ComPlan USER'S MANUAL
(Beta Version)

INTRODUCTION

The community-based planning model (ComPlan) estimates regional land development potential using prototypical community elements. This first version of the ComPlan is developed in a Microsoft Excel© spreadsheet with links to ARCVIEW© geographic information system (GIS) software. ComPlan is funded by a Transportation and Community and System Preservation (TCSP) grant from the Federal Highway Administration. The grant help fund the Eastern Area Planning Initiative conducted by the Thomas Jefferson Planning District Commission, located in Charlottesville, Virginia. This version of ComPlan is available through FHWA to Metropolitan Planning Organizations (MPOs) and other agencies.

This User's Manual presents an overview of ComPlan and instructions for its use. The Manual describes ComPlan's structure, how to input needed information, how to use the model to test alternatives and calibration steps. The manual also describes the linkages between the spreadsheet and ArcView.

MODEL STRUCTURE

ComPlan relies on prototypical community definitions (community elements) to create regional land development patterns and the resulting land use, building and socioeconomic characteristics of those patterns. Each community element is defined by a graphic illustration of a quarter-mile diameter area and by a set of land use, infrastructure and socioeconomic data. *Figure 1* illustrates an element graphic and *Figure 2* illustrates the associated data. The model includes a set of elements developed for the Eastern Area Planning Initiative, but the user is able to modify these elements or create new elements to match existing community types or to reflect desired community elements.

Community elements are assigned to subareas defined by the user. A combination of traffic analysis zones (TAZ's) and Census blocks are used for the Eastern Area Planning Initiative. ComPlan calculates the development potential for each subarea by multiplying each subarea's net developable acreage by the data associated with the subarea's assigned community element. To estimate alternative land development or redevelopment potential, users reassign the subarea's community element and the model calculates new totals.

Users calibrate ComPlan by comparing the actual land use acreage and socioeconomic totals with those estimated by the model. This calibration step is recommended if actual land use and/or socioeconomic data are available. Calibration is not required if existing data are not available.

This first version of ComPlan is available in a Microsoft Excel spreadsheet with macros that import and export dBASE files that link with ArcView so users can map and spatially summarize the data. These dBASE files are not necessary to use the ComPlan.

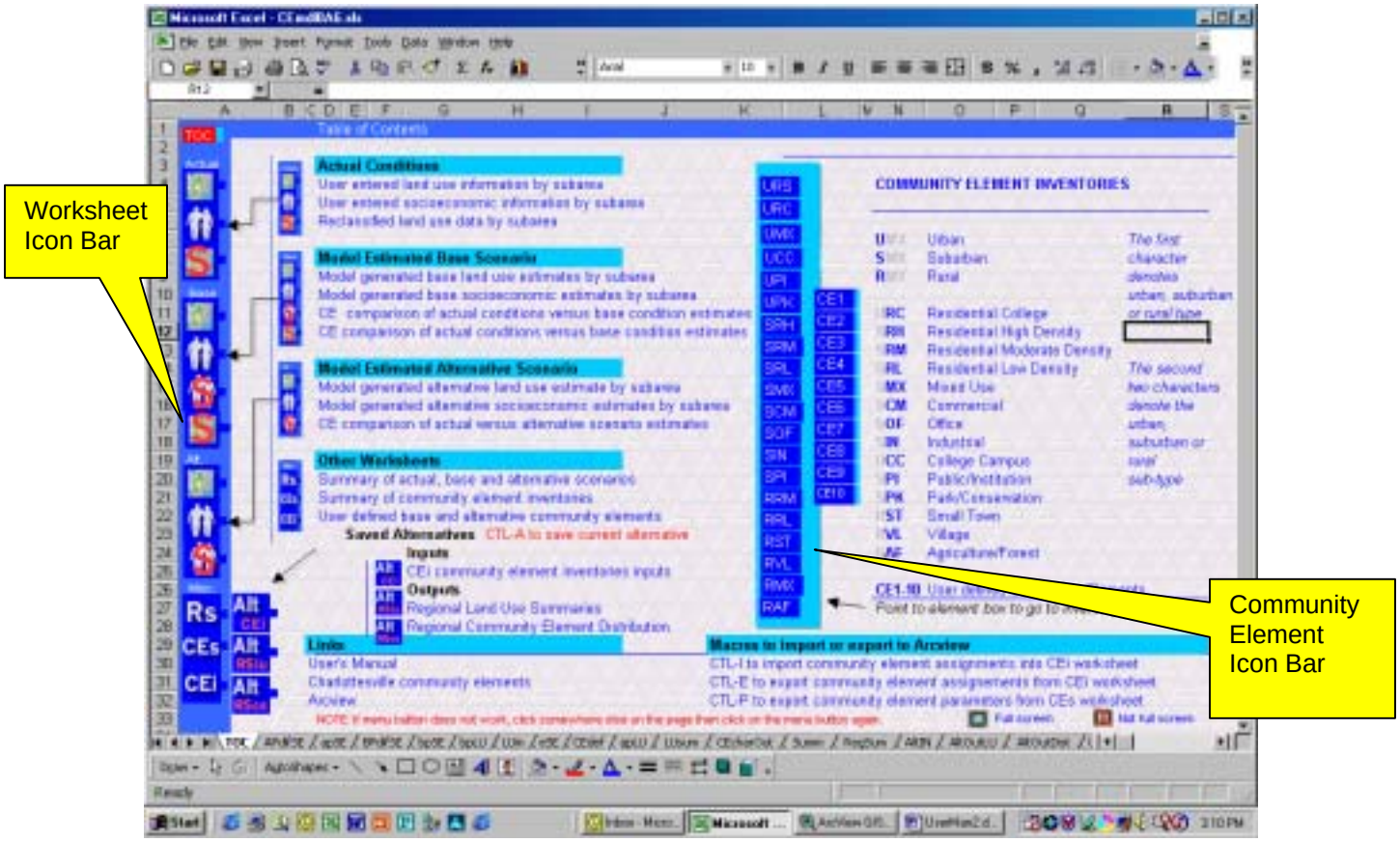
Figure 1
Community Element Plan

Figure 2
Community Element Inventory

GETTING STARTED

Step 1 – Go to the Table of Contents

ComPlan uses a number of pages (worksheets) in EXCEL. The file name is *ce.xls* and it should be located with other ComPlan related files in the Ce directory off of the root directory. The easiest way to navigate among the worksheets is to go to the Table of Contents worksheet (shown below).



The worksheet icon bar listed in column A of the Table of Contents worksheet is repeated on most of the other worksheets in the file. Users point and click on these icons to go to different worksheets. To get back to the Table of Contents from any of the worksheets, point and click on the red TOC box located at the top of the worksheet icon bar.

The community element icon bar includes all of the preset elements defined for the Charlottesville, Virginia region plus blank elements that can be defined by the user. Users point and click on these icons to go to the different community element inventories.

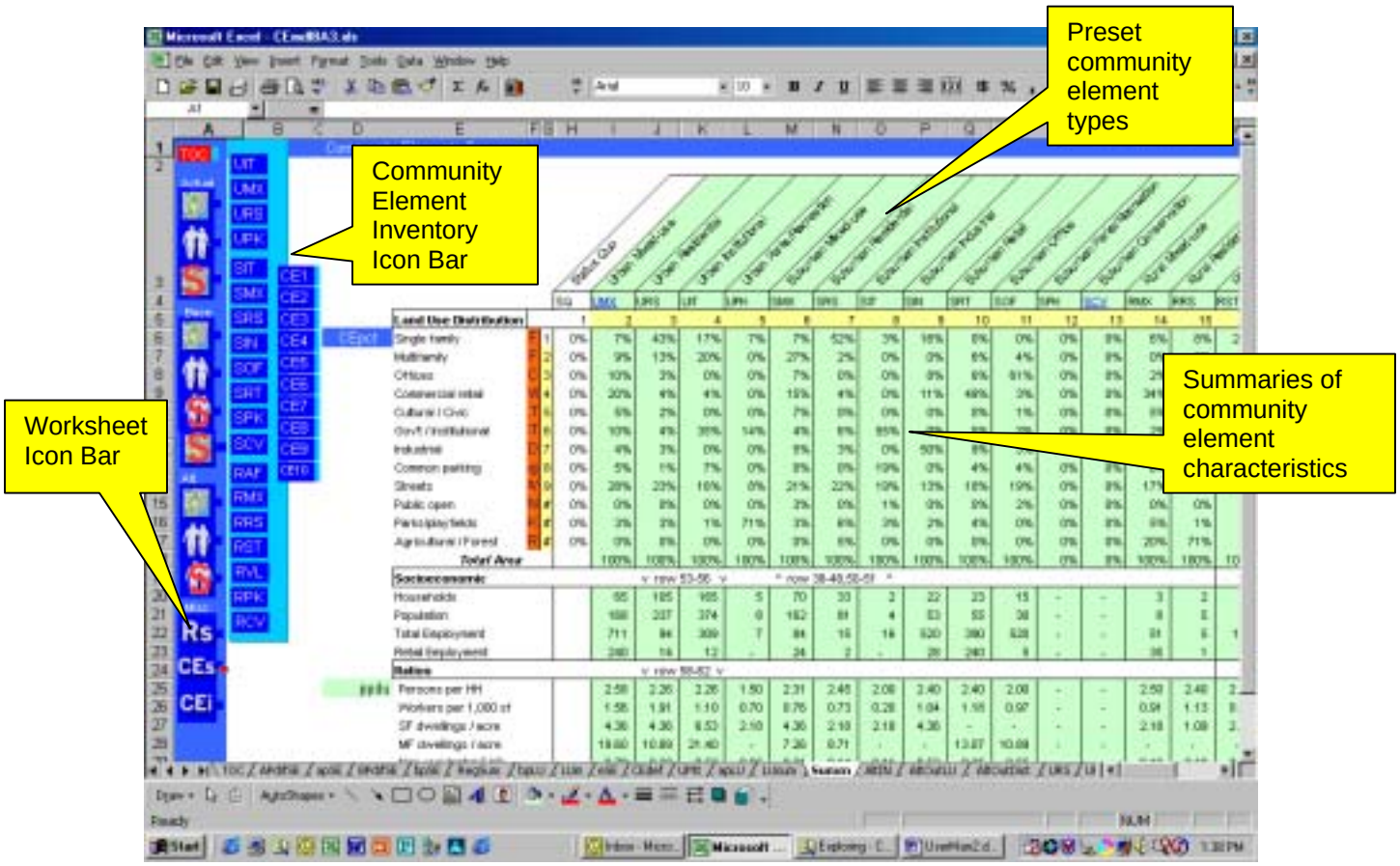
The spreadsheet includes several macros that add alternatives and import and export information to Arcview. Details of each of these macros are provided later in the manual.

Step 2 – Review the Available Community Element Information

Community elements are the building blocks of ComPlan. The model needs community element information before it can be calibrated or test alternatives.

ComPlan currently includes community element inventories for eastern part of the Thomas Jefferson Planning District (Charlottesville, Virginia and the Counties of Albemarle, Greene, Louisa and Fluvana). The community element summary worksheet (CEs on the worksheet icon bar) summarizes the characteristics for each of the Charlottesville-area elements, including the distribution of land uses among several land use types, socioeconomic characteristics and key ratios. Each inventory covers a quarter-mile diameter area, the maximum walking distance acceptable to most people.

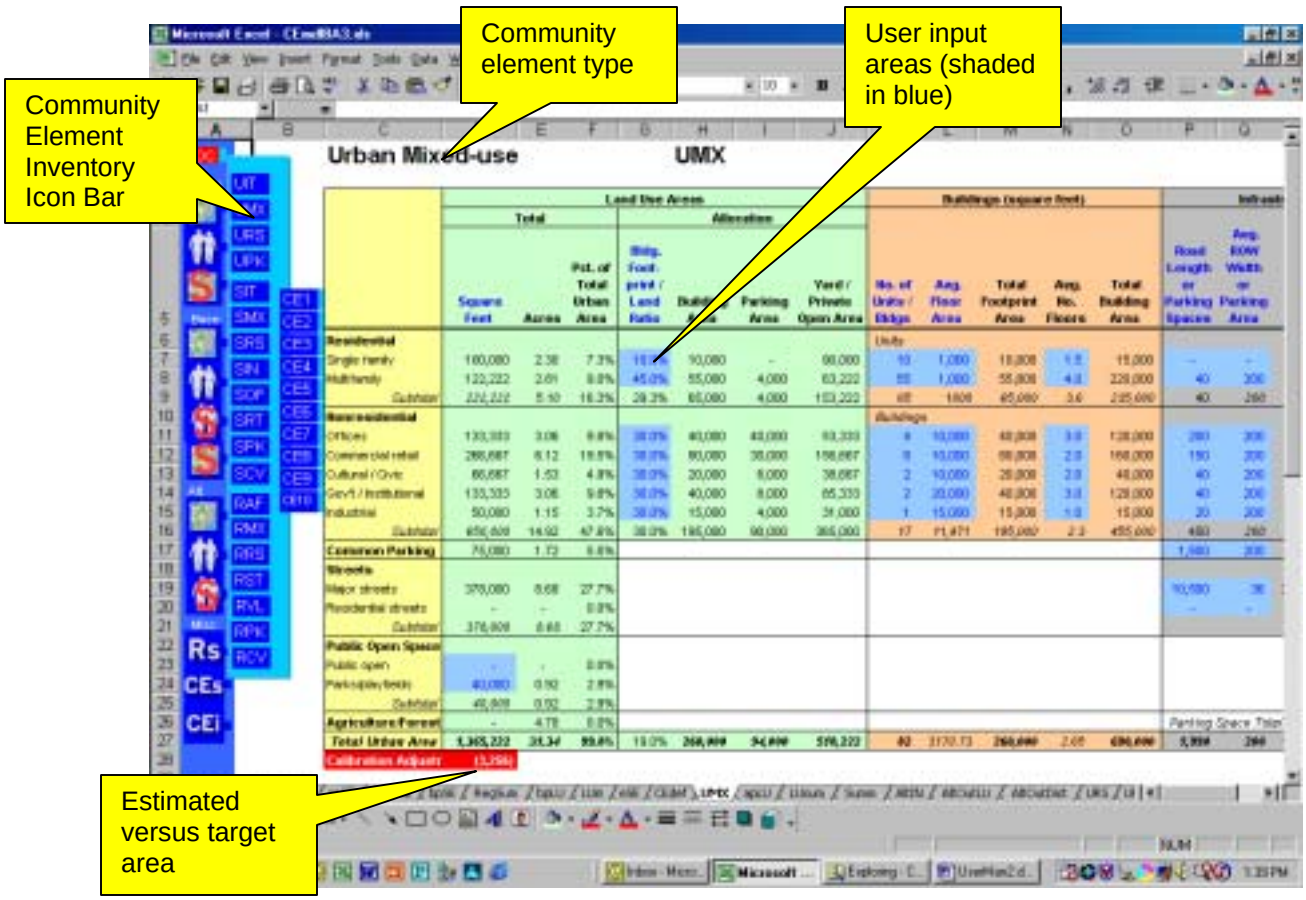
Detailed information for each of the community elements is found by pointing and clicking on the boxes listed in the community element icon bar. It should be noted that users could modify any of the preset elements or create up to ten additional community elements (approximately 30 Community Elements) within the existing template. Users can add as many new elements as needed by copying a blank inventory template into new worksheets.



Step 3 – Review, Update and/or Create Community Element Inventories
Each community element includes an inventory that numerically describes the characteristics of the element. The inventories include land use types and areas, building types and areas, roadway and parking areas and socioeconomic ratios.

Each inventory automatically calculates areas and socioeconomic totals based on user entries in the blue shaded cells. For example, once a user enters the number of single-family dwelling units in cell K7 and the average floor area in cell L7, the spreadsheet calculates the total floor (footprint) area of single-family dwellings (cell M7). Entering the average number of floors in cell N7 calculates the total building area (cell O7). The total floor area in cell M7 becomes a key input for the land use area. The user enters the footprint/land area ratio in cell G7 to estimate the total square feet devoted to the land use (cell D7) and the percentage of the total element area devoted to that use (cell E7).

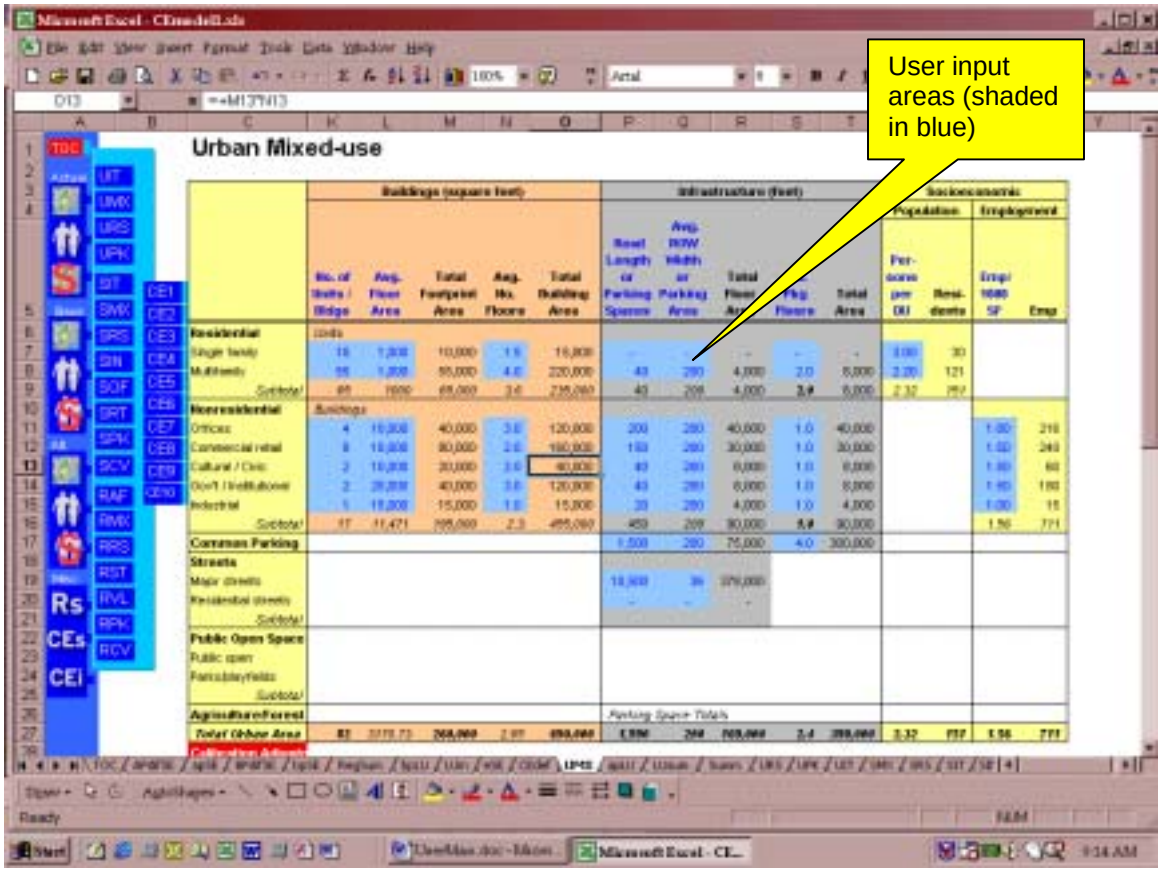
The inventory worksheet calculates total area as the user enters information. The totals must closely match the area of a quarter mile diameter circle (1,368,478 square feet or 31.42 acres). The worksheet calculates the difference between the estimated and target area in cell D28. An exact match is not necessary, but users should modify inputs until the calculated area is within five percent of the target (a difference of less than 68,000 square feet).



To the right of the land use and building area columns, the user enters information about parking for each land use (on-site parking), common parking (parking not associated with a site) and roadways. The key parking inputs are the number of parking spaces (column P), the average area of each space (including access/driveway areas – column Q) and the number of parking floors (for parking garages – column S).

Socioeconomic characteristics are to the far right of the inventory table. The user enters the number of persons per dwelling unit (column U) and the ratio of employees per 1,000 square feet of gross building area (column W).

Users are not limited to entering information into the blue shaded cells of the inventory. However, information entered into the non-blue cells will replace a calculation, making it more difficult to update the tables.



