

Memorandum

TO: Bill Meyer, Hall County Director of Planning
Kip Padgett, Gainesville Director of Planning
cc: Gainesville City Council
Hall County Board of Commissioners
Jim Shuler, Hall County Administrator
Brian Shuler, Gainesville City Manager
Greg Dale, McBride Dale Clarion
Heitzso

FROM: Bill Ross

DATE: June 20, 2003

RE: Citizen Comments—Demand Trends and Development Demand Analysis

Since publication of the Draft *Demand Trends and Development Demand Analysis* for public review, we have received comments only from one source—Heitzso—although others may share some of the same concerns.

The attached analysis considers each of the concerns expressed by Heitzso (as downloaded from his web site) and provides a response or observation as appropriate.

We appreciate the detailed analysis that Heitzso has provided, which reflects a strong concern for the community and the future of Hall County and Gainesville. We agree whole-heartedly with Heitzso's comment that, "Planning for the future demands good decisions based on reliable information." In summary, however, we do not find that any of his comments would result in changes of significance to the comprehensive planning process currently underway.

It is important to always bear in mind what the forecasts in the report are, and are not. The forecasts are not predictions of the future that will be forced upon the Comprehensive Plan, but planning reference points that help identify forces and trends to be considered in making public policy-making choices on future growth.

Ultimately, the population and employment forecasts feed into the *Capacity Analysis*, which considers the implications of the forecasts in terms of land development and compares the growth to land resources. Variations on the forecasts, including Heitzso's own forecasts, would not change the essential finding of the *Capacity Analysis*: That future growth demands suggest that the Comprehensive Plan should be an "end state" plan that considers the implications of full build-out of the county.

Analysis of Concerns Expressed by Heitzso

Most Recent Version downloaded 6/15/03

Concern Raised	Response or Observations
<i>Failure to Analyze Growth Demographic Components</i>	
<p>The primary criticism is that forecasts of a population requires an analysis, at the minimum, of the underlying crude birth, death, and immigration rates. ROSS+associates' use of simplistic function regression on population counts is not a valid technique. Furthermore, a population undergoing significant change, as is Hall County, requires an analysis of the major demographic components found within that population. Ideally, age specific birth, death and immigration rates for each demographic component should be studied.</p>	<p>This "cohort survival" technique is useful for short-term projections, but proves highly inaccurate in making long-term projections because of the many variables involved. Separate assumptions must be made regarding the birth rate over the next 25-30 years, the death rate, and net migration. Migration itself has three forms—international, domestic and federal movement—each of which is the result of adding the number of people moving in and subtracting the number of people moving out. Every variable is an opportunity to be inaccurate.</p>
<p>Compare the following population pyramids for the United States, Mexico, and for Hall County non-Hispanic and Hispanic populations for the year 2000. [Population pyramids omitted for brevity.]</p>	
<p>The 1985 Georgia County Guide forecasted Hall County's population would grow to 97,906 in 2000. Using the 2000 census which is acknowledged to undercount the Hispanic population, that forecast missed 41,371 people, of which 27,242 were Hispanic. Hence, at least 66% of the unanticipated growth in Hall County was Hispanic. This percentage increases even further when the undercount is taken into account. Using Doug Bachtel's estimate of the undercount of 2.5, the percentage of unanticipated growth attributable to Hispanic immigration increases to 83%.</p>	<p>Assigning the entire 2000 Hispanic population (27,242) to this alleged underestimate yields a grossly overstated percentage of 66%.</p>
<p>This is significant in light of the high birth rate found in Mexico and that the majority of Hispanics in Hall County are from Mexico. In 1970 Mexico had the highest birth rate in the world outside of Africa with the average Mexican woman having 6.7 children. Due to a strong government campaign to reduce birth rates, Mexico had reduced their natural rate of increase to 1.8% by 2000. A likely scenario is for Hall County first generation Hispanics to mimic their native cultural's natural growth rate.</p>	<p>In fact, the Census Bureau's estimates for 1991-1999 would have resulted in a lower population than counted by some 13,400 people. [Importantly, the Census Bureau used the cohort survival technique, above, each year to make its estimates, which obviously proved unreliable.]</p>
	<p>It cannot be assumed that characteristics of a larger population (like Mexico) apply equally, <i>ipso facto</i>, to a portion of that population (Hispanics in Hall County). This is a common error in set theory that any mathematician would recognize.</p>

