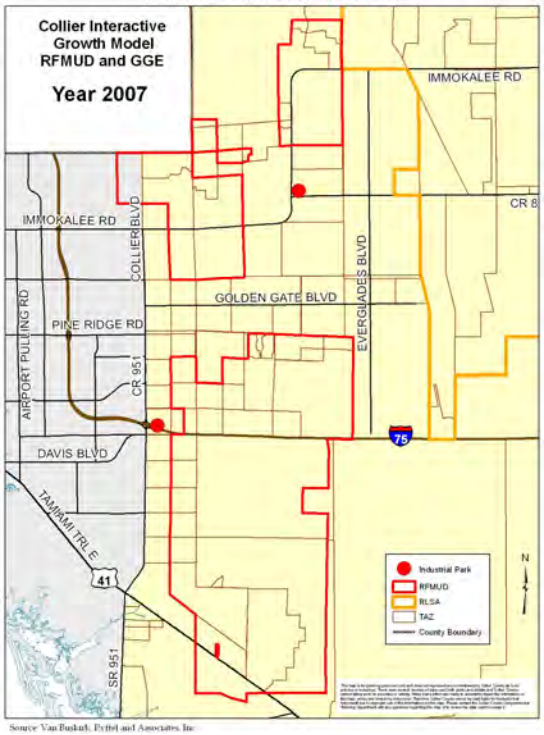
Another objective for industrial development for a community is to diversify its tax as well as its economic base. The CIGM needed to determine an industrial module to assess if there is sufficient land designated to meet theses objectives. It assumes a module of fifty-acre tech parks to illustrate this sub-model. The results are that if a fifty-acre tech park is allocated in each town in the RLSA, there would be sufficient industrial land to meet these objectives.

Figure 9
Industrial Floor Area 2007 and Build-Out



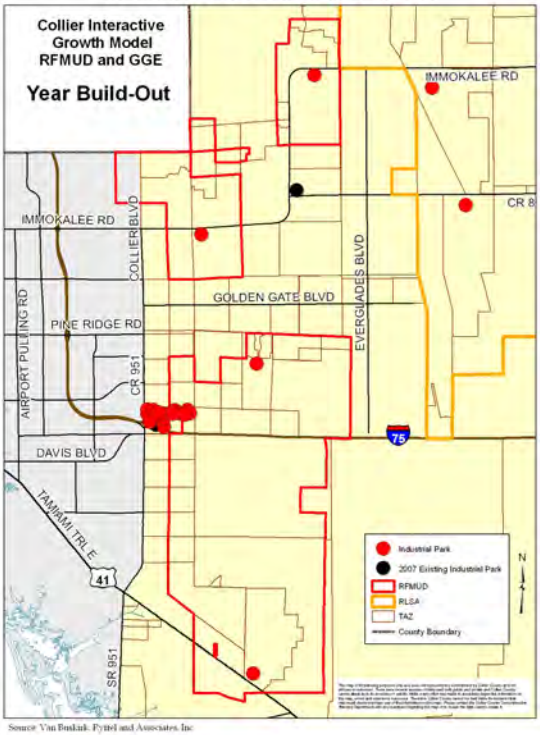
Source: Van Buskirk, Ryffel and Associates, Inc.

Map 50
Industrial Park Locations – 2007 – RFMUD/GGE



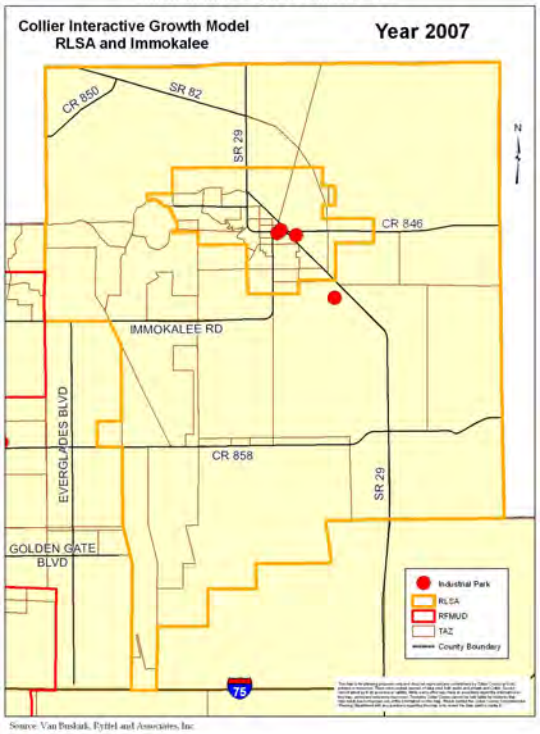
Source: Van Buskirk, Fyffel and Associates, Inc