Preset and Blank Inventories

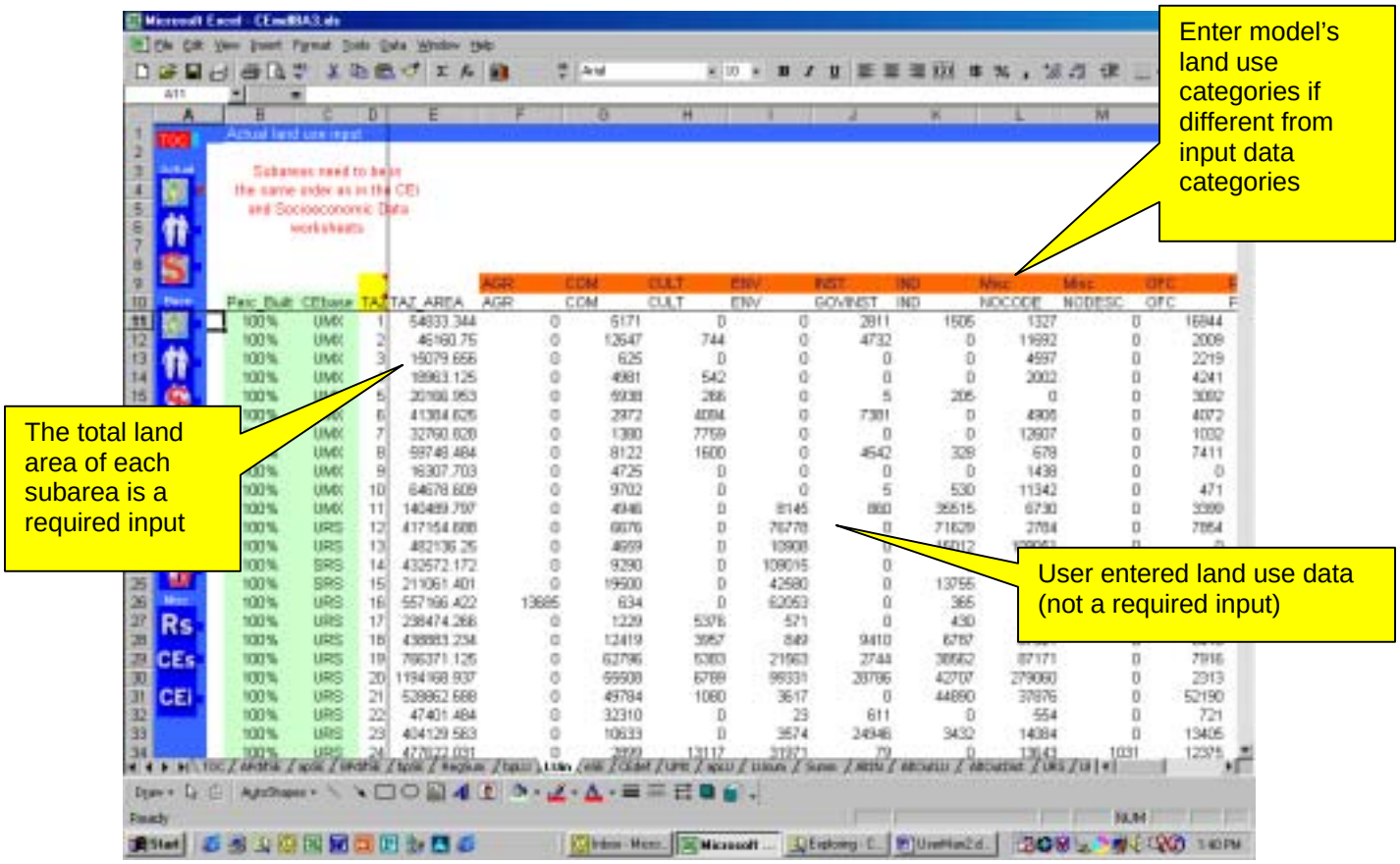
As noted above, the current version of ComPlan includes community element inventories for the Charlottesville, Virginia region. These inventories can be used as is or modified to reflect conditions in different regions. ComPlan includes ten blank inventories that can be used to create additional community elements. Users can access these blank elements by pointing and clicking on one of the CE1 through CE10 icons on the community element icon bar.

Step 4 – Enter Area Information

To estimate base and alternative conditions, users must enter useable and vacant areas for each subarea (described in more detail on the next page). ComPlan also requires a conversion factor if the input areas are in units other than acres.

Area information is entered in the land use worksheet (point and click on the actual land use icon). The land use area data are entered in the white areas of the worksheet, beginning at column F. The user must convert the input land use categories to those used by the model if the categories differ. Entering the land use codes in the red cells above each column does this. The ComPlan land use categories and codes are listed on the next page.

The worksheet will calculate the useable, developed and vacant area from the entered land use areas. If land use areas are not available, then total area must be entered in column E of the worksheet. The model calculates useable and vacant area from the percent built (shaded in green) input, entered in the CEi worksheet described in the next section.



Required Area Inputs

ComPlan requires area information for each of the defined subareas to estimate land consumption. The user must provide the following information:

- Useable area (uAREA) – the total area that is suitable for land development in each subarea. This area nets out land unfit for development because of environmental, historical or policy reasons.
- Developed area (dAREA) – the amount of useable area currently developed (including area that is used for parks, public open space, agriculture and forestry). This information is calculated with user-entered land use data or with the % BUILT information entered in the CEi worksheet. If developed and vacant land use data are entered by the user for a subarea, the %BUILT input for that subarea must be 100 to avoid double counting vacant area.
- Vacant area (vAREA) – the amount of developable area that is not currently developed. This is the difference between useable area (uAREA) and developed area (dAREA). If actual vacant land data are not available, the model calculates vacant land using the reciprocal of the %BUILT estimate.
- Conversion factor – this factor converts the measurement units for the input data into acres. *The input areas are divided by the conversion factor, so the user must enter the factor accordingly.* The Charlottesville area inputs are measured in square meters and there are 4,079 square meters in an acre. The model divides the total square meters calculated from the Charlottesville input data by the conversion factor entered in cell B6 to calculate the uAREA, dAREA and vAREA results. If the input information had been square miles, the reciprocal of 640 (the number of acres in a square mile) would have been entered.

ComPlan Land Use Categories

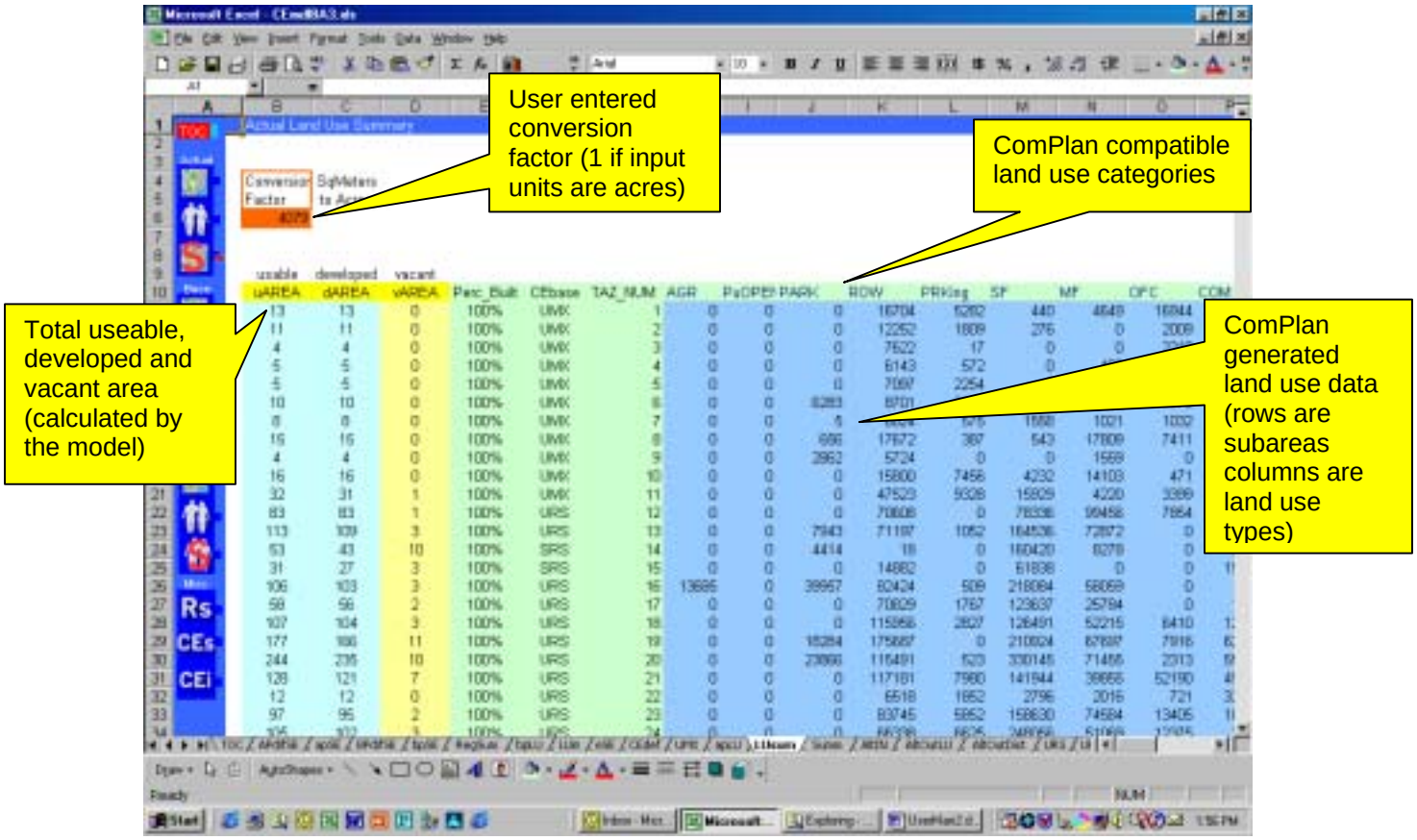
ComPlan uses the following land use categories. Entered land use data must be translated into one of these categories:

- Single family residential (SF)
- Multifamily residential (MF)
- Offices (OFC)
- Commercial retail (COM)
- Cultural/Civic (CULT)
- Government/institutional (INST)
- Industrial (IND)
- Common parking (PRKing)
- Streets/right of way (ROW)
- Public open space (PuOPEN)
- Parks/playfields (PARK)
- Agriculture/forest (AGF)
- Vacant (VAC)
- Permanently vacant (ENV)
- Miscellaneous (Misc)

Specific definitions for these land use categories are up to the user. The only requirement is that definitions be consistent. For example, an office-retail building can be coded as either office or retail but once coded, it must be coded the same way throughout the model.

Reclassified Land-use – this worksheet calculates land areas by the land use categories used in the community element inventories and listed on the previous page. Areas by land use categories are not necessary to run the model nor is a complete set of data needed for calibration or to develop comparisons.

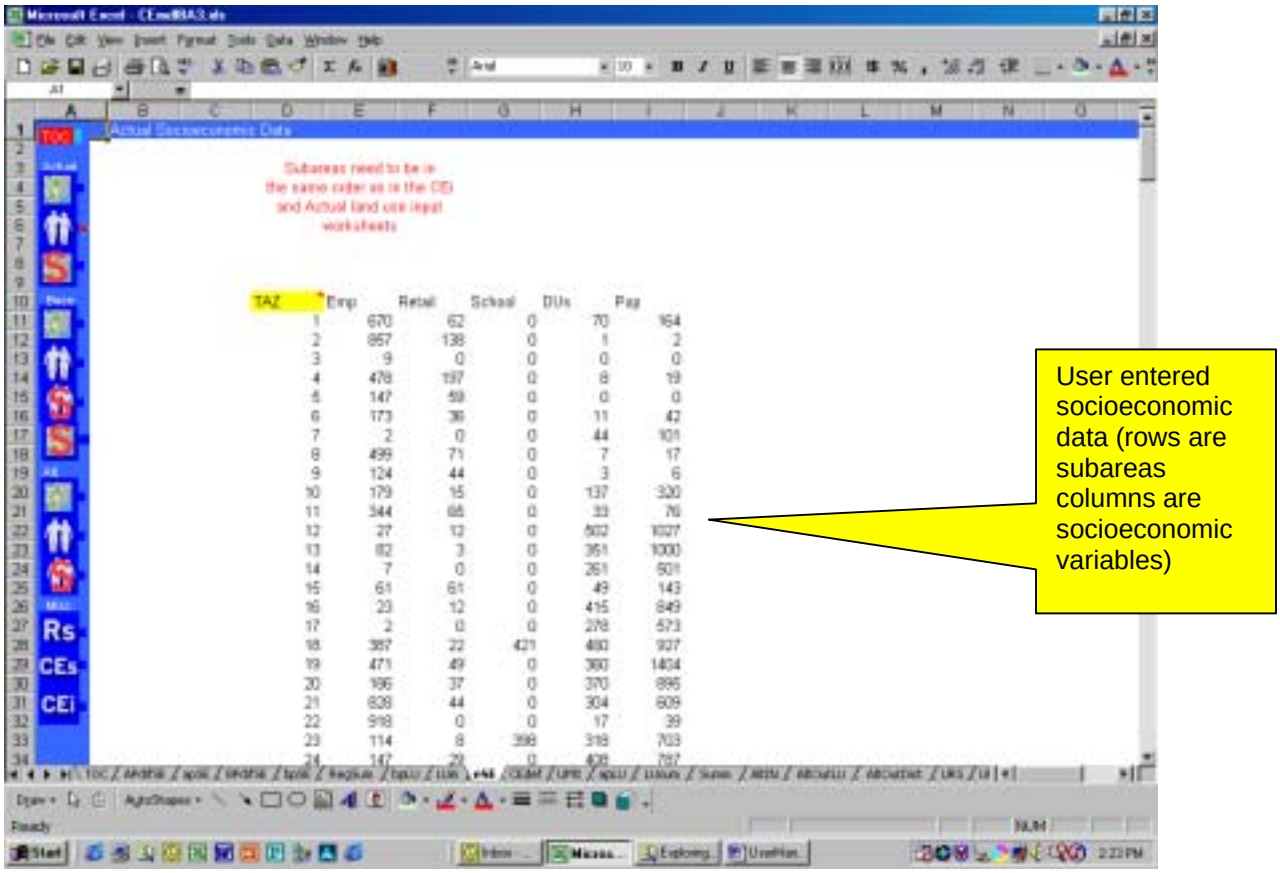
ComPlan requires a conversion factor if the input areas are in units other than acres (entered in cell B6 of the worksheet). The land use categories at the top of the worksheet are the ComPlan defined land uses and the totals in each column indicate how the input land use areas are aggregated by the model.



Step 5 – Enter Socioeconomic Information

This step is not required but highly recommended for model calibration and to establish a socioeconomic baseline for comparison. Users enter socioeconomic information as labeled in columns E through I. Total employment by work location (including retail employment) is entered in column E, retail employment by work location is entered in column F, school enrollment by school location is entered in column G, total dwelling units (single and multifamily) are entered in column H and population is entered in column I.

Often, socioeconomic information is available from trip generation input files (Z-data files) used by a region's travel demand forecasting model or from the Census Bureau.

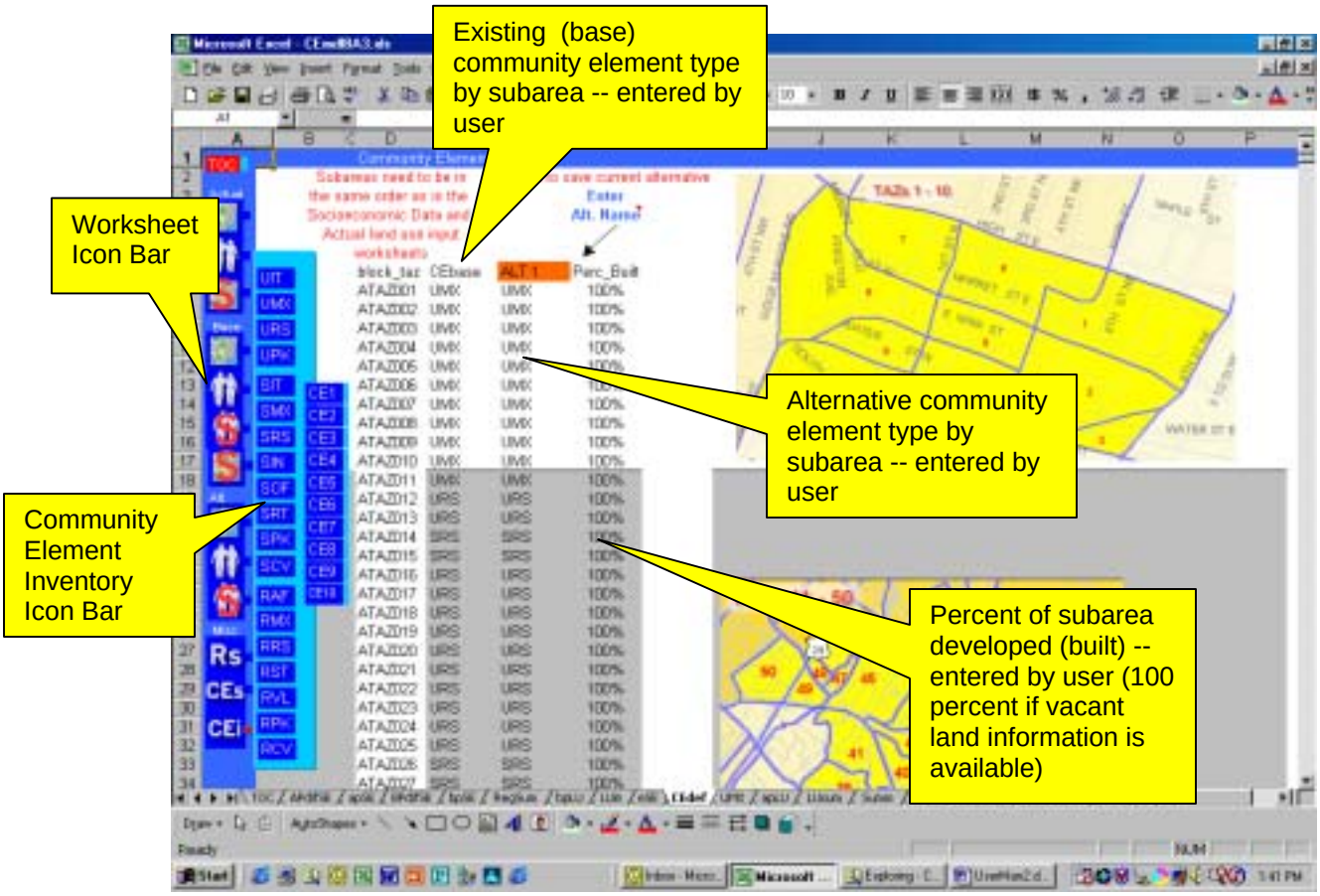


Step 6 - Enter Community Element Assumptions

Users must define community elements for the base condition in the community element input (CEi) worksheet. The user enters the subarea identifier in column D of the worksheet and the assumed community element in column E. The code for each community element is listed in the community element icon bar located to the left of the data entry area. The user enters a three-letter code, such as UMX for urban mixed-use, next to the subarea identifier and the model automatically calculates the base land use and socioeconomic conditions for that subarea.

To create an alternative scenario, the user enters a different three-letter code in column F of the worksheet where changes are expected. If the user wants to use actual data for a subarea in the alternative scenario rather than model-estimated information, SQ (status quo) is entered for that subarea.

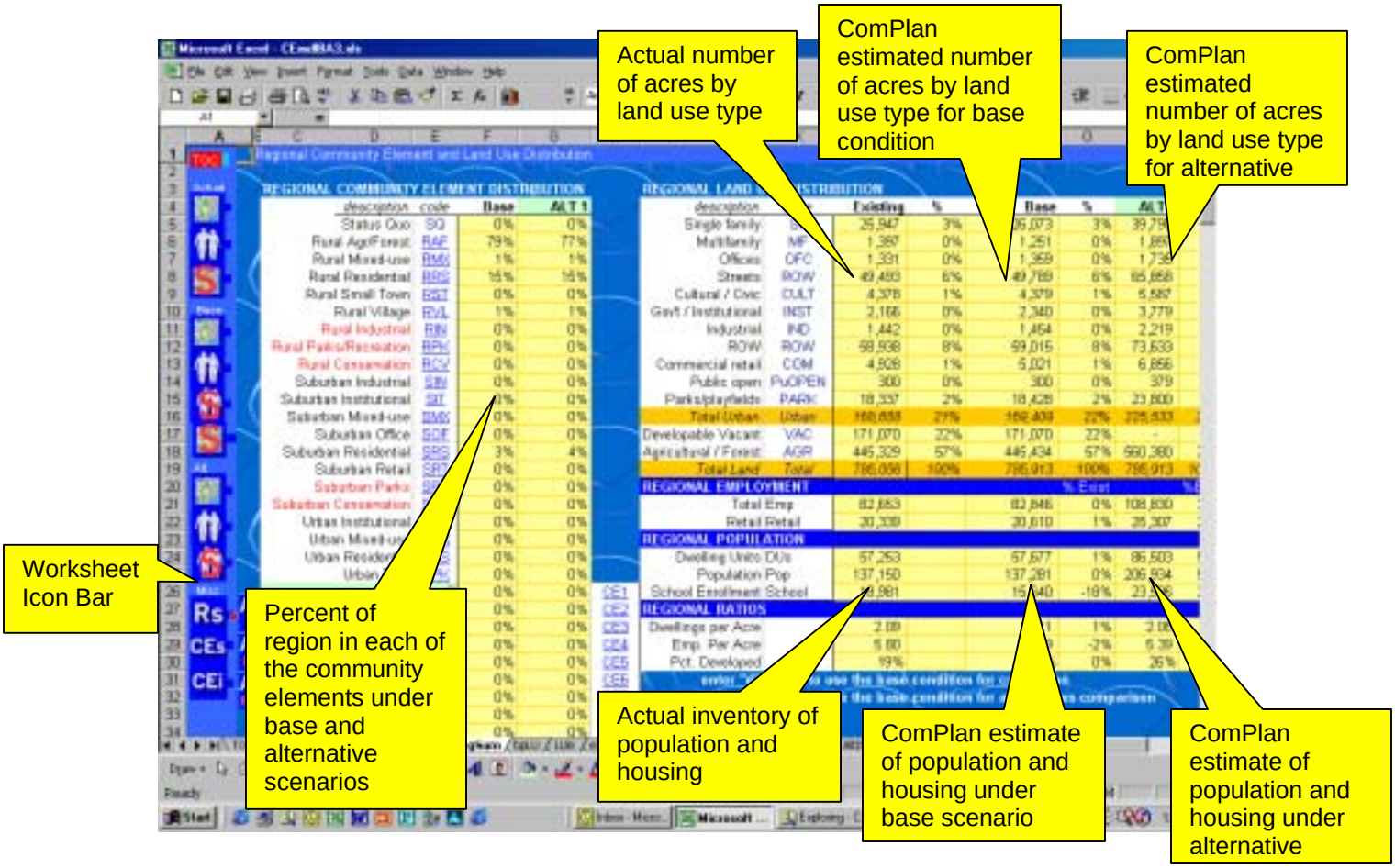
Percent built information is entered in column G. These percentages calculate developed and vacant land area if actual land information is not entered into the model. The percent entered is an estimate of how much of the subarea is developed – its reciprocal is an estimate of vacant land. One hundred (100) percent is entered if actual vacant land data are entered into the model. *The model currently assumes that agricultural/forested areas are developed, so these areas should not be entered as vacant land.*



Step 7 – Review Regional Summary

ComPlan presents information on three conditions: actual, base and alternative. The *actual* condition is an inventory of existing land use and/or socioeconomic conditions entered by the user. The model generates the *base* condition with user-defined assumptions about each subarea's current community element. This base information is compared against the actual information to calibrate the model (details about model calibration are provided in the ***Calibration*** section of this manual). If actual data are not available, the user can skip the calibration step and use the model for alternatives testing. The model can generate a number of *alternative* scenarios with user-defined assumptions about future community elements for each subarea.