Concern Raised

Response or Observations

ROSS+associates compares Hall County's growth to Gwinett and Cobb Counties. However, Gwinett and Cobb Counties primarily reflect growth pressure from metro Atlanta. Hall County's growth is primarily driven by Hispanic labor immigration. This difference will be reflected in future patterns of immigration, births, and deaths. The initial wave of Hispanic immigration was job driven. Construction boomed in Hall County through the 1990s along with the United States economy. Poultry jobs opened up as Asians departed. These construction and poultry industry jobs were filled by Hispanics immigrating into the county. Most Hispanics are living in the community where they work. The Hispanic population pyramid for Hall County 2000 shows a bias of young adult males. The flow of Hispanic male laborers will taper off if labor jobs are not available. However, those young adult Hispanic males who have settled in the county will bring over family members and have children at roughly the same birth rate as is found in their native culture. It is important to consider the different underlying causes of growth in Cobb and Gwinett Counties from Hall County to properly forecast growth in Hall.

← Net domestic migration far outpaced net international migration during the 1990s, by a factor of about 5 to 1.

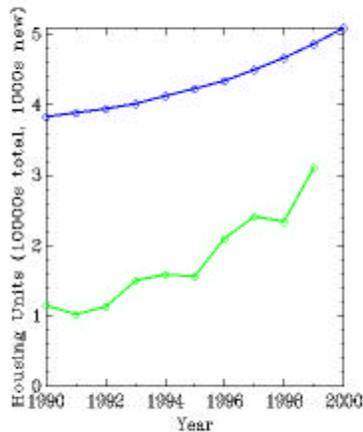
← Growth over the past 30 years in Cobb and Gwinnett were not factors in the Hall forecasts. The comparison was made only to address the question, "How will our future growth compare to what has happened in those two counties?"

Regressing on Smoothed Historical Data

Given that ROSS+associates performed a simplistic function regression on population time series data, they incorrectly regressed on data that had already been smoothed by equations for the intercensal years between 1990 and 2000. This smoothing can be seen in the following graph of total housing units (10,000s) and new housing units (1,000s).



The housing data were not smoothed. The annual housing totals resulted from the addition each year of units issued building permits.

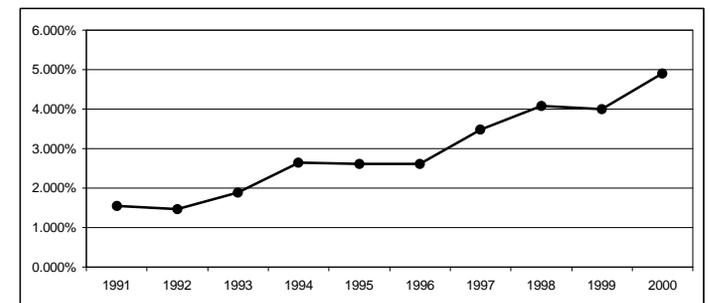


Comparing 1,000s to 10,000s on the same graph is not appropriate. The eye can be fooled, but the data does not show any smoothing at all. Small variations in large data sets are difficult to “see” visually but easy to identify mathematically.

Had the data been smoothed, there would be some “continuity” in the annual increase in total units. This is not the case, as shown below.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total Housing Units	38,315	38,902	39,469	40,211	41,271	42,345	43,449	44,960	46,792	48,662	51,046
Annual Increase		1.532%	1.458%	1.880%	2.635%	2.603%	2.608%	3.476%	4.076%	3.996%	4.900%

Notice the variation in new housing units data that corresponds to the normal variation found in real historical data. The total housing units data has obviously been smoothed by equations. ROSS+associates uses the smoothed total housing units data to generate the intercensal population estimates and then feeds these smoothed population estimates into their function regressions. Once historical data has been smoothed with an equation it is guaranteed that a similar equation will artificially have the best fit. No reliable statistician would attempt to regress higher ordered functions on data that has already been smoothed by a higher ordered function, and then claim any validity to the goodness of fit measure of the resulting regressed function as ROSS+associates did on page 8 of their report under **Initial Results**.



There is an obvious “trend” to the data, of course, which is what regression analysis seeks to identify.

Concern Raised

Response or Observations

Using ROSS+associates' yearly population data for Hall County from 1990 to 2000 a time series was created using The Coca-Cola Company's Interactive Forecasting System. Of the six functions regressed on ROSS+associates' data the modified exponential function ($y=C0+C1*C2^{**t}$) had the best r-squared (goodness of fit) of .999825, versus .961950 for the linear, and .999115 for the quadratic. The modified exponential function predicts Hall County population in 2030 with a 90% confidence interval to be between 3,762,907 and 3,765,376. By comparison, the linear function predicts Hall County population in 2030 with a 90% confidence interval to be between 243,308 and 279,135. There are two points to be made. One is that the artificially smoothed historical data shows up in the artificially near-perfect r-squared values. The other is that higher ordered functions are seriously prone to error when extrapolated out, for instance, thirty years from ten years of data.