Map 51
Industrial Park Locations – at Build-Out – RFMUD/GGE



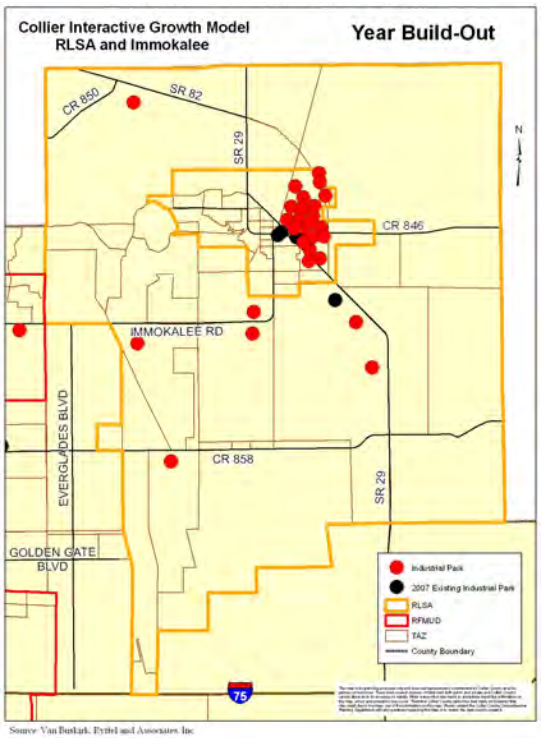
Source: Van Buskirk, Fyffel and Associates, Inc

Map 52
Industrial Park Locations – 2007 – RLSA/Immokalee



Source: Van Buskirk, Fyffel and Associates, Inc

Map 53
Industrial Park Locations – at Build-Out – RLSA/Immokalee



Source: Van Buskirk, Fyffel and Associates, Inc

Table 11
Study Area Industrial Parks 2007-Build-out
by TAZ Location

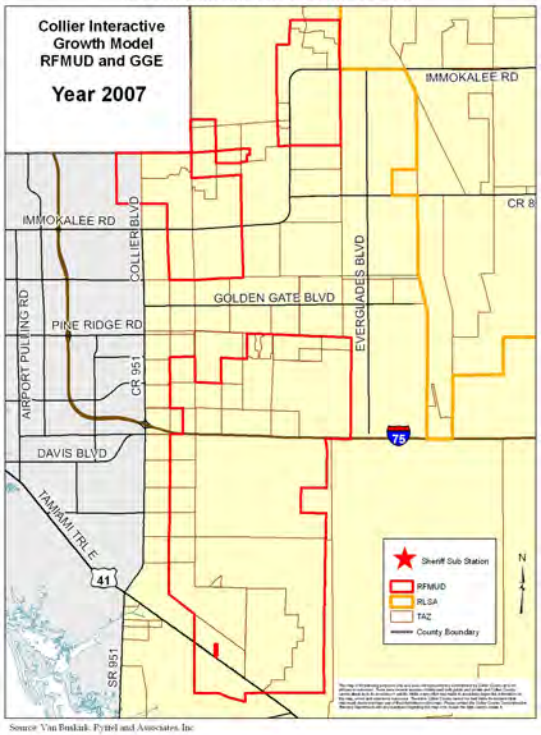
Year	TAZ	Industrial Park (50acre module)	Year	TAZ	Industrial Park (50acre module)
2007	383a	IP*	2040	230	IP
2007	398	IP	2040	230a	IP
2007	410	IP	2040	410	IP
2007	413	IP	2040	383a	IP
2007	428	IP	2040	397	IP
2015	387	IP	2045	426	IP
2020	426	IP	2045	230	IP
2020	230	IP	2045	230a	IP
2020	410	IP	2045	421a	IP
2020	386d	IP	2045	355	IP
2025	426	IP	2050	426	IP
2025	230	IP	2050	230	IP
2025	230a	IP	2050	410	IP
2025	389	IP	2055	426	IP
2025	217	IP	2055	230	IP
2030	426	IP	2055	410	IP
2030	230	IP	2055	230a	IP
2030	230a	IP	2060	426	IP
2030	388a	IP	2060	230	IP
2035	426	IP	2060	425a	IP
2035	230	IP	2065	426	IP
2035	230a	IP	2065	411	IP
2035	410	IP	2070	426	IP
2035	383a	IP	2070	425a	IP
2035	225	IP	2075	426	IP
2040	426	IP	2080	425a	IP
			Build-out	No Additional Required After 2080	
			Total		52
			Need		52
			Shortfall		0