The user can view a regional summary of these three conditions by pointing and clicking on the RS icon on the worksheet icon bar. The left hand table in the regional summary indicates how the region is proportioned among community elements under the base and alternative scenarios and the table to the right presents actual, base and alternative land use and socioeconomic totals.



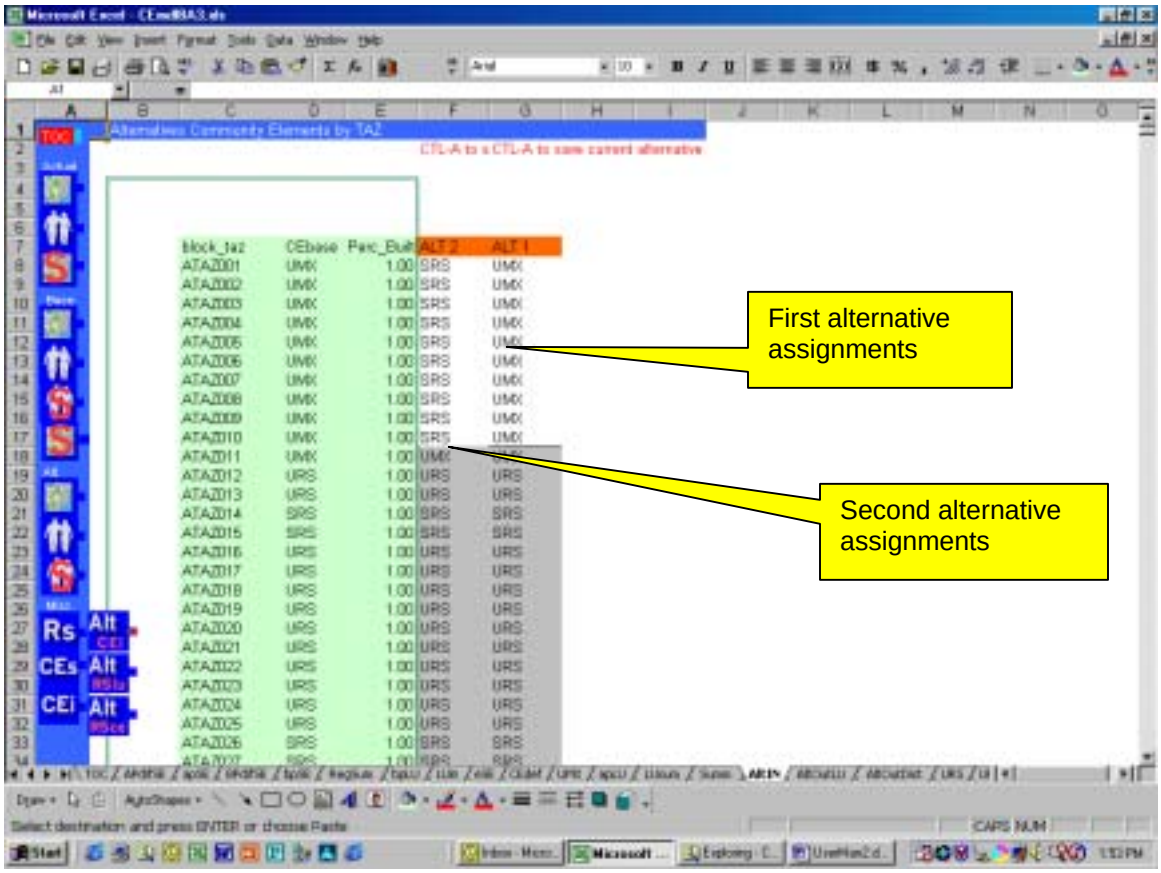
Step 8 – Create and Review Alternative Scenarios

To create an alternative land development scenario, enter a unique name for the scenario in cell F7 of the CEi worksheet (shaded in red). Then modify the community element codes by subarea in column F.

To create and compare multiple scenarios, press the CTRL and A keys simultaneously to invoke the macro that adds alternatives. This saves the results of the current scenario in other worksheets for comparisons. Enter a new name in cell F7 of the CEi worksheet and modify element codes in column F.

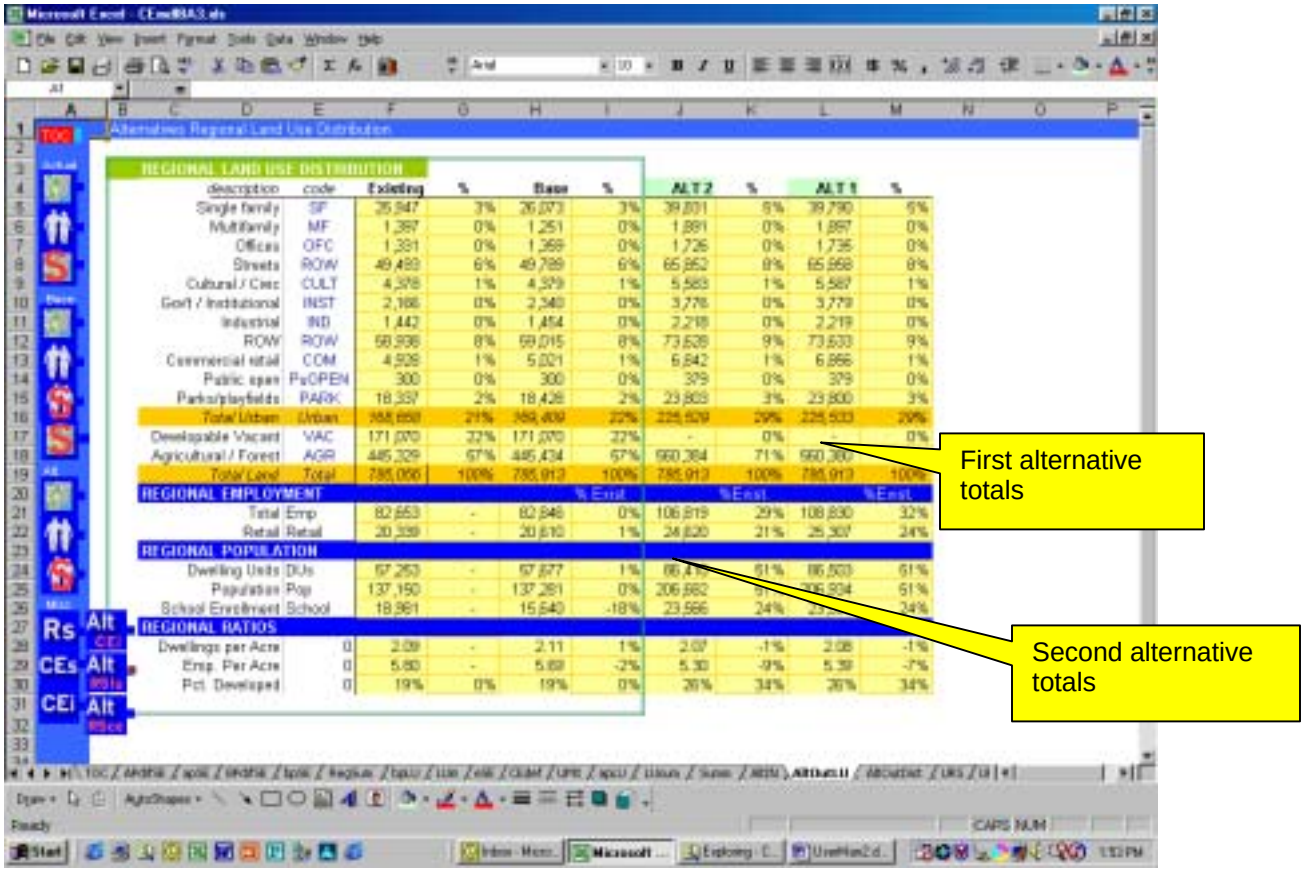
Point and click on the Alternative Assignments icon to review alternative assignment scenarios. In the example illustrated below, the initial alternative is labeled "ALT1." The community element assignments for the second alternative are listed in the columned labeled "ALT2." Users can test an unlimited number of alternatives.

To delete an alternative from this worksheet, highlight the column of the alternative by pointing and clicking on the column header (in gray) and use Excel's edit/delete command. In the example below, to delete the ALT1 alternative, click on the G column header, then click on Edit in the top left menu for the pull down menu, then click on Delete.



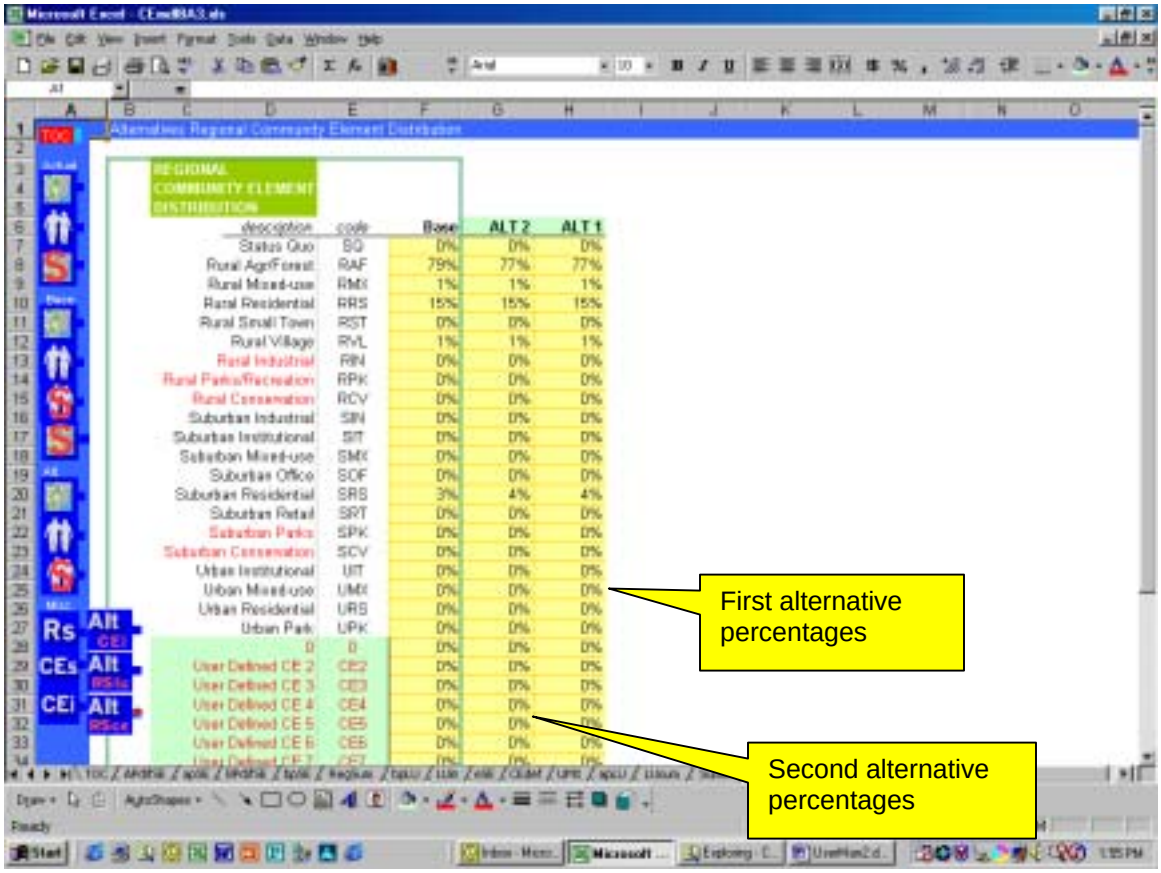
Point and click on the Alternatives Review icon to review the results of the analysis. The spreadsheet automatically labels each alternative according to the name entered in the CEi worksheet. Comparisons can then be made among alternatives and to the existing and base conditions.

To delete an alternative from this worksheet, highlight the columns of the alternative by pointing and clicking on the column headers (in gray) and use Excel's edit/delete command. In the example below, to delete the ALT1 alternative, click on the L and M column headers, then click on Edit in the top left menu for the pull down menu, then click on Delete.



Point and click on the Alternative Elements icon to review the allocation of useable land by community element for each alternative tested.

To delete an alternative from this worksheet, highlight the column of the alternative by pointing and clicking on the column header (in gray) and use Excel's edit/delete command. In the example below, to delete the ALT1 alternative, click on the H column header, then click on Edit in the top left menu for the pull down menu, then click on Delete.



MODEL CALIBRATION

The Community-Based Planning model is calibrated by comparing the base condition with actual information. Calibration adjustments are made to either the community elements assigned to each subarea or to the community element inventories. This section describes the calibration steps.

As described in the previous section, users can enter land use and socioeconomic information into ComPlan to reflect actual conditions. ComPlan estimates a base condition using assumptions about average land use and socioeconomic conditions in each community element, and how those elements are located in the study area. This estimate of development characteristics in the base condition is compared with actual information to determine the predictive accuracy of the ComPlan.

Calibration Caveats

Users should be aware of several calibration limitations. First, calibration is not meaningful at small geographic areas. Second, urban areas are complex and varied and attempting to apply averages is difficult. The goal of calibration is to develop a reasonably accurate reflection of urban characteristics so that future year estimates are within reason. Third, a region or locality may want completely new development patterns, not an extrapolation of past patterns. In such cases, calibration is useful only in comparing how a new pattern differs from a continuation of existing patterns.

Calibration and Scale

Each community element inventory reflects typical conditions of a 31-acre area. In nearly all cases, an area of this size includes a number of parcels, each having a unique building and use. Comparing a specific parcel within the 31-acre area to the average characteristics of the area will not yield meaningful insights. Therefore, calibration does not make sense for areas smaller than 31 acres.

Furthermore, because of the complexity of urban areas, comparisons of subareas are difficult even if they are the size of a community element (around 31 acres). If the study area is roughly equivalent to the size of a community element (31 acres), or the study area includes only one subarea of a given community element, then calibration is possible. However, if a study area includes several subareas of a given community element, then calibration becomes more difficult because of the nuances among similarly classified developments. A shopping center in one part of a region (classified as a suburban retail in the ComPlan's preset elements) will have similar, but not exactly the same characteristics as another shopping center located elsewhere in the region. If the differences between development types assumed to be the same community element are significant enough to cause calibration problems, then users might want to create another community element to distinguish between these areas.

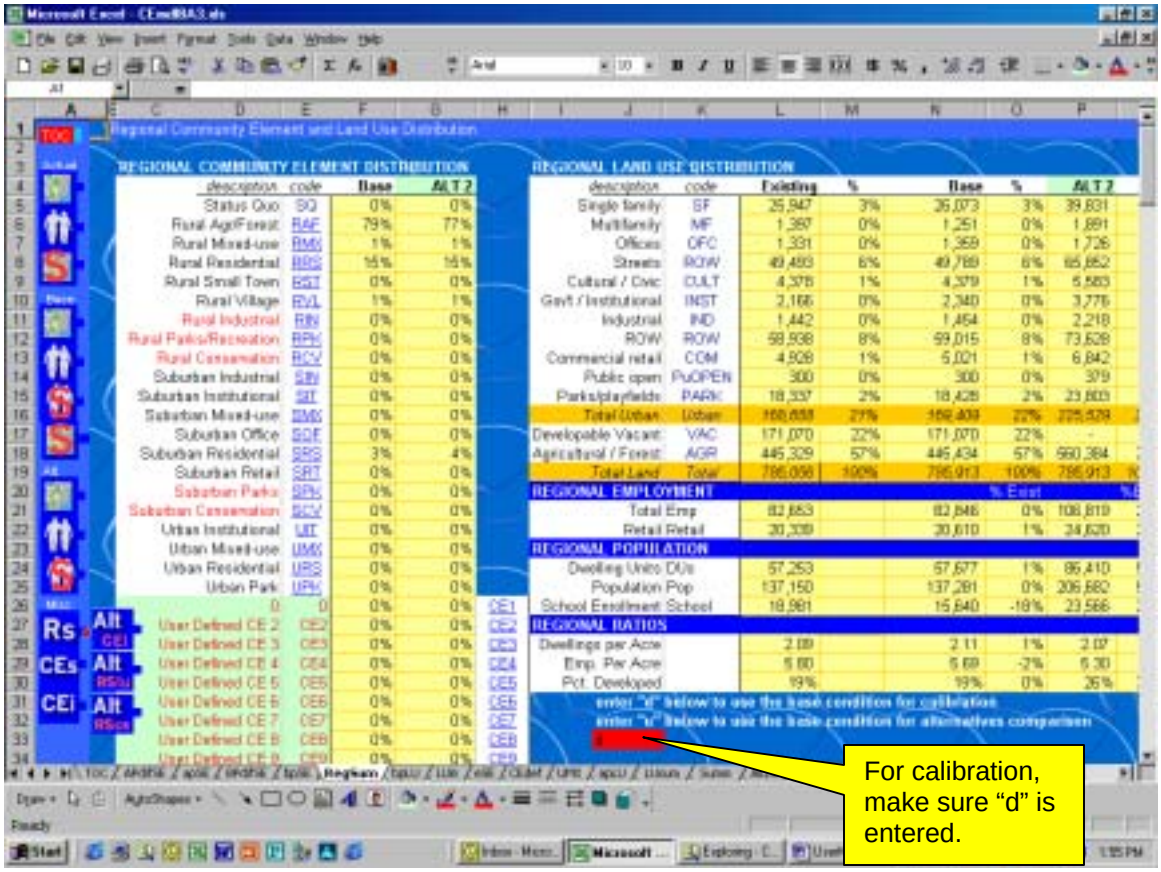
Calibration Steps

To begin calibration, information for the actual condition is entered into the model. This includes both land use and socioeconomic information. The next step is assigning community elements to subareas for the base condition. Step three is reviewing

differences between the actual and base condition and making adjustments to minimize the differences. These model set-up steps are described in detail at the beginning of this manual.

ComPlan is calibrated by adjusting either community element inventory inputs or the community element assignments under the base condition. The Regional Summary (RS icon on the icon bar) compares actual to base conditions. *For calibration, make sure that a "d" is entered in cell J33 (highlighted in red in the bottom right of the Regional Summary worksheet). This calculates areas in the base condition using developed acreage (dAREA) rather than useable acreage (uAREA).* Entering a "u" in cell J33 changes the areas in the base calculation from developed acreage to useable acreage, which provides a baseline estimate of the development potential that may be of value for alternatives testing.

The land use distributions in the top right worksheet table and the socioeconomic totals in the lower right worksheet tables compare actual and base condition. ComPlan provides more detailed land use and socioeconomic comparisons (shown on the following pages) if the regional comparison indicates significant differences.