Using regression formulae accepted by mathematicians, our projections did not achieve such radically different results (see Table P-6).

Our linear regression on the 1990s data achieved results equivalent to Heitzso's, but the trend is clearly not linear.

The data was not smoothed, as discussed above.

Table P-6 also shows regressions against the past 30 years (1970-2000) with high-correlation results comparable to the 1990s parabola.

Concern Raised

Response or Observations

Omitting Recent Available Data

Table P-5 on pg. 7 of the ROSS+associates report used housing building permits to generate intercensal population estimates for the years 1991 through 1999. The same technique can be used to extend the population estimates out to 2003 based on 2000, 2001, and 2002 housing building permits. Doing so provides Hall County population estimates of 144,459, 148,900, and 153,902 for the years 2001, 2002, and 2003. Regressing first, second, and third order equations on the ROSS+associates' population estimates for 1990 through 2000 combined with the population estimates for 2001, 2002, and 2003 yields new Hall County forecasts for 2030 summarized in the following table.

Function	2030 Forecast Population	
	Based on 1990-2000 Pop. Estimates	Based on 1990-2003 Pop. Estimates
First order (linear)	261,222	277,661
Second order (parabolic curve)	603,730	476,728
Third order ('ess')	1,183,570	-164,463

Note that the second order function used by ROSS+associates to generate their high forecast found in Table P-11 on pg.11 and the foundation of their most likely forecast, drops from 603,730 to 476,728 for 2030 when the regression includes recent population estimates. Omitting this recent available data inflated the high population forecast in 2030 by 27%.

The change in the 'ess' function is more dramatic with the revised forecast for 2030 dropping to a negative population. As noted earlier, "... higher ordered functions are seriously prone to error when extrapolated out, for instance, thirty years ...".

The following table documents the 2001, 2002, and 2003 population estimates used in the above regressions. These recent population estimates are created using the same techniques used by

The figures presented by Heitzso were developed using some methodology different from our own, resulting in incorrect numbers across the board.

It is true that expanding the data set from 2000 to 2003 would result in different projections. The 2030 projections using the 1990-2003 time period would be:

Linear	282,139
Parabola	515,087
"Ess" curve	74,364

Following through, this would result in our "most likely" forecast for 2030 to be 452,438 instead of 489,366 (a 7.5% reduction).

However, including these years in the data set for the projections would skew the results based on temporary current conditions. The past several years have seen a downturn in the economy that has been reflected in a reduction in residential construction. Comparing permits issued in 2000, 2001 and 2002 to the previous 3 years (1997-99), we see an 18% reduction in new house permits, a 28% reduction in new manufactured homes, and a 47% reduction in multi-family.

In our view, the 2000-03 period reflects a downturn in the economic cycle that will not become a permanent feature of growth in Hall County.

For this reason, the results of the "ess" curve were considered unreasonable in our analysis, and continue to be so.

Concern Raised

Response or Observations

ROSS+associates to generate their intercensal estimates for Hall County, as found in Table P-5 on pg. 7. Notes after the table contain detailed explanations of the data sources.



The same techniques were not used. Most of the figures shown on the table are incorrect, including several for 2000 that are available directly from the census.

Year	2000	2001	2002	2003
Gainesville and Uninc. Hall Housing Units Permitted	2191	1853	2043	
Total Housing Units Permitted	2121 (see note)	1824.44	2011.51	
Gross Housing Units	51768	53167	54465.44	55950.95
Discounted Housing Units	722	526	526	526
Total Housing Units	51046	52641	53939.44	55424.95
Percent Occupied	92.8	92.8	92.8	92.8
Number of Households	47370.69	48850.85	50055.8	51434.36
Persons per Household	2.89	2.91	2.93	2.94
Population in Households	136948.66	142071.59	146433.69	151347.93
Pop in Group Households %	1.68	1.68	1.68	1.69
Pop in Group Households	2297	2387.42	2466.04	2554.28
Hall County Total	139245.66	144459.01	148899.73	153902.21
Hall County Total Rounded	139277	144459	148900	153902

Notes:

- Gainesville and unincorporated Hall County housing units permitted data for 2000, 2001 and 2002 is from the Gainesville-Hall County Building Inspections Department.
- Total housing units permitted in 2000 is from census data.