Source: Van Buskirk, Ryffel and Associates, Inc.
*IP Industrial Park

Law Enforcement (Sheriff) Sub-Model

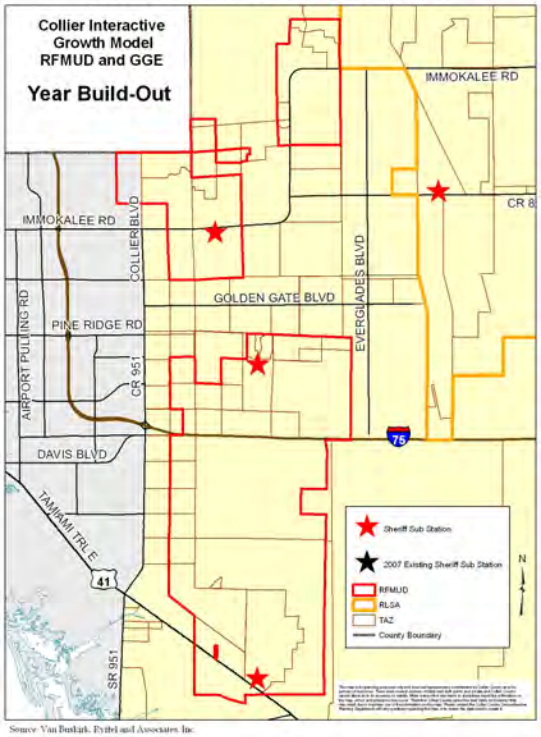
The CIGM identified the need for 7 Sheriff's Department sub-stations at build-out to serve the population of the study area. The FLUE does provide the opportunity for these sites as determined as to timing and location by the CIGM in accordance with their standards.

Map 54
Sheriff Sub Station Locations – 2007 – RFMUD/GGE



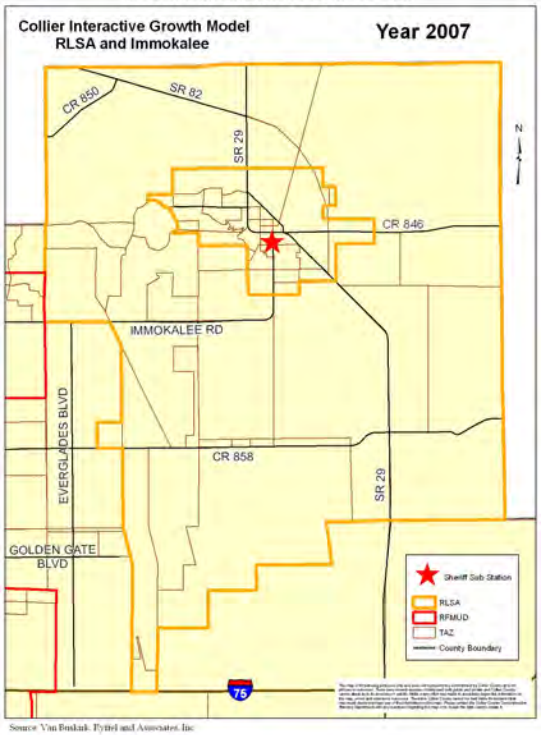
Source: Van Buskirk, Fyfitel and Associates, Inc