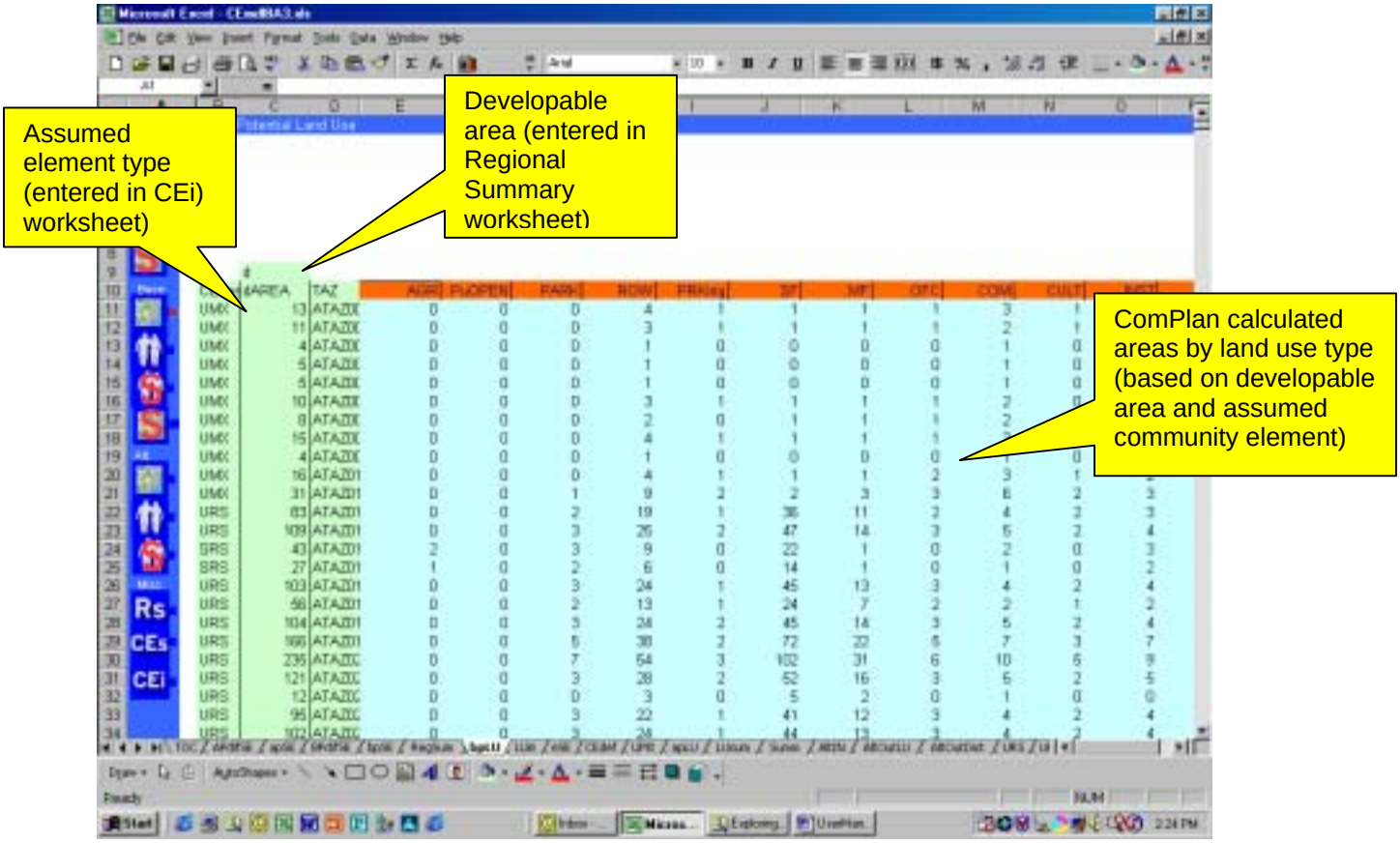
Calibration Step 1 – Entering Actual Information

To calibrate the model or compare alternative conditions to actual conditions, users enter land use and socioeconomic information by subareas. Details of entering data are provided in Steps 4 and 5 in the Getting Started section. Undevelopable, developable and vacant areas by subarea are required model inputs (described in more detail on page 9 of this manual).

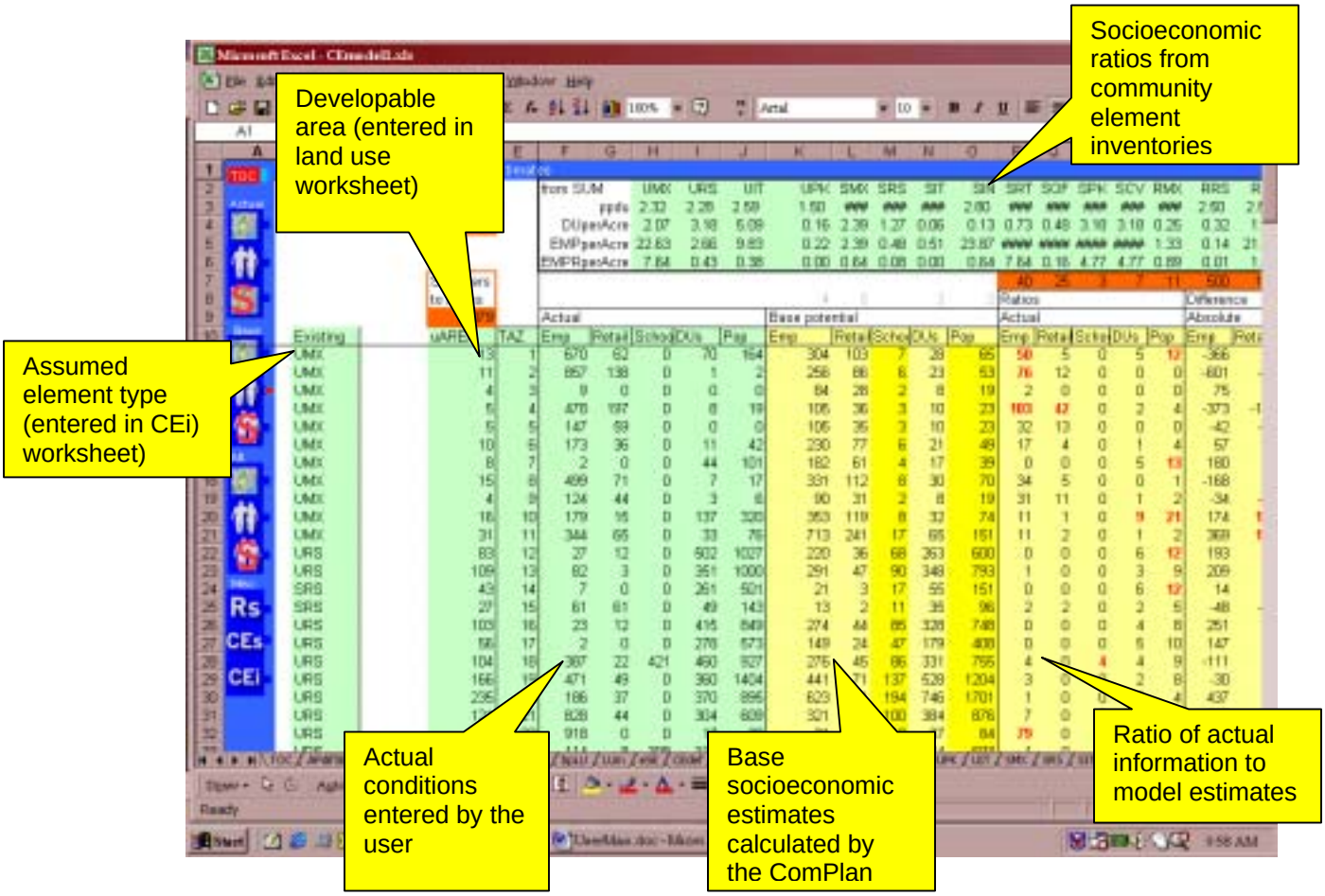
Calibration Step 2 – Generating Base Conditions Estimates

As noted above, the model estimates a base condition based on the developable acreage in each subarea, the community element assigned to the subarea and the development characteristics for the community element. The base condition estimates calculated by ComPlan are:

Base Land-use Estimates – this worksheet calculates land use areas based on user-defined community element assumptions for each subarea. The model multiplies the community element land use inventory inputs by the net developable acreage in each subarea to calculate how the subarea is developed. For example, subarea one (row 11) is assumed to be an urban mixed-use (UMX) element. The UMX element assumes that a certain percentage of the total area is devoted to single-family (SF) uses. ComPlan multiplies this percentage by the total developable area (cell c11) to estimate the single family-area (in cell J11).

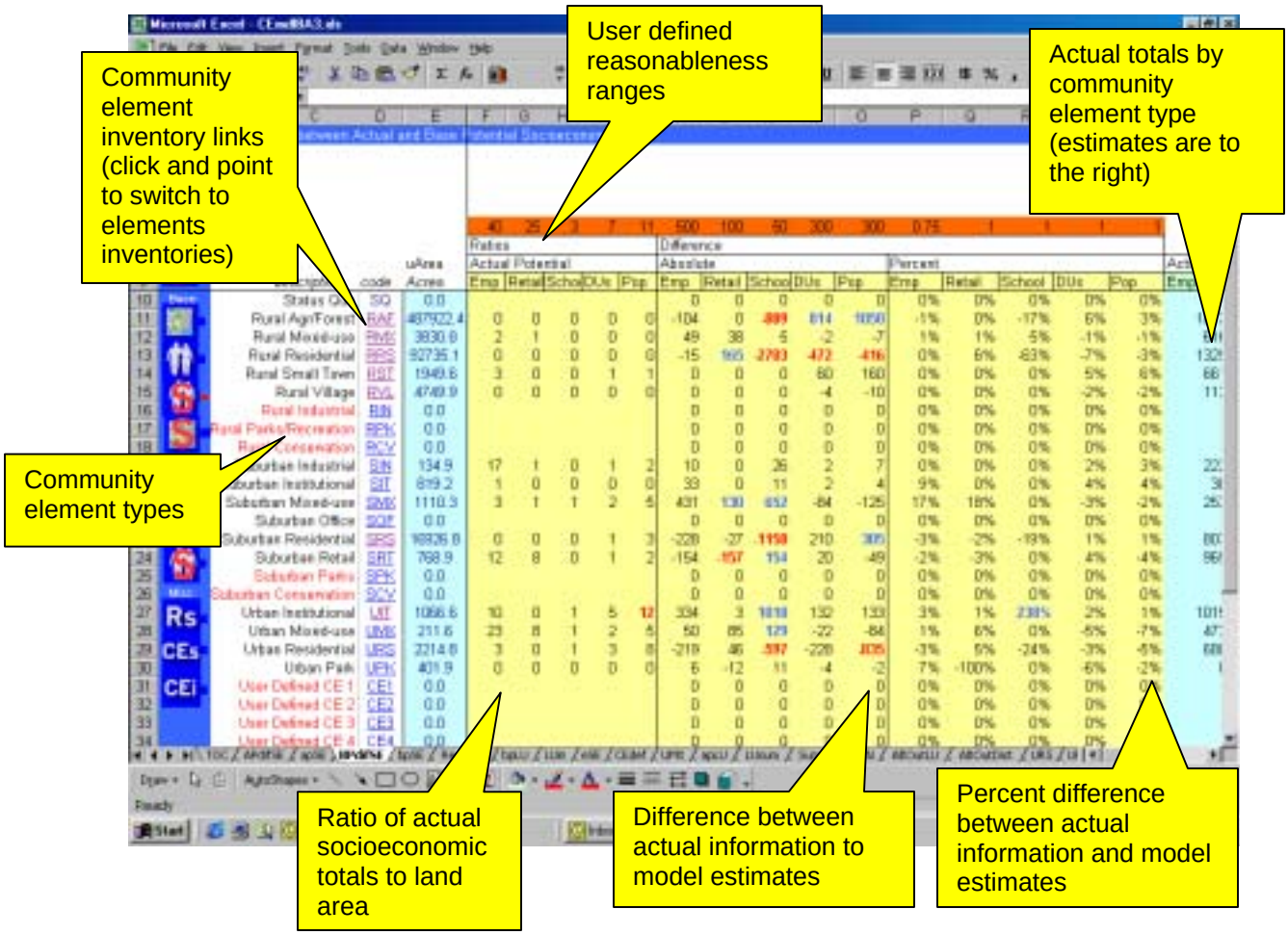


Base Socioeconomic Estimates – this worksheet calculates socioeconomic totals for subareas based on the assumed community element type (from the CEi worksheet), the amount of useable area in the subarea and socioeconomic ratios from the community element inventories (listed at the top of the worksheet). The worksheet also makes several comparisons. The first checks the reasonableness of input data by calculating the ratios of socioeconomic variables to useable land area. Users can enter ranges in the red cells above the comparisons to highlight subareas (in red) where ratios are higher than expected. For example, ComPlan highlights those instances where the actual employment exceeds the 40 employees per acre entered in cell P7. The ComPlan also compares the absolute and percentage differences between actual conditions and model estimates. Again, the user can set ranges at the top of each comparison column.



It should be noted that differences are expected when subareas are smaller than the areas assumed in the community element inventories (31 acres) or when the subarea is not completely developed. The Calibration Caveats section of this manual provides more information on why this is so. Because of this, the model also provides regional comparisons.

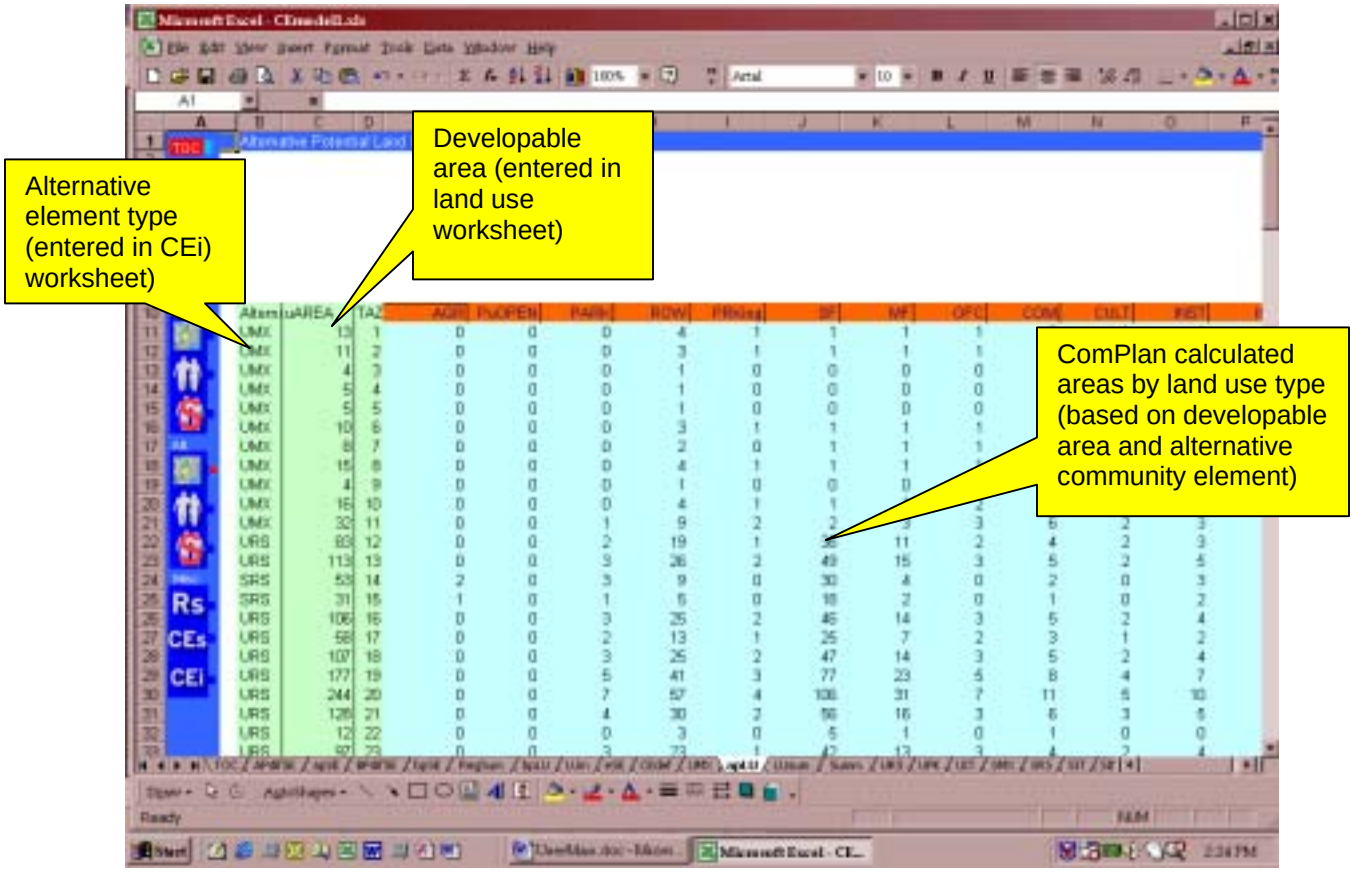
Base Socioeconomic Estimates by Community Element – this worksheet calculates socioeconomic totals by community elements rather than subareas. It provides a more reasonable basis for comparison and is a more appropriate scale for model calibration. It presents several summaries, the first being the ratio of socioeconomic characteristics to useable land. The use can enter a reasonableness range at the top of each column that highlights all elements exceeding the expected range. ComPlan also provides absolute and percent differences between actual and estimated socioeconomic characteristics, highlighting in red those elements where differences exceed reasonableness ranges (defined by the user). Actual totals and base estimates for community elements are shown to the right of the comparisons.



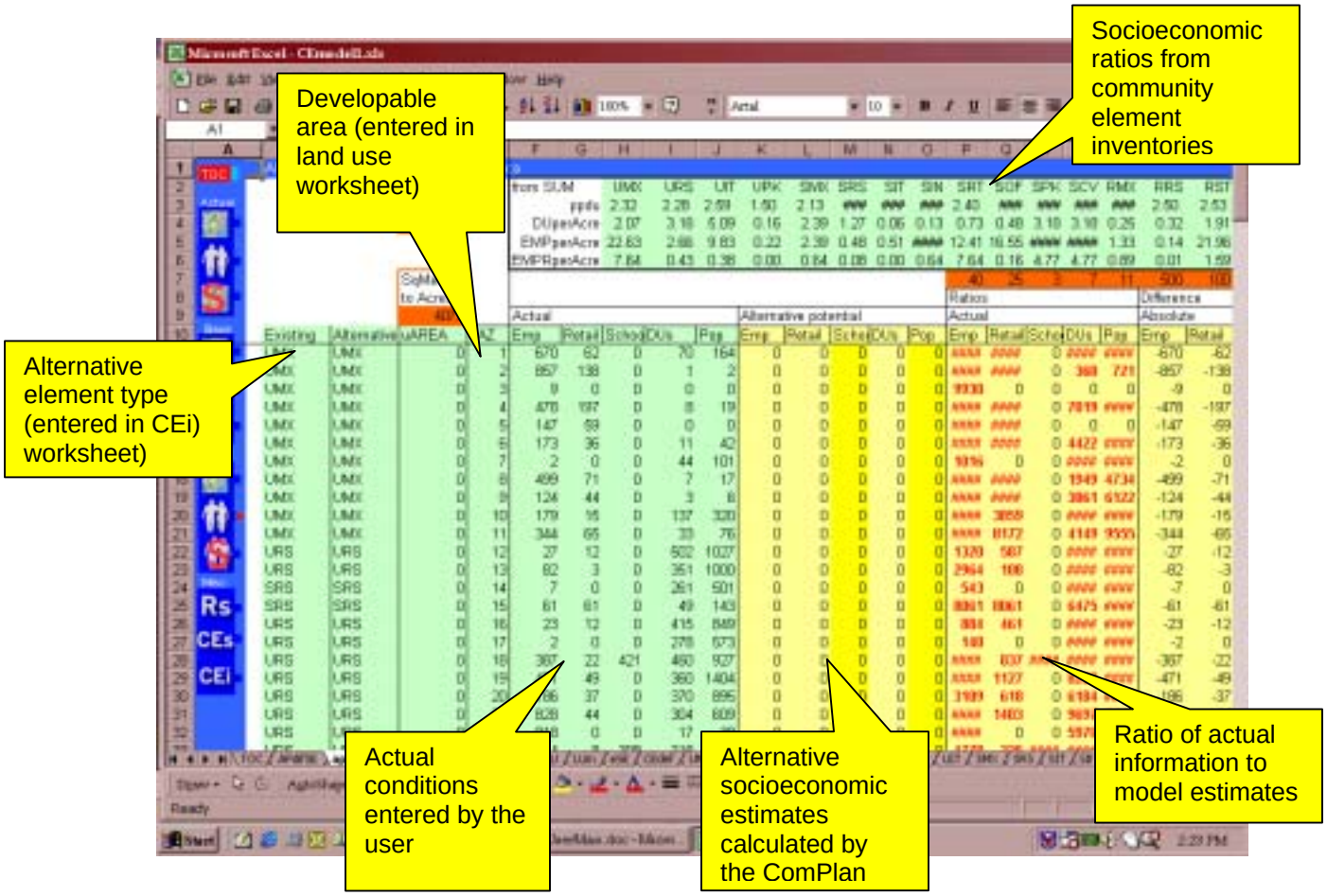
Alternative (ComPlan Generated) Estimates

ComPlan also generates detailed comparisons of alternative scenarios with actual conditions. The subarea alternative information is used to generate the regional summaries. While these comparisons should not be used for calibration, they are available for review. Like the base condition, the model calculates alternative conditions based on the developable acreage in each subarea, the alternative community element assigned to the subarea (column F in the CEi worksheet) and the development characteristics for the community element. The alternative condition information calculated by ComPlan includes:

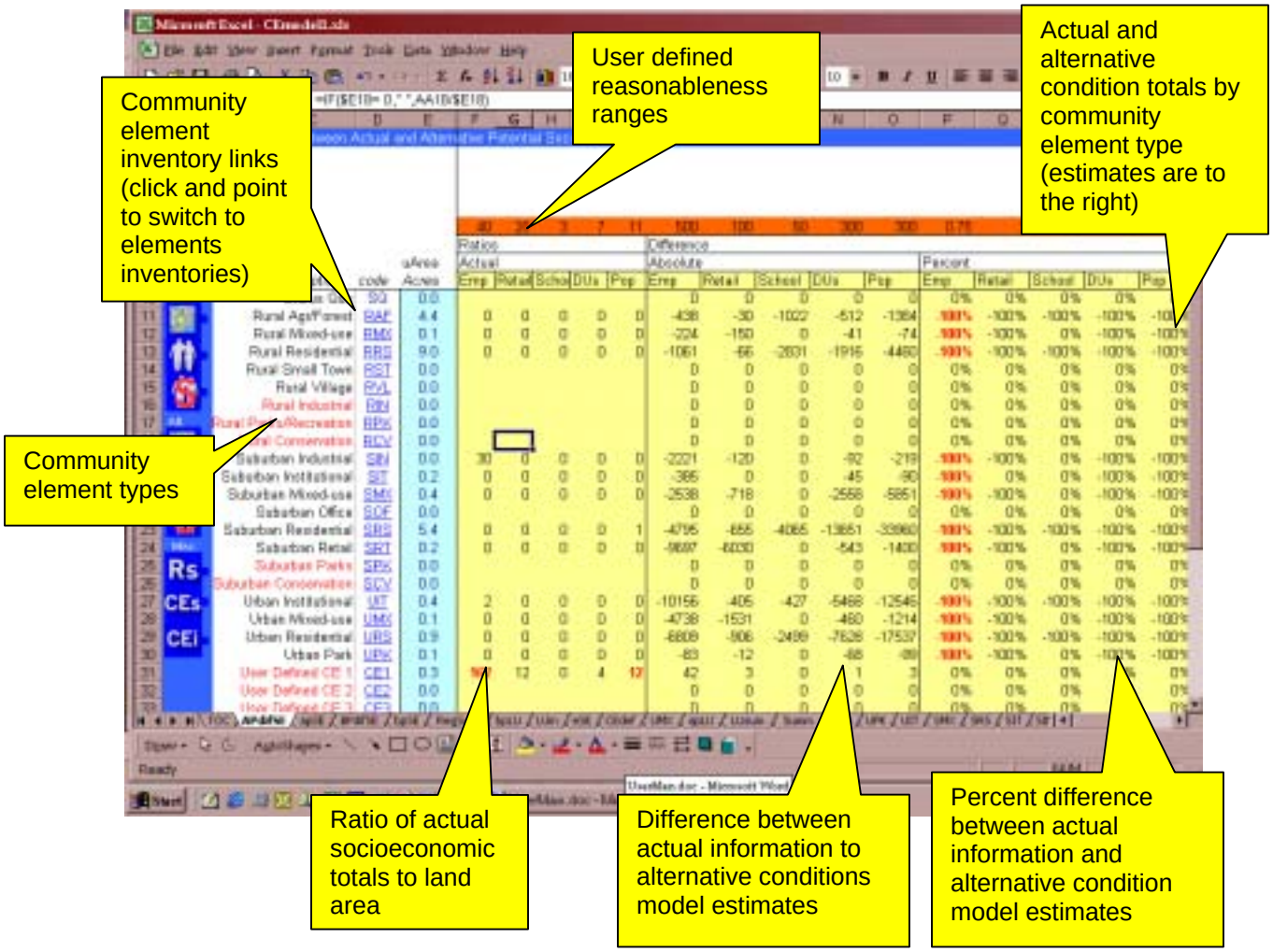
Alternative Land-use Estimates – this worksheet calculates land use estimates based on user-defined community element assumptions for each subarea. The model multiplies the community element land use inventory inputs by the net developable acreage in each subarea to estimate how the subarea is developed. For example, subarea one (row 11) is assumed to be an urban mixed use (UMX) community element type. The UMX element assumes that a certain percentage of the total area is devoted to single-family (SF) uses. The ComPlan multiplies this percentage by the total developable area (cell c11) to estimate the single family-area (cell J11).



Alternative Socioeconomic Estimates – this worksheet calculates socioeconomic totals for subareas based on the assumed community element type (from the CEi worksheet), the amount of useable area in the subarea and socioeconomic ratios from the community element inventories (listed at the top of the worksheet). The worksheet also makes several comparisons. The first checks the reasonableness of input data by calculating the ratios of socioeconomic variables to useable land area. Users can enter ranges in the red cells above the comparisons to highlight subareas (in red) where ratios are higher than expected. For example, the ComPlan highlights those instances where the actual employment exceeds the 40 employees per acre entered in cell P7. The ComPlan also compares the absolute and percentage differences between actual conditions and model estimates. Again, the user can set ranges at the top of each comparison column.



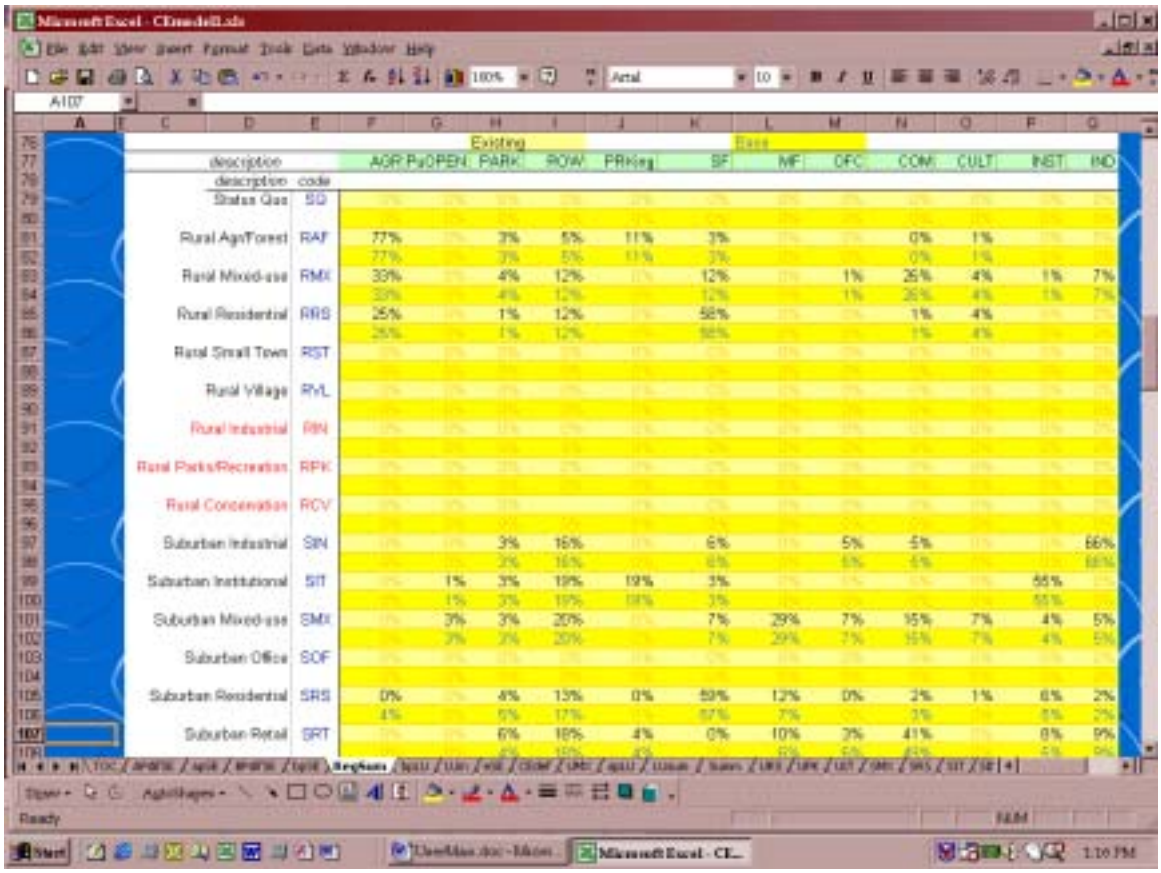
Alternative Socioeconomic Estimates by Community Elements – this worksheet calculates socioeconomic totals by community elements rather than subareas. It provides a more reasonable basis for comparison and should be used for calibrating the ComPlan. It presents several summaries, the first being the ratio of socioeconomic characteristics to useable land. The use can enter a reasonableness range at the top of each column that highlights all elements exceeding the expected range. The ComPlan also provides absolute and percent differences between actual and estimated socioeconomic characteristics, highlighting in red those elements where differences exceed reasonableness ranges (defined by the user). Actual totals and base estimates for community elements are shown to the right of the comparisons.



Calibration Step 3 – Reducing Land Use Differences

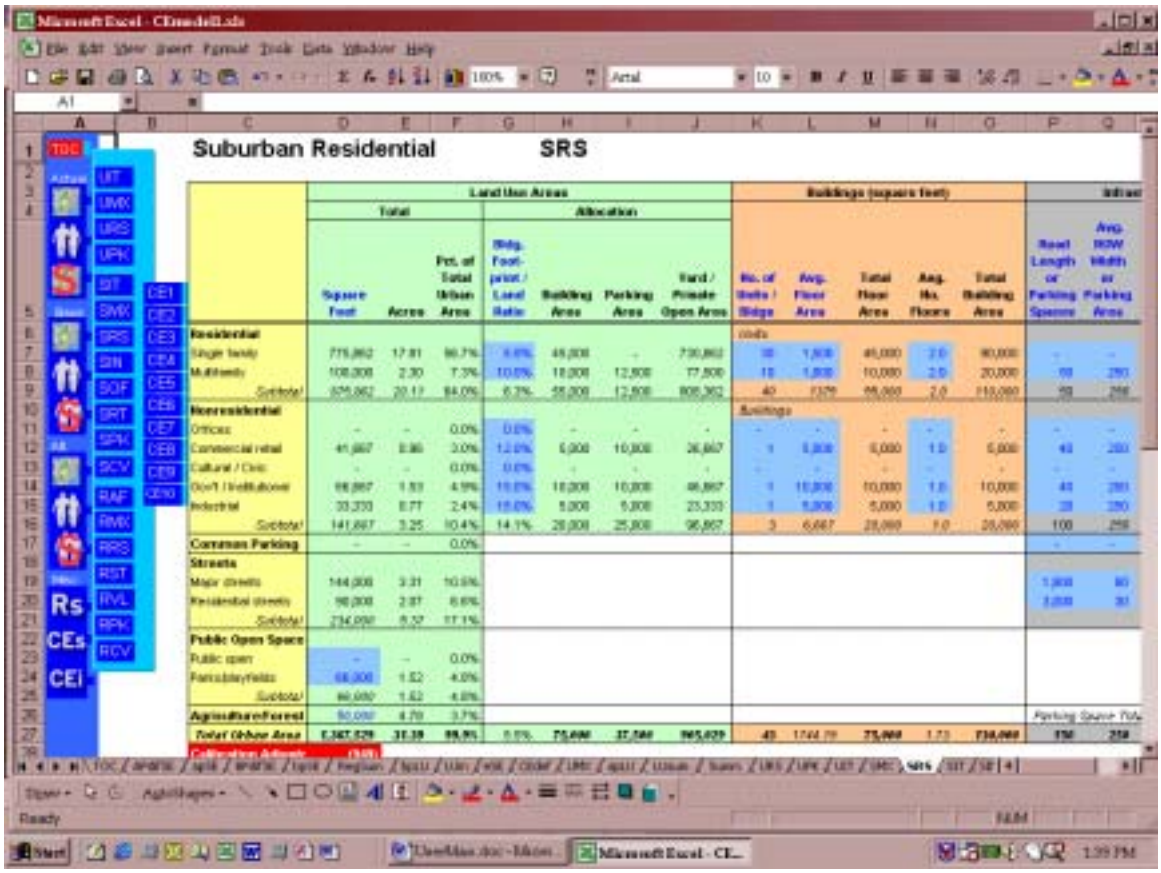
The land use comparison worksheet presents actual and base condition differences by land use categories and by community elements. Each community element has two rows, the top or darker row indicating actual condition proportions and the bottom or lighter row indicating base condition proportions. If there are significant differences in the proportions for a community element, point and click on the community element code to go to the inventory worksheet.

For example, the figure below indicates the suburban residential element is over-representing right of way (ROW) and over-representing multifamily use (MF). To change these proportions in the community element inventory, click and point on the suburban residential code (SRS).



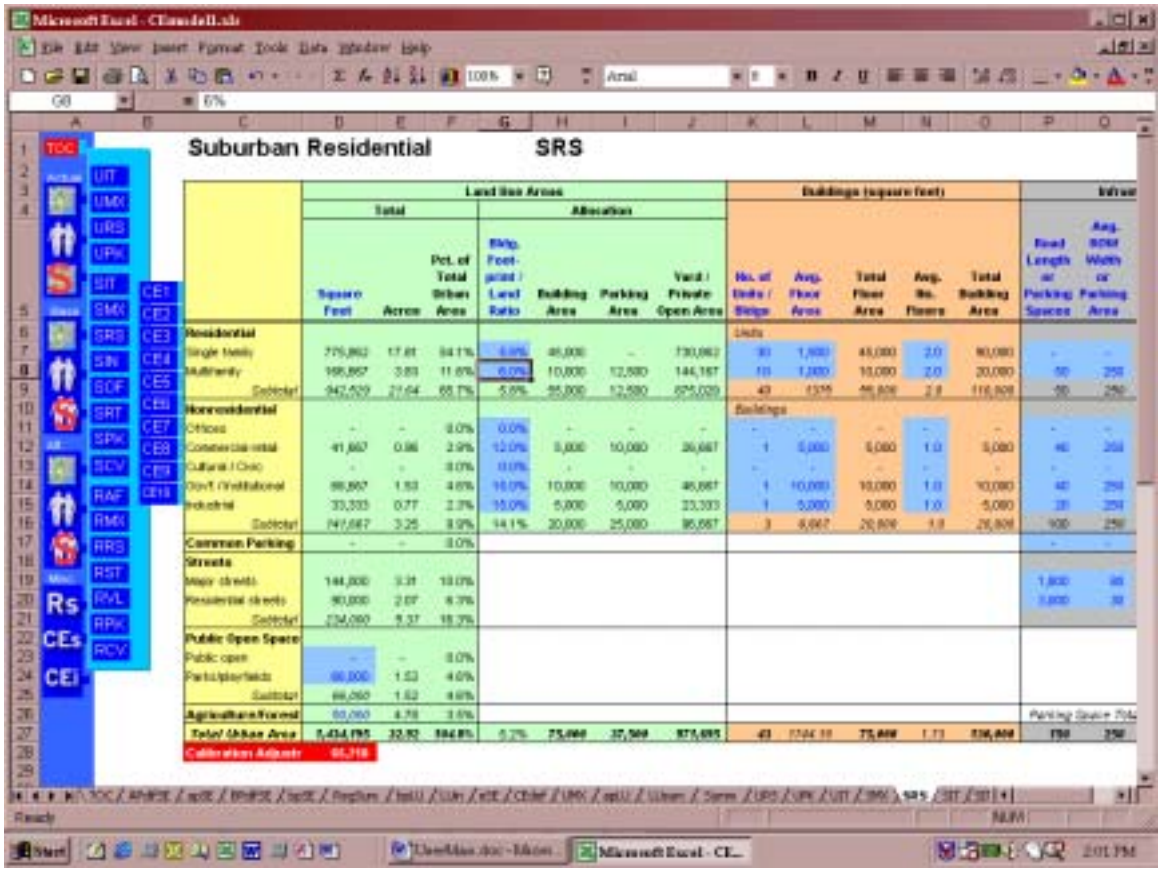
		Existing						Base					
description		AGR	PvOPEN	PARK	ROW	PRKng	SF	MF	OFC	COM	CULT	INST	IND
description	code												
Status Quo	SQ												
Rural Agr/Forest	RAF	77%		3%	5%	11%	3%			0%	1%		
		77%		3%	5%	11%	3%			0%	1%		
Rural Mixed-use	RMX	39%		4%	12%		12%		1%	26%	4%	1%	7%
		39%		4%	12%		12%		1%	26%	4%	1%	7%
Rural Residential	RRS	25%		1%	12%		58%			1%	4%		
		25%		1%	12%		58%			1%	4%		
Rural Small Town	RST												
Rural Village	RVL												
Rural Industrial	RIN												
Rural Parks/Recreation	RPK												
Rural Conservation	RCV												
Suburban Industrial	SIN			3%	16%		6%		5%	5%			66%
				3%	16%		6%		5%	5%			66%
Suburban Institutional	SIT		1%	3%	19%	19%	3%					55%	
			1%	3%	19%	19%	3%					55%	
Suburban Mixed-use	SMX		3%	3%	20%		7%	29%	7%	15%	7%	4%	5%
			3%	3%	20%		7%	29%	7%	15%	7%	4%	5%
Suburban Office	SOF												
Suburban Residential	SRS	0%		4%	13%	0%	59%	12%	0%	3%	1%	6%	2%
		4%		6%	17%		57%	7%		3%		6%	2%
Suburban Retail	SRT			6%	18%	4%	0%	10%	3%	41%		0%	9%
				6%	18%	4%		10%	3%	41%		0%	9%

The proportions of land uses are shown in column F of the community element inventories. As shown in the summary on the previous page and in column F below, 17 percent of land in suburban residential elements is assumed to be right of way (higher than the actual proportion of 13 percent) and seven percent is assumed to be multifamily (lower than the actual proportion of 12 percent). The right of way proportion in this example is lowered by reducing either the street widths (column Q) or, more appropriately, shortening the length of streets (column P). Increasing the number of units (column K), the average floor area (column L) or the ratio of building area to land area (column G) are ways to increase the multifamily proportion.



Modifying the community element inputs for any of the land use categories will change the proportions for all categories (not just the target categories) and the overall useable area. Therefore, adjustments usually require several iterations. Also, changes to building areas not only influence land areas, they change socioeconomic results as well. For example, increasing the number of multifamily units will increase the multifamily population as well as the land allocated to the multifamily uses. *The first calibration steps should focus on modifying those community element inputs that isolate land use proportions (building to land area ratios and infrastructure inputs).*

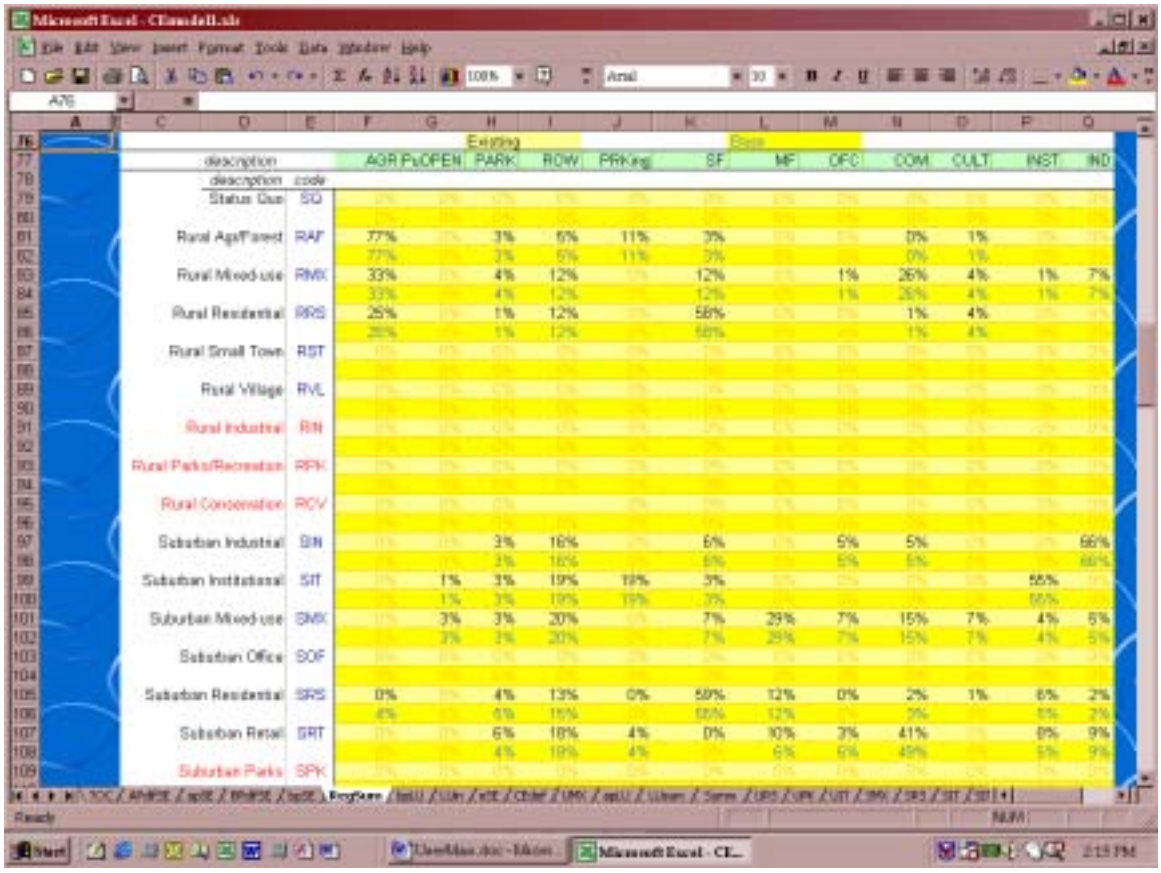
The first adjustment in the example is to the building/land area ratio (changed from 10 to six percent). This adjustment increases total multifamily area from 2.3 to 3.83 acres and nears the target of 12 percent. However, in also increases the total useable area to 65,718 feet over the total element area target (shown in the red box at the bottom of the inventory). The next step is changing road widths to reduce both the right of way proportion and the overall useable area.