Concern Raised

Response or Observations

- Total housing units permitted in 2001 and 2002 are estimates generated from the 2001 and 2002 Gainesville and unincorporated Hall County housing units permitted numbers multiplied by the average ratio for these numbers for 1998, 1999 and 2000.
- Gross housing units is calculated as prior year housing units plus prior year housing units permitted.
- Total housing units for 2000 is from census data.
- Discounted housing units for 2001, 2002, and 2003 is the average of 1991 to 2000 discounted units.
- Percent occupancy for 2001, 2002, and 2003 is 2000's value carried forward. Given the current high vacancy rate and record number of foreclosures this seemed a reasonable estimate that favors a high growth rate mental model.
- Persons per household for 2001, 2002, and 2003 is estimated from a first order linear regression on 1990 to 2000 data for persons per household.
- Population in group households percent for 2001, 2002, and 2003 is estimated from a first order linear regression on 1990 to 2000 data for population in group households percent.
- Differences between ROSS+associates' totals, as for Hall County Total in 2000 and the unrounded figures in the above table are due to round off of percentages and rates as printed in their report and the actual numbers used. For instance, for 2000 in Table P-5 on pg. 7 if you multiply 51,046 by 92.8% you arrive at 47,371, not the 47,381 shown on the table. What is happening is that the percent number used in their calculations has more decimal places than were printed in the report and rounds down to 92.8%.

This analysis of ROSS+associates omitting recent data in their regressions is **not** an endorsement of these techniques to forecast Hall County's population growth.

Concern Raised

Response or Observations

Housing Unit Removals

ROSS+associates' data removes 5,259 housing units between 1991 and 2000 (Table P-5, pg. 7). Given that it is rare to remove a housing unit less than 10 years old these 5,259 housing units would have been deleted from the 38,315 housing units stock in place in 1990. By this accounting approximately 14% of Hall County's entire 1990 housing stock was removed by the year 2000.

A more realistic measure of removals comes from the Gainesville-Hall County Building Inspections Department's data for permits issued for demolition versus construction of housing units. Demolition permits were not required until a few years ago so only data from 2001 and 2002 is used. Also, there is no guarantee that all removals obtained the proper demolition permits. As such, these numbers are indicators of the approximate size of the ratio of additions to removals and not precise numbers.

Year	2001	2002
Housing Units Added	1853	2043
Housing Units Removed	69	68
Ratio Added:Removed	27:1	30:1

By comparison, ROSS+associates' average ratio of added to removed housing units is approximately 3:1. Removal of one housing unit for every 27 added is likely; the removal of one housing unit for every 3 added is not.

ROSS+associates ignores the census Hispanic undercount (see [Failure to Include an Estimate of the Hispanic Undercount](#)). This undercount corresponds to unreported housing units. ROSS+associates are therefore forced to apply unrealistically steep discounts to the housing stock to push the more solid data of building permits down to underreported census housing stock numbers.

The adjustments to the housing stock deal with the fact that more units were authorized during the 1990s by building permits that the 2000 inventory indicates.

Demolitions account for only a portion of this difference. Mobile home move-outs are not documented but new units are, and some "permitted" units are never built.

The adjusted housing inventory on Table P-5 is clearly consistent with the occupancy rate, persons per household and group quarters population from the 2000 Census.

"Removals" include mobile home move-outs and units never built, neither of which show up in permit data. Only a portion of actual demolitions are actually reported.

The ratio is 1.4 units permitted for every net increase of 1 unit in the inventory.

Nationally, challenges to the 1990 Census were primarily based on "missed" housing units. There is no documentation of this by Hall County for 2000.

The Hispanic undercount is more commonly ascribed to under-reported household sizes and undocumented immigrants rather than "Hispanic" houses not being counted.