Map 55
Sheriff Sub Station Locations – at Build-Out – RFMUD/GGE



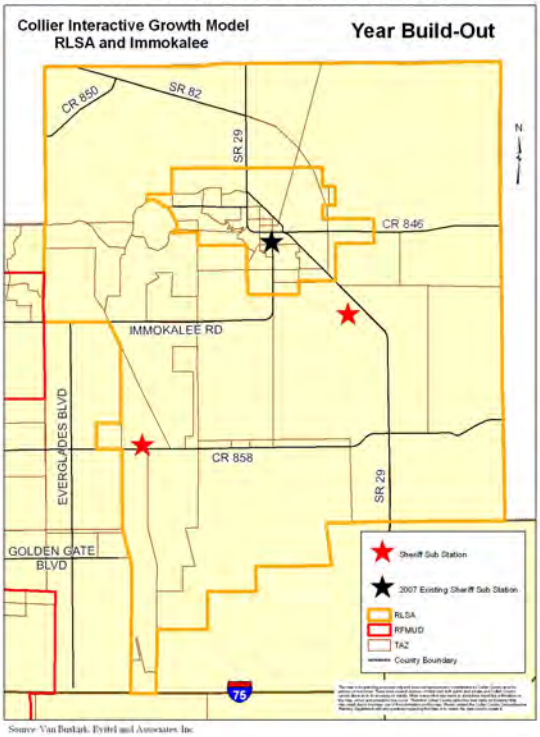
Source: Van Buskirk, Fyfitel and Associates, Inc

Map 56
Sheriff Sub Station Locations – 2007 – RLSA/Immokalee



Source: Van Buskirk, Fyfitel and Associates, Inc

Map 57
Sheriff Sub Station Locations – at Build-Out – RLSA/Immokalee



Source: Van Buskirk, Fyfitel and Associates, Inc

Table 12
Study Area Sheriff Sub Stations 2007-Build-out
by TAZ Location

Year	TAZ	Sheriff Sub-Station
2007	351	Station
2007	405	Station
2015	383a	Station
2025	390b	Station
2030	217	Station
2035	355	Station
2040	225	Station
Build-out	None Required After 2040	
Total		7
Need		7
Shortfall		0

Source: Van Buskirk, Ryffel and Associates, Inc.

Affordable Housing Sub-Model

It was the purpose of the affordable housing sub-model to determine the pro-rata share (percentage) of affordable housing units to all new units within the study area. This would be based on future growth to build-out as determined by the CIGM. A review of the findings contained in the Affordable Housing Workshop presentation on March 4, 2008 to the BCC provided valuable insight in making this determination.

To be certain, we are in a period of difficult economic times and the real estate market has experienced a significant decline, making many units in the general real estate market more economically attractive. While some may be able to take advantage of these bargains many more cannot, resulting in a real estate market that is a moving target.

With what is purported to be the highest county *Area Median (Household) Income* (AMI) in Florida, (at $63,900) it should be expected that affordable housing could be a major local issue. To begin addressing this issue at least part, it must be what reasonable percentage of total housing units should be affordable. In Collier County, the target group is those households earning between 35% and 120% of the AMI. These households are considered to be "cost-burdened" because they spend more than 30% of their income on housing, including principal, interest, taxes and insurance, or rent and utilities. In the workshop mentioned above, it was learned that in the year 2007, there was an affordable housing need of 10,461 units and 6,208 available, leaving a deficit of

4,253 units on a county-wide basis. Table 13 shows the breakdown of the AMI groups and the portion they represent of the total affordable need of 10,461 units in 2007.

Table 13
AMI Groups by Number and Percent of 10,461 Needed Units in 2007

AMI Category	Number Portion of Afford. Need	Percent Portion of Afford. Need
35%	3,812 units	36%
50%	2,292 units	22%
60%	1,573 units	15%
61-120%	2,784 units	27%
Total	10,461 units	100%

To determine the percentage of affordable housing units that should be made available, on a pro-rata basis in the study area, the total 2007 county-wide need of 10,461 units was compared to the total county housing units in that year. The estimated U.S. Census has indicated a total of 192,043 units. This translates into 5.4 percent. This percentage was then applied to the study area's total number of dwelling units, in five-year increments to build-out as forecasted in the CIGM. Table 14 shows results of the allocation.

Table 14
Study Area Affordable Housing Units Needed 2007-Build-out*

Year	Study Area Population	Total Study Area Dwelling Units	Pro-rata Time Interval Affordable Dwelling Units Needed @ 5.4 Percent	Net Additional Dwelling Units Needed Between Previous and Current Time Interval
2007	79568	32781	1770	N/A
2010	89910	37039	2000	230
2015	117916	49744	2686	686
2020	153631	66619	3597	911
2025	191329	84523	4564	967
2030	230283	102910	5557	993
2035	269814	121704	6572	1015
2040	308560	140083	7564	992
2045	343071	156327	8441	877
2050	371180	169429	9149	708
2055*	392562*	179294	9682	533
2060	407970	186339	10062	380
2065	418623	191180	10324	262
2070	425789	194412	10498	174
2075	430524	196539	10613	115
2080	433628	197929	10688	75
Build-out	442537	202107	10914	226

Source: Van Buskirk, Ryffel, and Associates
*90% of Build-out.