The second adjustment in the example is reducing the length of major streets in cell P19 from 1,800 feet to 1,000 feet. This adjustment brings the right of way proportion in line with the actual proportion and reduces the estimated useable area to within 2,000 square feet of the element target.

After making the adjustment, point and click on the worksheet icon to review the land use comparison. In the example, the adjustments improve the land use proportions for the right of way and multifamily types.

It should be noted that modifications to any of the inventory inputs should be reasonable. For instance, building/land use ratios for multifamily uses typically range from five to twenty percent. Having to adjusting ratios beyond such reasonableness ranges suggests that another variable is the culprit for differences.

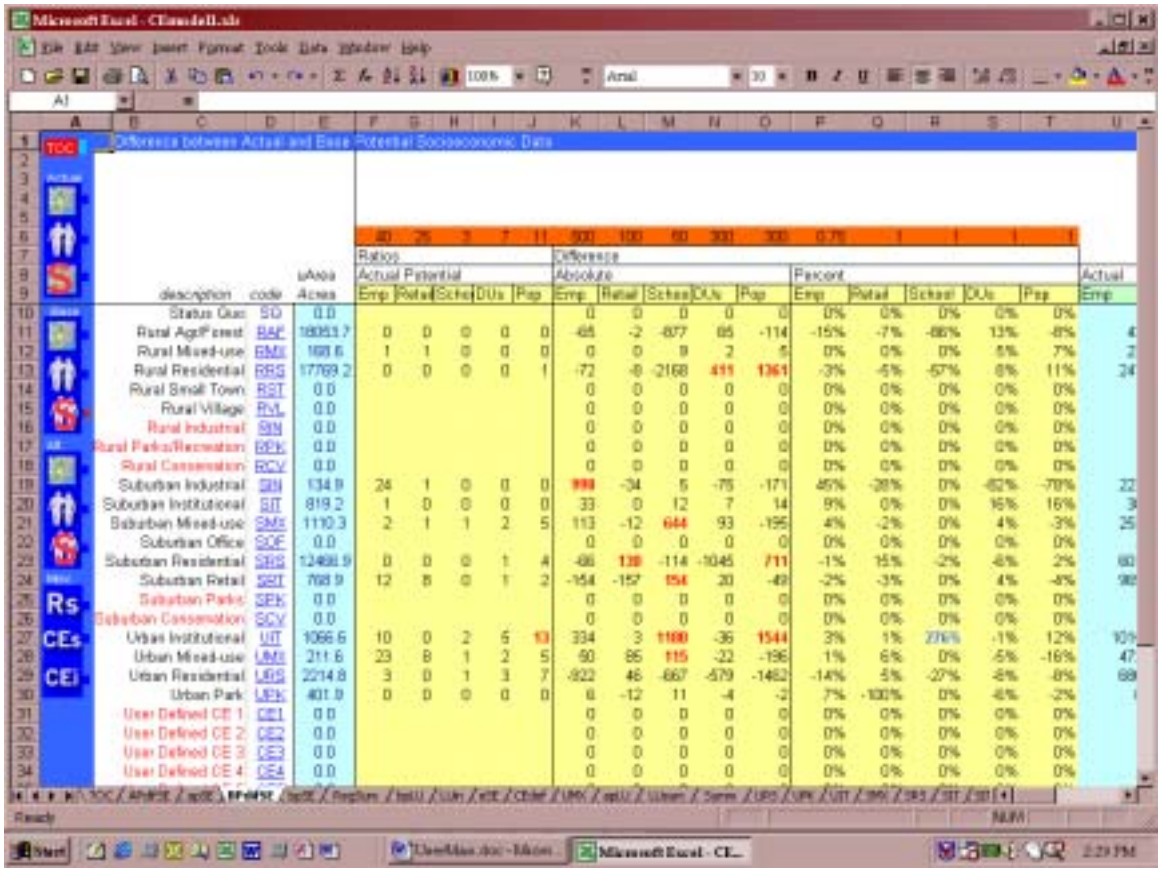


description	code	AGR	PuOPEN	PARK	ROW	PRKng	SF	MF	OFC	COM	CULT	INST	IND
Status Quo	SQ												
Rural Agr/Forest	RAF	77%		3%	6%	11%	3%			0%	1%		
Rural Mixed-use	RMX	33%		4%	12%		12%		1%	26%	4%	1%	7%
Rural Residential	RRS	25%		1%	12%		58%			1%	4%		
Rural Small Town	RST												
Rural Village	RVL												
Rural Industrial	RIN												
Rural Parks/Recreation	RPK												
Rural Conservation	RCV												
Suburban Industrial	SIN			3%	16%		6%		5%	5%			66%
Suburban Institutional	SIT		1%	3%	19%	19%	3%					55%	
Suburban Mixed-use	SMX		3%	3%	20%		7%	29%	7%	15%	7%	4%	5%
Suburban Office	SOF												
Suburban Residential	SRS	0%		4%	13%	0%	59%	12%	0%	2%	1%	6%	2%
Suburban Retail	SRT			6%	18%	4%	0%	10%	3%	41%		0%	9%
Suburban Parks	SPK												

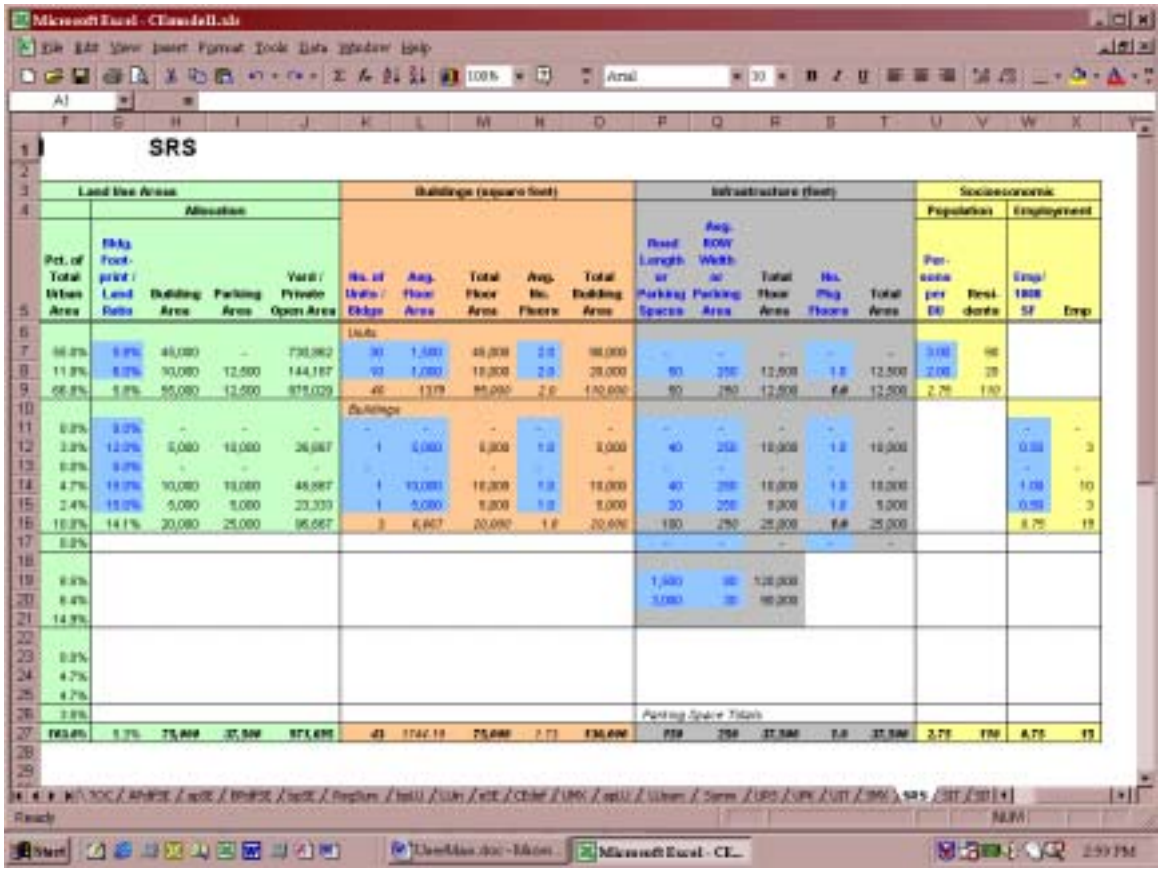
Calibration Step 4 – Reducing Socioeconomic Differences

Calibrating the model to improve the differences between actual and base socioeconomic results is similar to the land use step described in the previous pages. The first step is reviewing the regional socioeconomic totals in the bottom right tables of the regional summary (RS) worksheet. If there are significant differences, then point and click on the base summary icon button to go to the base summary worksheet. The worksheet compares socioeconomic information (total employment, retail, school enrollment, dwelling units and population) at the community element level.

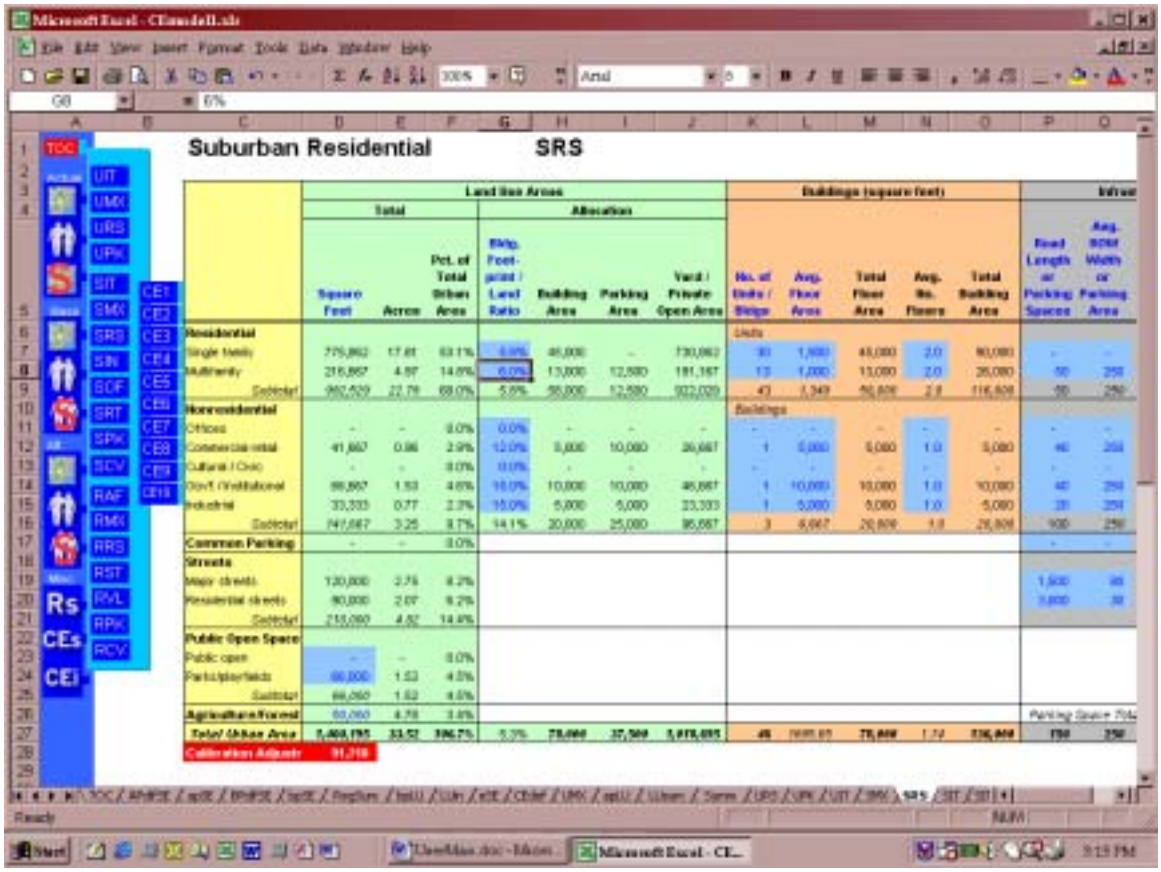
To modify community element inventory inputs so that base conditions more closely match actual conditions, point and click on the code of the community element to adjust. Focus on the percent rather than absolute differences during calibration. In the percent difference comparison below, model estimated suburban residential dwelling units are noticeably lower (-6%) than actual units. To reduce the difference, point and click on the SRS code.



As with the land use adjustments, the first socioeconomic calibration steps should focus on those variables that change socioeconomic estimates only (persons per dwelling unit in column U and employees per 1,000 square feet in column W). In the example described above the percentage of dwelling units is low, for the suburban residential category, which can only be improved by increasing the number of dwelling units in column K. This change will affect land use as well as socioeconomic results.

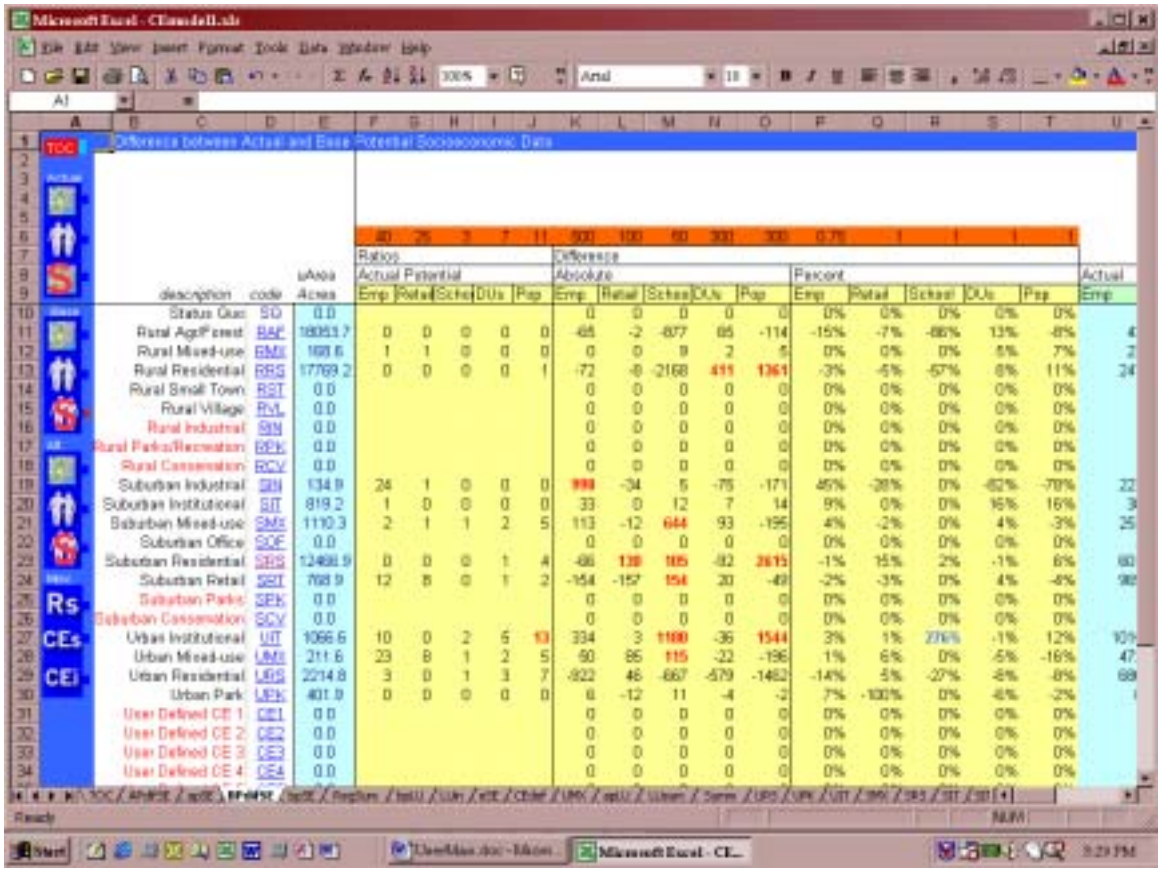


The base estimate of dwelling units for the suburban residential element is eight percent lower than the actual number of units, so the number of dwelling units assumed by the element must be increased from 40 to 43. Because the multifamily land use proportion was low in the land use calibration step, it makes sense to add the units to the multifamily units category. This will increase the building area, which will increase the land area unless the building/land ratio is also increased. Increasing the number of multifamily units results in a multifamily land use proportion that is too high (14.8 percent versus a target of 12 percent) and a total useable area that is over 90,000 square feet too much.

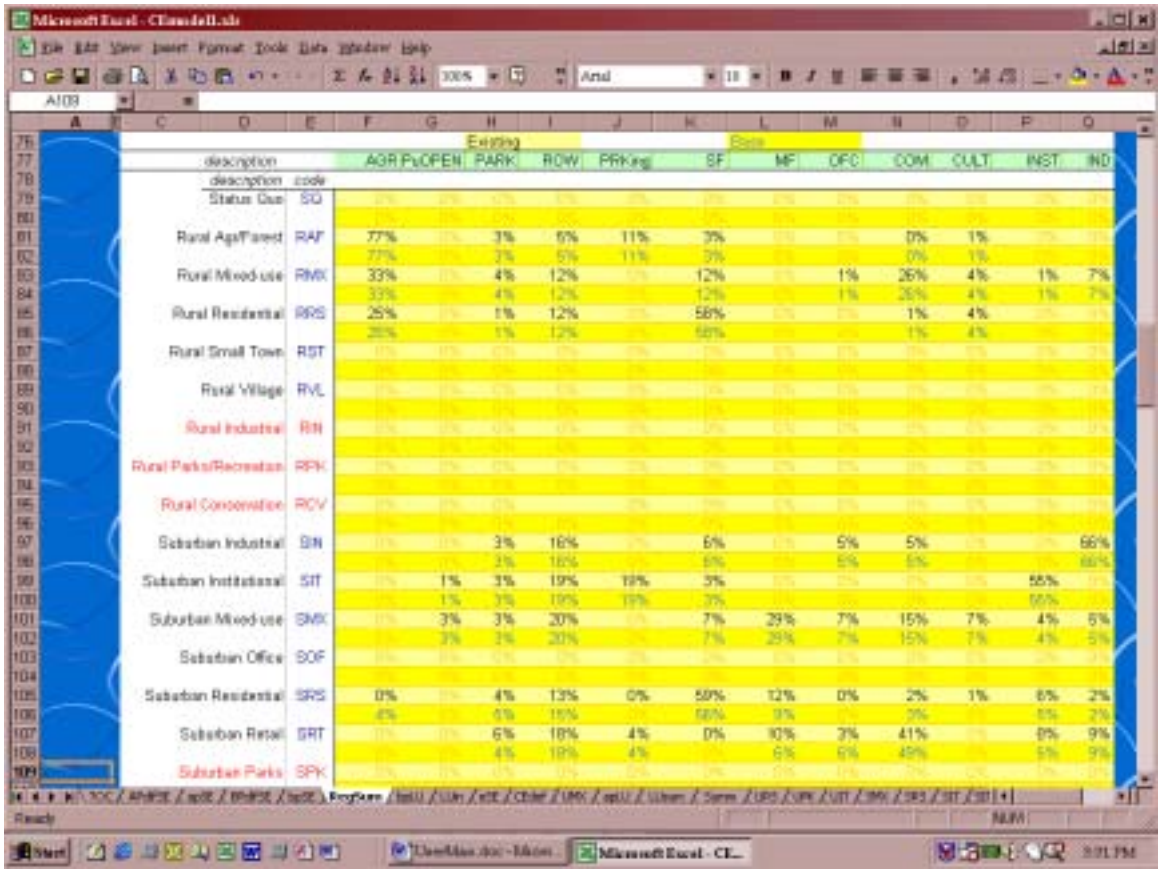


Increasing the building to land ratio from six percent back to the 10 percent initially assumed compensates for the over-adjustment caused by the increase in multifamily units. The amount of useable area is now within 5,051 square feet (very close to the target), and the proportion of multifamily land is now around 10 percent (lower than the target but reasonable.

Point and click on the socioeconomic comparison icon to check the socioeconomic results of these changes. The estimated number of dwelling units for the suburban residential communities is now only one percent lower than the actual number of units, as compared to eight percent lower using the initial assumptions.



Because of the changes to land use assumptions, now point and click on the land use comparison icon. The multifamily proportion is further from the target than before, but still within reason. Of course, if this result is not acceptable, additional adjustments can improve results even further.