Concern Raised

Response or Observations

Failure to Include an Estimate of the Hispanic Undercount

ROSS+associates' population estimates assume that the 2000 census counts are accurate. No mention is made of the Hispanic undercount and no adjustments based on the undercount are made. Doug Bachtel of the University of Georgia estimates the Hispanic population in Hall County in 2000 at 2.5 times the census count of Hispanics. A Hall County apartment owner surveyed the Hispanics in one of his complexes shortly after the 2000 census and noted that only 50% responded, which corresponds to a correction of 2.0. Another undercount estimate based on building permits issued and the average number of Hispanics of Mexican origin per household for the United States as taken from the Census March 2000 Supplement has a 1.25+ correction factor (building permit data is still being collected from some municipalities, hence the '+' sign). Another estimate can be garnered from the average fertility rate in Mexico in 2000 of 9.3% (births per 100 women aged 15 to 44) and the 1,031 Hispanic births 2000 and determining the total Hispanic population from the census 2000 pyramid for that population, which yields a correction of 1.77. Finally, while Census Bureau does not endorse an estimate of the 2000 undercount, their official estimate of the 1990 undercount is 2,257. If we assume that this undercount is composed primarily of Hispanics then the 1990 correction factor for the Hispanic count is 1.5 and it is not unreasonable to use this as another estimate of the correction factor for 2000. Whichever estimate of the undercount is closest to reality, ROSS+associates' failure to acknowledge the Hispanic undercount implies they have not considered the long term effect of cultural differences on growth.

Further discussion of the 2000 Hispanic undercount can be seen [here](#) [on Heitzso's web site].

The point of the Development Demand Analysis is to estimate demand for new land development. In the case of residential demand, this is embodied in the forecasts of new housing units.

The Census Bureau uses "imputation" to estimate the population in a housing unit know to be occupied but for which no response can be obtained. Thus, a population would have been "imputed" for the 50% nonresponding units, not "0". There may be an undercount, but certainly less than this suggests.

Regardless of any Hispanic undercount, the physical inventory of housing units is more certain.* Whether a housing unit contains more people or fewer, it is the construction of the housing unit itself that uses land.

If the total population figures were increased to include an undercount, the average household sizes would also increase to account for the housing inventory. The larger household sizes divided into the larger population figures would produce the same results as our forecasts.

*Because challenges nationally in 1990 focused on housing unit counts, the Census Bureau worked closely with localities before the census was taken in order to identify existing subdivisions, apartment complexes, etc.

Factual Errors

Errors of fact occur in the following:

- 1. **Annual Housing Inventory - 1990-2000** (ROSS+associates' Tables P-3 and P-4 on pg.6)
Based on data obtained by MetaMedia, Inc. from Development Services Department of Gainesville/ Hall County, in the ROSS+associates' report permits issued in Hall County include data from both Gainesville and Hall County in some years and omit addition of Gainesville data in others. Specifically, both *multi-family* and *single family detached* permits in Gainesville in 1990 and 1991 were omitted from the totals. *Single family detached* permits for Gainesville were omitted for 1992.
- 2. **Annual Housing Inventory - 1990-2000** (ROSS+associates' Tables P-3 and P-4 on pg.6)
Basic addition errors occur in the *single family detached* permits issued in 1997, 1998, and 1999. When combined with the errors noted in (1) above, the net result is that seven of the ten years presented have incorrect totals of permits issued.
- 3. **Population Estimates - 1990-2000** (ROSS+associates' Table P-5 on pg.7)
For the year 1990 ROSS+associates identified *persons per household* figure was incorrectly selected and applied to the *number of households*, resulting in an inflated *population in households* and ultimately in the *Hall County Total Population*. Rather than use the census identified county-wide *persons per household* figure of 2.70, the census identified *persons per owner-occupied unit* figure of 2.72 was used. A simple comparison of the population total obtained by this mathematical exercise and the total provided by census would have pointed out the error.

← Our building permit data were obtained directly from the Building Inspections Division and has been double checked by the County.

Applying Heitzso's corrections, this amounts to a total of 112 units out of 17,990, an insignificant 0.62%. Revising the figures produces equally insignificant changes to the projections.

← There are no such errors on either table.

← This is not correct. Since the Census rounded their figure off to the nearest decimal point (2.7 not 2.70), we used the actual average household size calculated by dividing the total population in households by the number of housing units. The actual figure, based on the actual 1990 census figures, is 2.719824 when rounded to 6 decimal places. The computer, of course, uses the actual number calculated, not the truncation (2.72) shown by formatting.

While each of these errors taken independent of one another might not be cause for concern, in aggregate they raise doubts about the overall veracity and quality of work being presented.

← Even taken collectively, the differences are insignificant.

Concern Raised	Response or Observations
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Summary

Planning for the future demands good decisions based on reliable information. Gainesville and Hall County have a right to expect legitimate data be provided them by the consultants they have hired. ROSS+associates' forecasts have serious issues that need to be addressed before their data will be of use to Hall County or the City of Gainesville.