The column in the table entitled, "Pro-rata Time Interval Affordable Dwelling Units Needed at 5.4 Percent" is the result of multiplying the column entitled "Total Study Area Dwelling Units" by 5.4 percent. The result of this would be the number of affordable units that should be made available during the time interval indicated in the "Year" column. As an example for the year 2065, 10,324 affordable units are indicated. That means that between the years 2007 and 2065, 10,324 affordable units would have ideally been made available.

The meaning of the column entitled "Net Additional Dwelling Units Needed Between Previous and Current Time Interval" shows the number of units that would have to be constructed in any of the time intervals assuming that all those required in the preceding time interval were available. Theoretically, or if determined by County policy, if the affordable units were not available, the deficit would be added to the following time interval(s).

To determine if the 5.4 percent factor is reasonable, we reviewed the situation in one of the study's comparable counties. By utilizing the procedure described for Collier County, we performed the same analysis for Sarasota County. The Director of Housing and Community Development there agreed that the methodology was appropriate. The affordable housing need factor there was 4.2 percent which appears close to Collier's 5.4 percent. It gets closer however, when it is recognized that Sarasota County only addresses affordable housing needs up to 80 percent of the Area Mean Income (AMI) while Collier County addresses up to 120 percent of the AMI.

It would be safe to conclude that if the 80 percent was increased to 120 percent in Sarasota County, their percentages would be nearly the same as Collier's. Conversely, as shown in Table 13, in Collier County, there was an AMI category of 61-120% that represents 27 percent of the total affordable need. It was unfortunate that the 80% AMI was not differentiated within that group for purposes of comparing it to Sarasota County. However, if everything above 80% were removed from the affordable count, in Collier County, just for purposes of comparison, we believe that the percentages of affordable need would be very close between the two counties.

Overall CIGM Conclusions

The following is an overview of the conclusions of this report:

- The Future Land Use Element (FLUE) of the County's Growth Management Plan is a sophisticated and progressive plan that addresses multiple environmental and development issues that results in a series of complex approaches to address

these conflicts in the best interest of current and future residents. The FLUE best represents future development in the study area. The CIGM had to integrate the multiple disciplines (i.e. schools, parks, etc) and multiple development scenarios (RLSA, RFMUD, etc) into a dynamic model that evolves over time. The CIGM met that challenge.

- The CIGM estimates that the population for the study area in 2007 was 79,568 and forecasted it to be 442,537 at build-out. The forecasted population at build-out for some of the key sub-districts are: RLSA 210,632; RFMUD 34,837; Immokalee 59,127 and for Golden Gate Estates (GGE) 79,614.

- There are sufficient opportunities provided in the FLUE for land uses designated for schools, community parks, commercial centers, industrial development, fire and ems stations and sheriff sub-stations to meet the needs of future populations with the exception of Immokalee and the Golden Gate Estates. It is anticipated that the current development of the Immokalee Master Plan will address these needs.

- Golden Gate Estates is a unique low-density residential development. One strategy to address the shortfalls is to disturb the land uses in GGE as little as possible. For example, to locate the sites for facilities on its periphery in which the service area is sufficient to penetrate GGE so that the coverage provides the necessary level of services.

- For the towns and villages in the RLSA, a level of specificity needs to be established in the development of their plans for land uses and the spatial distribution to insure that the needs of future populations are met. For example, if there is a need for two elementary schools, it is important that the future sites be spatially located to serve their neighborhoods. The CIGM provides the data to assist in this endeavor.

- The FLUE does not have provisions for a regional center. Given the forecasted build-out population of the RLSA and Immokalee of 269,759 persons, it would call for a regional center to support a regional hospital, a regional shopping center, a regional park, etc.

- The CIGM needs to be updated annually in order to manage growth, identify development and demographic trends, assist in the apportionment of land uses to meet the needs of future populations and to determine and monitor the impacts of growth.