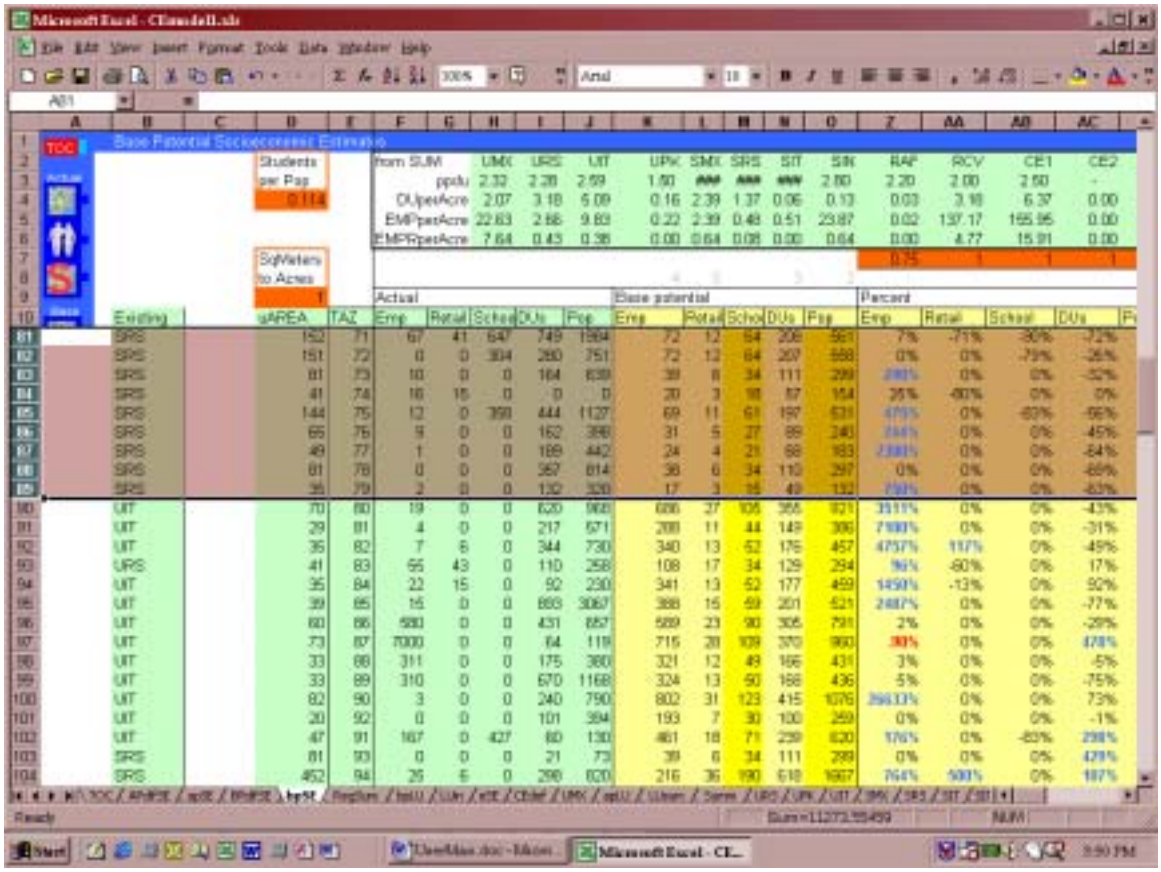


		Existing						Base					
description		AGR	PuOPEN	PARK	ROW	PRKing	SF	MF	OFC	COM	CULT	INST	IND
Status Quo	SQ												
Rural Ag/Forest	RAF	77%		3%	6%	11%	3%			0%	1%		
Rural Mixed-use	RMX	33%		4%	12%		12%		1%	26%	4%	1%	7%
Rural Residential	RRS	25%		1%	12%		56%			1%	4%		
Rural Small Town	RST												
Rural Village	RVL												
Rural Industrial	RIN												
Rural Parks/Recreation	RPK												
Rural Conservation	RCV												
Suburban Industrial	SIN			3%	16%		6%		5%	5%			66%
Suburban Institutional	SIT		1%	3%	19%	19%	3%					55%	
Suburban Mixed-use	SMX		3%	3%	20%		7%	29%	7%	15%	7%	4%	5%
Suburban Office	SOF												
Suburban Residential	SRS	0%		4%	13%	0%	59%	12%	0%	2%	1%	6%	2%
Suburban Retail	SRT			6%	18%	4%	0%	10%	3%	41%		8%	9%
Suburban Parks	SPK												

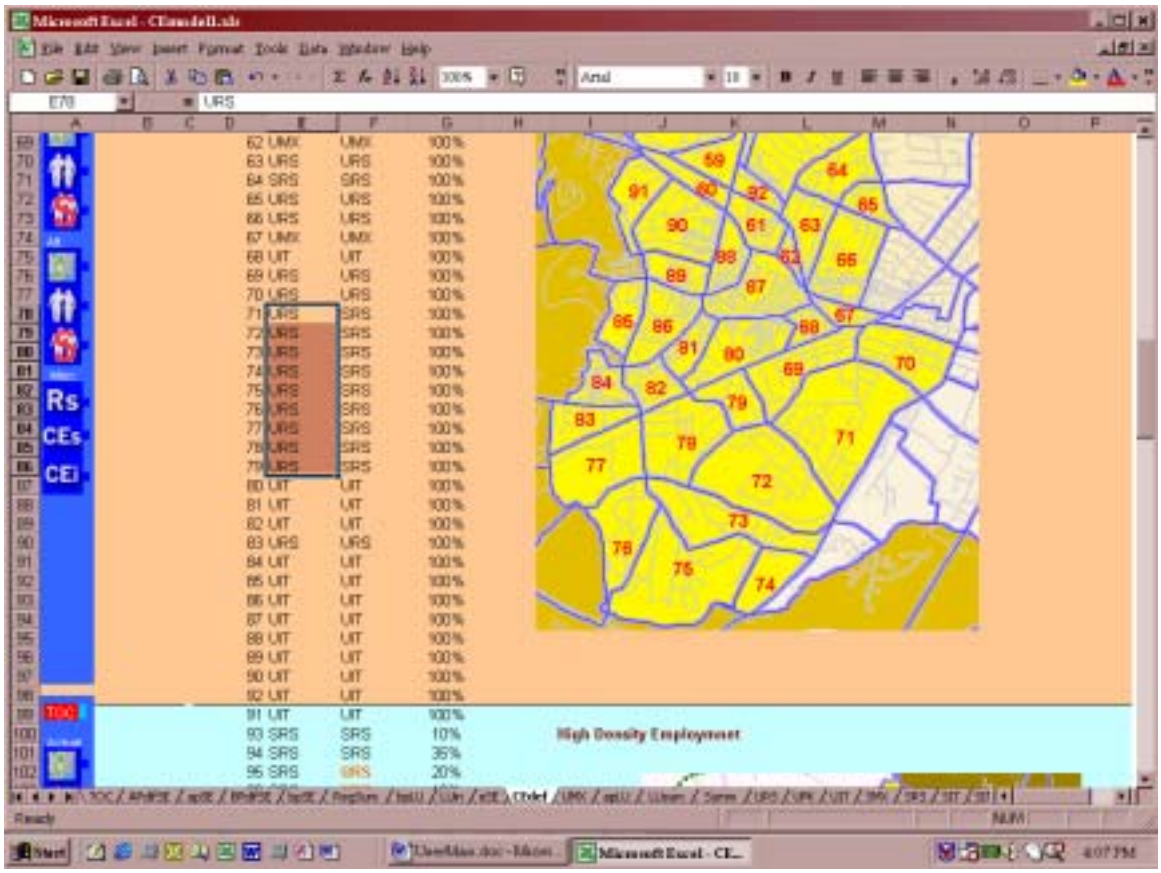
Calibration Step 5 -- Changing Assigned Elements

Yet another way to calibrate the ComPlan is to change community element assignments to subareas. For reasons described in the Calibration Caveats section, this adjustment may not be appropriate for subareas less than 31 acres. The adjustment may also be inappropriate for larger areas for reasons described in the Caveats section. Thus, this type of calibration adjustment is recommended as a last step.

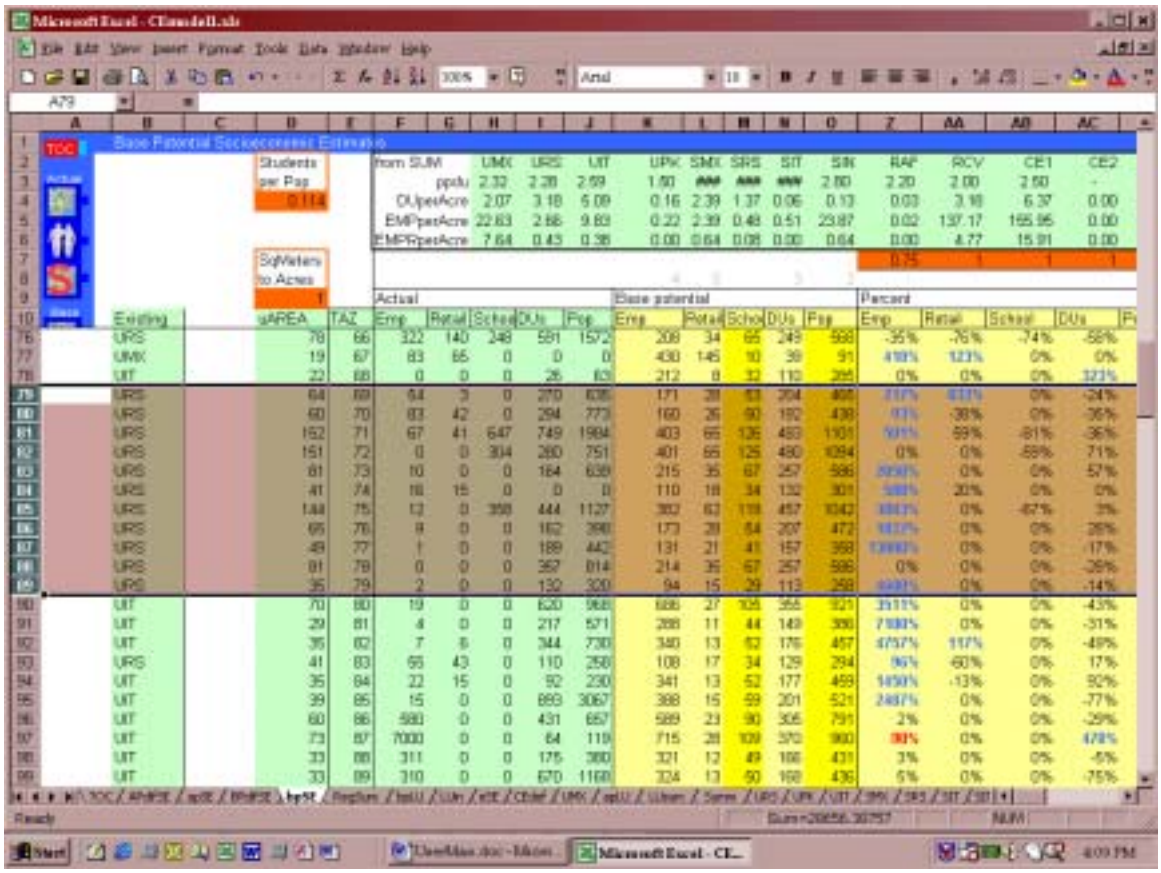
To make the adjustment, point and click on the detailed base comparison icon and check results by subareas, focusing on percentage rather than absolute differences. In the example below, the actual number of dwelling units in all of the suburban residential subareas highlighted is higher than the base estimate. Because the suburban residential element is calibrated at a regional level, these results indicate other areas of the region have consistently lower densities. This is somewhat expected because the subareas highlighted below are relatively close to downtown Charlottesville.



The urban residential element assumes higher densities than the suburban residential element, so the model's performance for subareas 71 through 79 may be improved by changing the assigned community element. To do this, point and click on the CEi icon and change the base codes (column E) for subareas 71 through 79 from SRS (suburban residential) to URS (urban residential) as shown on the screen below.



To check results, point and click on the detailed base comparison icon and review results for subareas 71 through 79. The differences between actual versus estimated dwelling units have decreased, but the differences between actual versus estimated employees have increased dramatically.



This suggests that subareas 71 through 79 are comparable to the urban residential element in some ways and to the suburban residential element on others. To improve calibration results, a new community element could be created for these subareas; however, there is a trade-off between improving calibration results and model complexity to consider.

Calibrating with Incomplete Data

Calibration is possible if only some of the actual land use or socioeconomic data are available. In Metropolitan Planning Organization (MPO) areas, population and employment data are available by subareas (traffic analysis zones). Population and dwelling unit information is also available from the Census. Therefore, socioeconomic data are available to all areas and provide a reasonable basis for calibration.

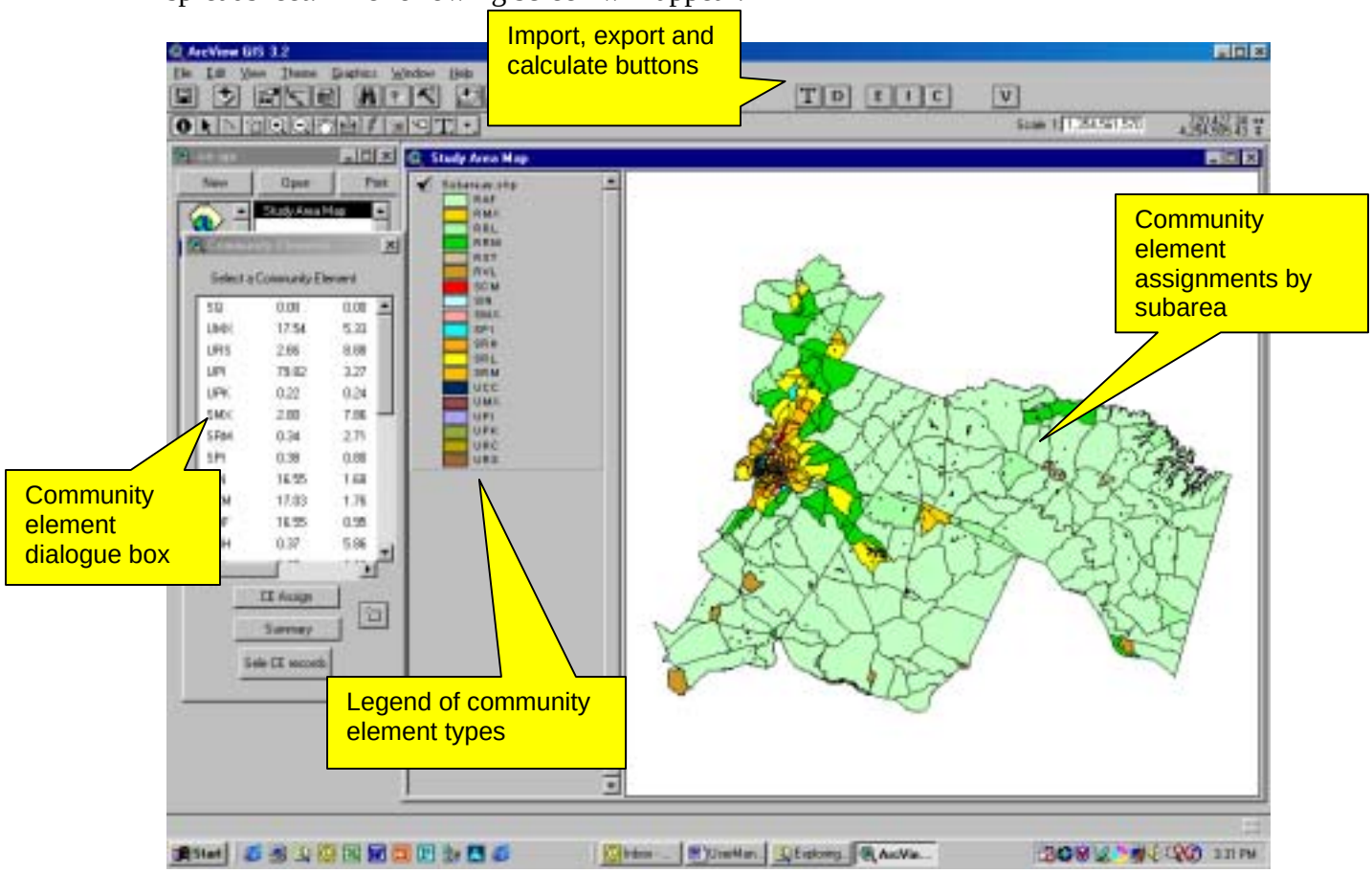
Land use data are not as readily available. In the Charlottesville region, land use data are only available from the City of Charlottesville, yet the study area extended far beyond the city's boundaries. Nevertheless, calibration was possible for those elements assigned to subareas within Charlottesville.

If no land use data are available for calibration, the model will input base condition estimates in the actual condition. If data are available for only portions of the study area, the model will use actual data where available and base condition estimates for the remaining areas. Thus, actual results will automatically match base results where no data are available and approximate base results when limited data are available. The more available data there is the greater the likelihood that there are differences between the actual and base conditions.

ARCVIEW

ArcView is a proprietary geographic information system (GIS) software package that integrates electronic maps with databases. While the ComPlan spreadsheet is designed to work with or without the ArcView GIS software package, it is helpful to make community element assignments using ArcView. To use ArcView, you must have the ArcView software installed and the ComPlan files located in the CE directory.

To invoke the ArcView information for the Eastern Planning Initiative in the Charlottesville region, double click on the *ce.apr* file icon in Windows Explorer software or on the ArcView link at the bottom of the table of contents page in the ComPlan spreadsheet. The following screen will appear.



The Community Elements dialogue box to the left of the screen lists all available community elements in the leftmost column, the average number of employees per acre in the second column and the average number of people per acre in the third column. Several buttons below the element data are available to select and assign elements to the subarea map on the right of the screen. The legend in the middle of the screen indicates the color for each community element. The map on the right of the screen shows the community element assignments. The buttons above the map help import, export and update community element assignments and parameters.

Exchanging Information between ComPlan spreadsheet and ArcView
The following macros are available in the ComPlan spreadsheet to exchange information with ArcView:

CTL E – press the control and E keys simultaneously to invoke a macro that exports the list of subareas (traffic analysis zones and block aggregate areas) and community assignment codes in the CEi worksheet to ArcView. This macro stores this information in a file named *cei2dbf.dbf* that is read by a script in ArcView that imports this information (described later). There will be several prompts from Excel about saving the file. Answer yes to each prompt to export the information.

CTL I – press the control and I keys simultaneously to invoke a macro that imports the list of subareas and community assignment codes from ArcView to the CEi worksheet. This macro looks for the *cei2xls.dbf* file that is created by the export script in ArcView (described later).

CTL P – press the control and P keys simultaneously to invoke a macro that exports the community element employment and population density parameters from the CEs worksheet to the *ce_def.dbf* file read by a script in ArcView that imports the parameters (described later). Answer yes to each of the file save prompts from Excel as it completes the macro steps.

Each of these macros is listed at the bottom of the ComPlan table of contents.

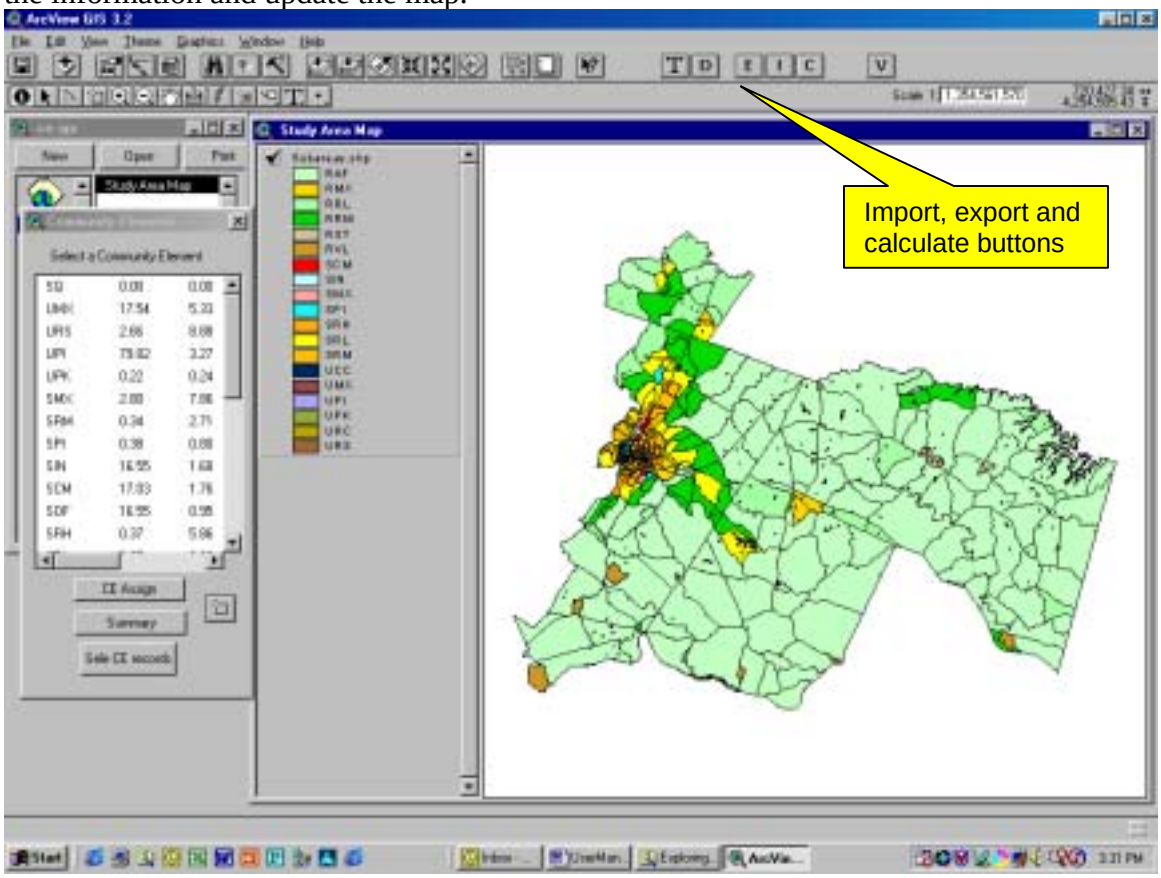
The following scripts are available in ArcView to exchange information with the ComPlan spreadsheet:

E – press the E button at the top of the screen to invoke an ArcView script that exports a list of subareas and community element assignments to a file named *ce2xls.dbf* . This file is read by the community element import function in the ComPlan spreadsheet (the CTL I macro).

I – press the I button at the top of the screen to invoke a script that imports a list of subareas and community element assignments from a file named *ce2dbf.dbf.* This file is created by the community element export function in the ComPlan spreadsheet (the CTL E macro).

V – press the V button at the top of the ArcView screen to invoke a script that imports the population and employment densities (listed in Community Elements toolbox to the left of the map) from a file named *ce_def.dbf.* This file is created by the community element parameter export function in the ComPlan spreadsheet (the CTL P macro).

C – press the C button after importing any new information into ArcView to recalculate the information and update the map.



T – this button does not import or export files, rather it turns on or off the table of contents (legend) that lists the colors of the community element to the left of the map.

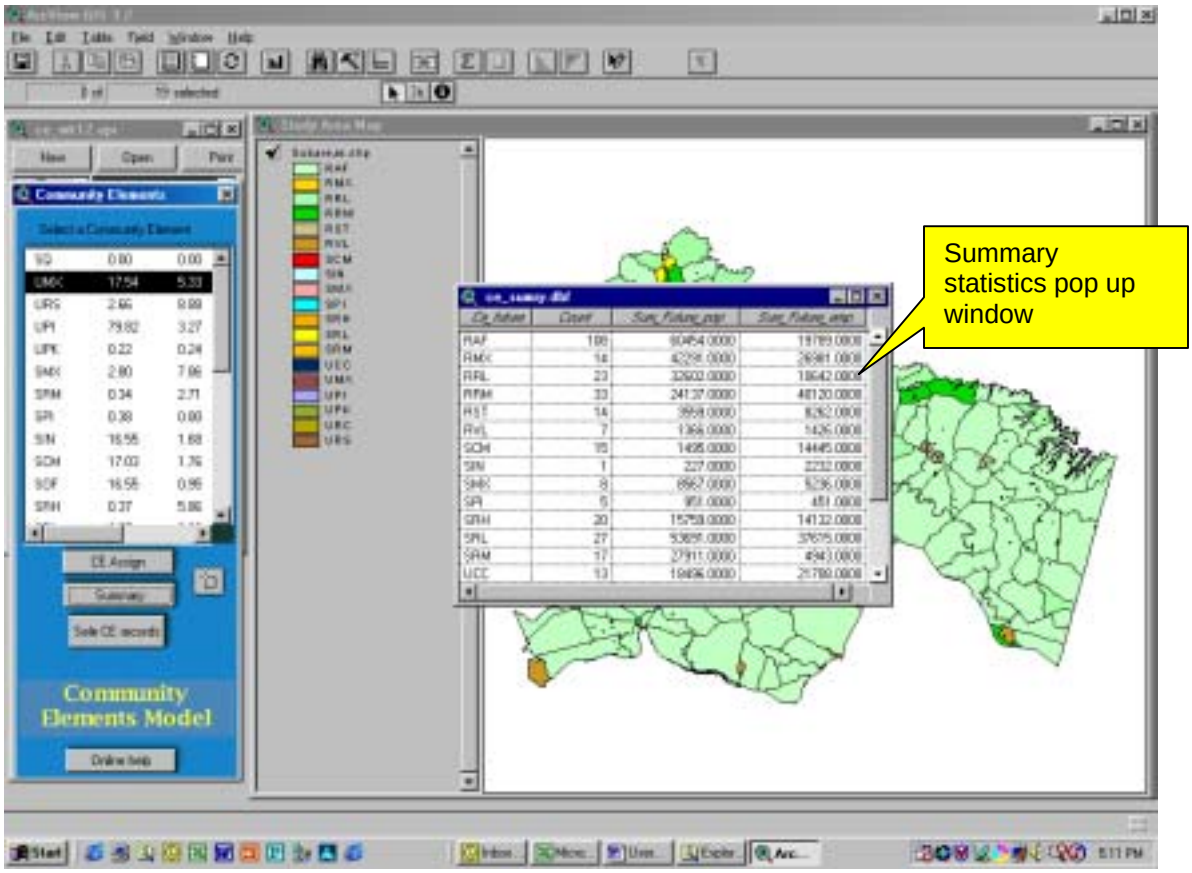
Community Element Dialogue Box

The Community Element dialogue box located to the left of the screen provides a list of the currently available community elements in the window at the top of the box and the following buttons that invoke scripts at the bottom of the box.

CE Assign – this button assigns a highlighted record in the toolbox window to a selected subarea (or subareas) on the map. Before pressing this button, point and click on the *select* button to the right of the *CE Assign* button (denoted with a box graphic) and select one or more subareas to change. To select more than one subarea, hold the shift key down as you point on each subarea. Next point and click on one of the elements listed in the toolbox window. Finally, point and click on the *CE Assign* button. The selected areas should now be in the same color (shown on the legend) as the selected element.

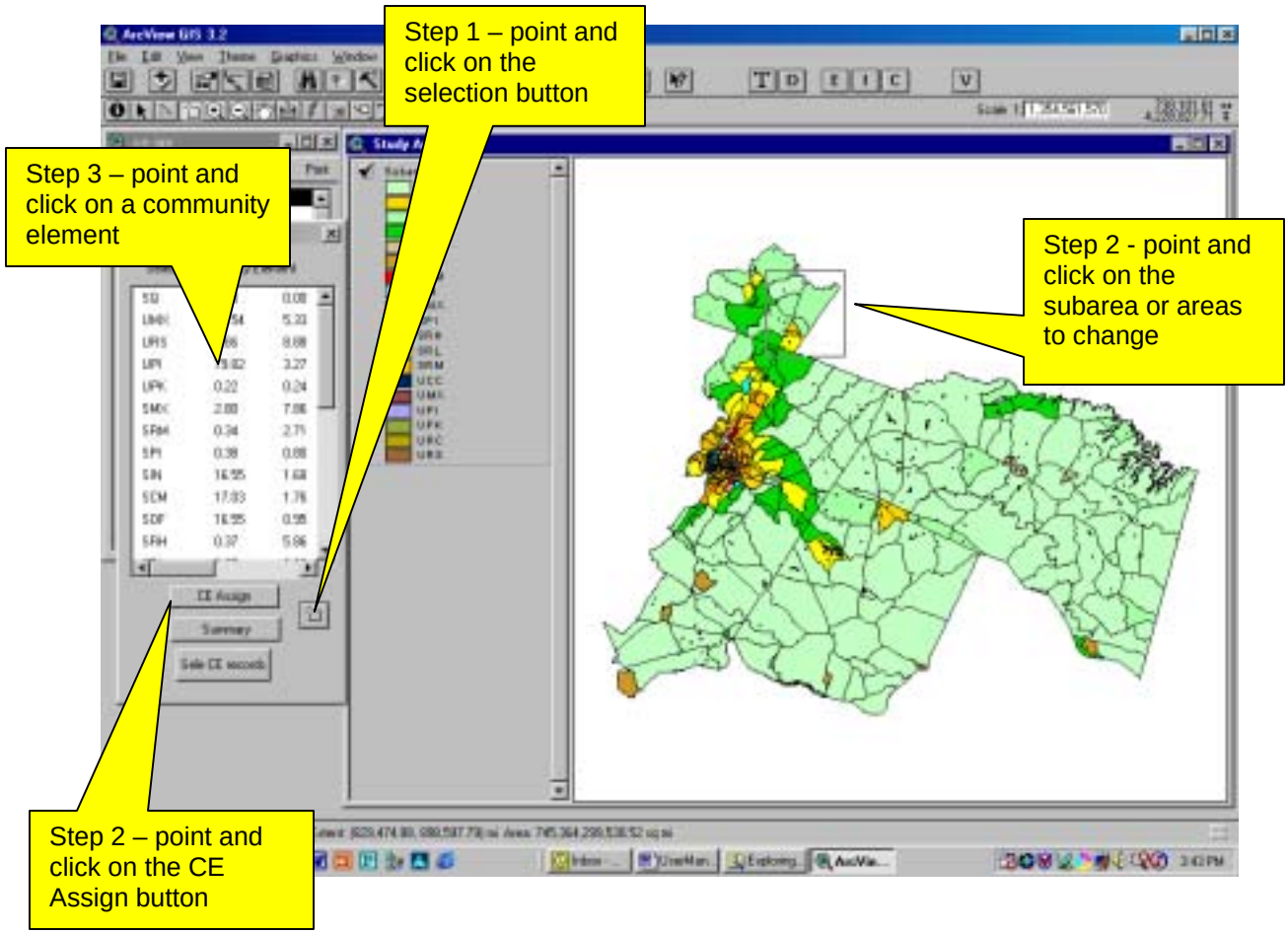
Summary – this button presents summary statistics for the region or a selected set of subareas. A summary pop window lists the community elements in the selected subareas and the total population and employment for the selected area.

Select CE records – this button selects all subareas for a community type. To use the button, select one of the community elements in the window, then point and click on the button. The map then highlights all subareas of the selected type.



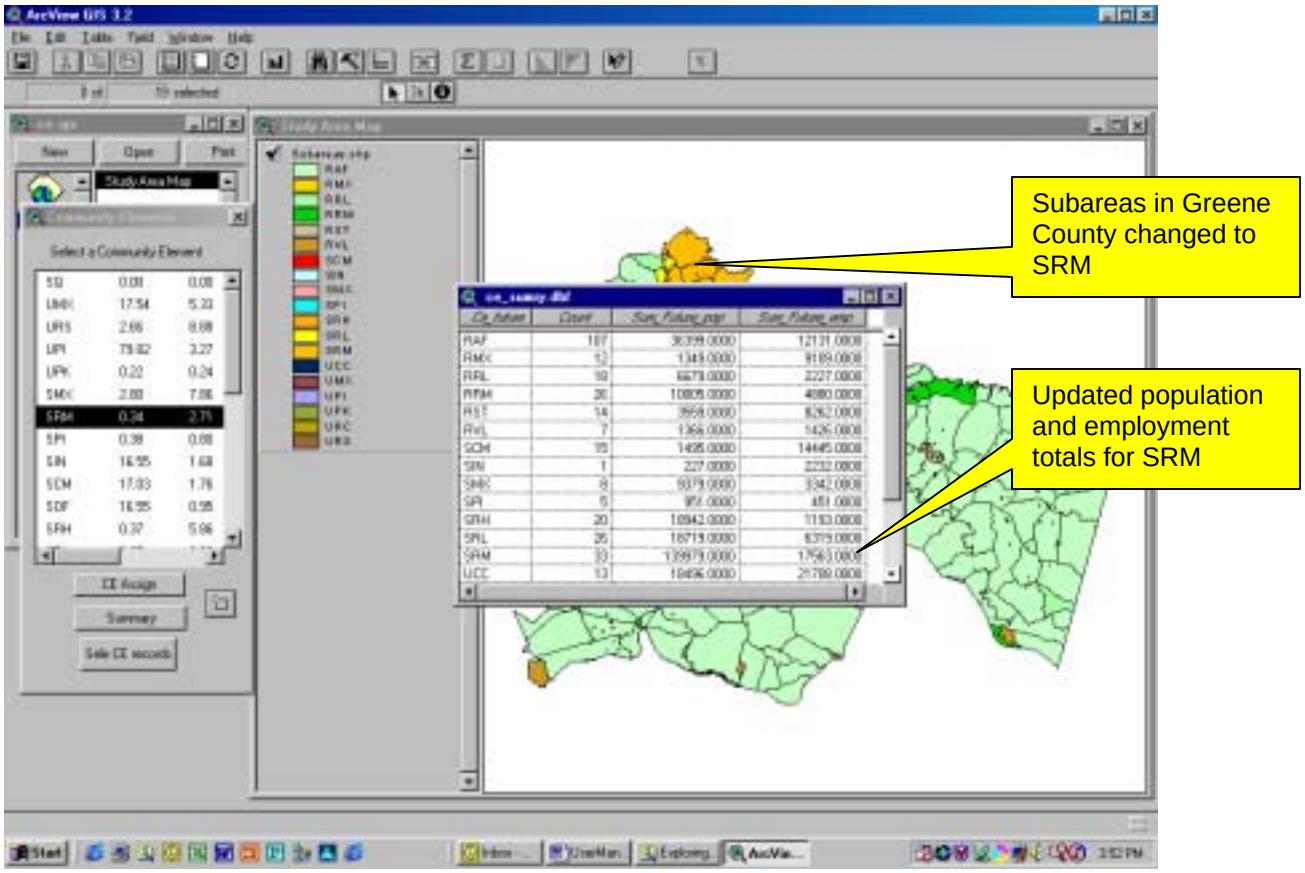
Creating Alternatives in ArcView

To change any of the community elements, point and click on the selection button (with a square icon) in the community dialogue box. Next, point and click on any one of the subareas in the region, or to select a group of subareas, use the mouse to create a box around those subareas to change. Point and click on one of the community elements in the dialogue box, then point and click on the *CE Assign* button. The selected subareas will change to the color of the new community element.

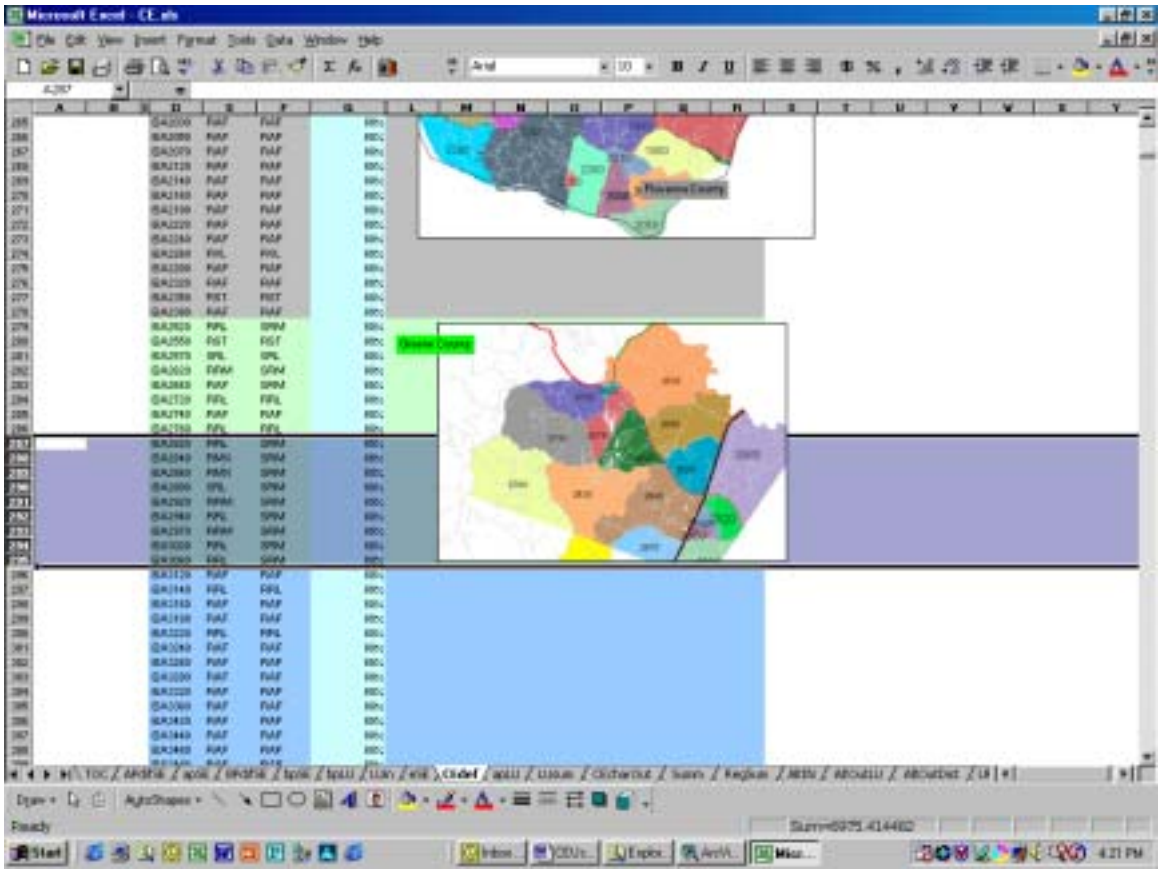


In the example below, several of the subareas in Greene County are changed to the suburban residential, moderate density element and now have a burnt orange color. The change updated the supporting database, which can be checked by pointing and clicking on the *Summary* button in the community element dialogue box.

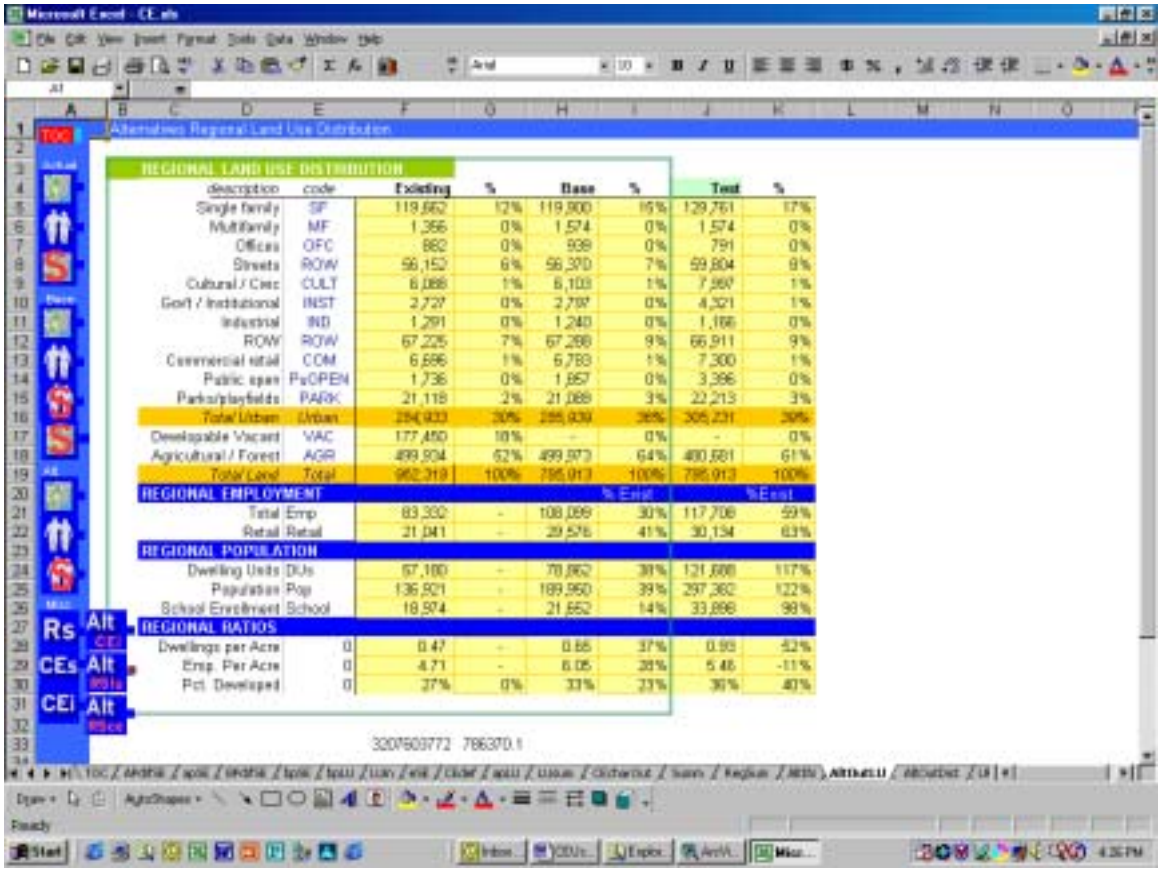
In the base case of the community element assignments (shown in the screen on page 43), there are 17 suburban residential moderate (SRM) elements in the region, with a total population of 27,911 and employment of 4,943. In the modified version shown below, there are now 33 SRM subareas with a total population of 139,979 and employment of 17,563.



Any changes to the community element assignments can then be exported to the ComPlan spreadsheet using the E (export button at the top of the ArcView screen), then invoking the import macro in the spreadsheet by pressing the CTL and I keys simultaneously. The highlighted rows below are the subareas changed in ArcView and imported to the spreadsheet.



Regional summaries and comparisons can than be made of alternatives in the spreadsheet by pressing the CTL and A keys. The Test alternative in the screen below reflects the changes made in Greene County using ArcView. The regional population potential increases from nearly 190,000 under the Base case to over 297,000 in the Test alternative and the total employment potential increases from around 110,000 to around 118,000. The changes upgraded rural residential and agricultural subareas in Greene County to moderate suburban residential development, so the increases in population and employment potentials are as expected.



WHERE TO GET HELP

The Renaissance Planning Group developed this beta version of ComPlan. E-mail questions about the model to:

gduke@citiesthatwork.com