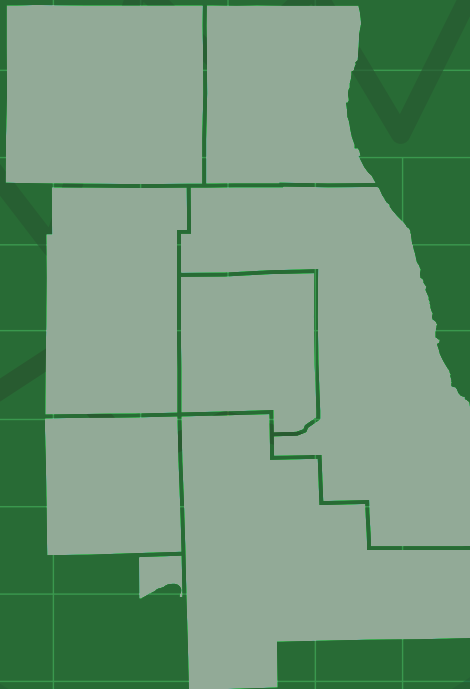




# Homes for a Changing Region Toolkit Data Analysis Guide CMAP Region

March 2016



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# Introduction

*Homes for a Changing Region* plans are based heavily on data from local, regional, and national sources. To organize and simplify the compilation and analysis of that data, the Chicago Metropolitan Agency for Planning (CMAP) has developed two Excel files that contain the key data elements of a *Homes* plan ([available together in zip format here](#)):

- The Currentdata CMAP Region.xlsx workbook file contains tabs that explore current local housing data.
- The Capacity module.xlsx workbook file helps users calculate a community's current capacity to accommodate future growth through new construction on vacant or redevelopable land.

These files allow users to mix and match components, and were developed from a suite of open source regional planning tools (*Envision Tomorrow*) created by Fregonese Associates, a consulting firm based on Portland Oregon.<sup>1</sup>

This document is intended to complement the *Homes for a Changing Region* toolkit, by providing a step-by-step guide to how to use the files.

## ***Where do I input information?***

Throughout the modules, purple shaded cells are used to input information.

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<sup>1</sup> <http://www.frego.com/services/envision-tomorrow/>

# Current Data

The [Currentdata.xlsx](#) workbook file contains the central data and analysis used in the development of a *Homes* plan. The seven tabs can be broken into different roles for the user:

**Table 1. Tabs breakdown**

Tabs	Color	User role
Initial inputs	Blue	Use automation to gather data
Current age Unit type Cost burden Current income Current rental Current owner	Green	Review data provided and use tables and charts

CMAP has automated the [Currentdata.xlsx](#) workbook for users, so that all of the existing conditions in U.S. Census Bureau data will be automatically provided by following the steps in this guide. That said, there may still be instances where the source data does not reflect actual conditions due to out-of-date data, sampling issues, etc. Therefore, it is important to review every tab for consistency with local conditions. This review should take place in collaboration with local stakeholders who have specific knowledge of on-the-ground conditions from the public (planners, building inspectors, etc.), private (developers or real estate professionals), and non-profit (housing counselors and social service providers) sectors.

To automatically populate information in the [Currentdata.xlsx](#) workbook, go to the Initial Inputs tab and follow these steps (see screenshot below).

1. Click the large button titled “Select Geography and load data.”
2. Click “Clear spreadsheet.”
3. The model can be run for municipalities, townships, or counties in the CMAP seven county region. Click on either “List Munis,” “List Townships,” or “List Counties” for the preferred geography for analysis.
4. Use the dropdown menu to select your specific geography for analysis.
5. Click “Load Data for Selected” and wait for the cells in the table to fill with data.

CMAP will be updating the file each year with new American Community Survey information. The email address you supplied to download the [Currentdata.xlsx](#) workbook will be used to send you information about these updates. To use the newest information in the model, remember to press the “Clear Spreadsheet” button and then follow the previous five steps.

INITIAL DATA	
Selected Geography	
Initial Year	
Comparison geography	CMAP Region
	0
General Data	
Population B01003	
Households B11001	-
Persons in Group Quarters B26001	
Persons Per Household	#DIV/0!
Vacancy Rate	#DIV/0!
Vacant Units	-
Total Dwelling Units	
Population, 2000 Census DP-1	
Households, 2000 Census P015	
ACS B25119: MEDIAN HOUSEHOLD INCOME	
Median household income in the	
Total:	
Owner occupied (dollars)	
Renter occupied (dollars)	

Each of the green tabs in the Current Data workbook covers one housing topic. Once the data has been loaded by the user, it can be used by local leaders to help identify and quantify local housing problems. For example, the team has frequently heard concerns about households struggling with increasing housing costs; the Cost Burden tab automatically generates charts which explain the percent of owner and renter households that are paying more than 30 percent of income on housing costs. Similarly, many communities have cited a trend of increasing single-family rentals; a review of the *housing type by owner/renter* charts can help a community understand how many of their occupied single-family units are inhabited by renters (see the Unit Type tab).

### Recently incorporated municipalities

Seven municipalities in the region were not incorporated in 2000. Therefore, charts that use data from the 2000 U.S. Census must be manually adjusted for any of these seven communities:

- Big Rock
- Campton Hills
- Homer Glen
- Kaneville
- Millbrook
- Plattville
- Port Barrington

## Unit Type tab

On the Unit Type tab, one chart breaks down the occupied local housing stock into four different housing types based on tenure (*[Community] housing type by owner/renter*) and another compares that breakdown to the CMAP Region (*Housing type by owner/renter [Community] and the region*). The Current Rental tab contains a chart that explains how tenure changes by household income, both in the community and in the CMAP region (*[Community] comparison of rental household incomes with occupied units at each income level*). Together, these three charts help the user understand the types of housing units and the income levels of owners and renters in their communities.

One of the most essential elements necessary to understand local housing dynamics is the concept of housing affordability. “Affordable housing” is a relative measure that varies from household to household, but an affordable housing unit is generally considered one that a family can own or rent for no more than 30 percent of its income. This figure includes rent or mortgage spent on housing as well as any housing-related costs that the resident might incur, such as property taxes, insurance, and utilities. This benchmark is a time-tested measure that is reflected in everything from the underwriting standards of private lenders to data from the U.S. Census Bureau.

## Cost Burden tab

The Cost Burden tab contains two charts that display the change in the number of cost-burdened owners and renters in the community and in the CMAP Region (*Percent of renter occupied households paying more than 30 percent of income on gross rent and Percent of owner occupied households paying more than 30 percent of income on monthly owner costs*). As mentioned above, these charts are particularly important for helping a community understand the extent to which local households may be burdened by housing costs, and understanding the sources of this burden can provide important guidance for policies and programs that help lower such costs, including energy efficiency programs, property tax incentives, and rental assistance programs.

## Current Rental and Current Owners tabs

The Current Rental and Current Owner tabs contain charts that break down the current number of either renter- or owner-occupied households by income level, and compare that to the number of units affordable at that same income level (*[Community] comparison of owner households with occupied units at each income level and [Community] comparison of renter households with occupied units at each income level*). The following is an example of a rental chart:

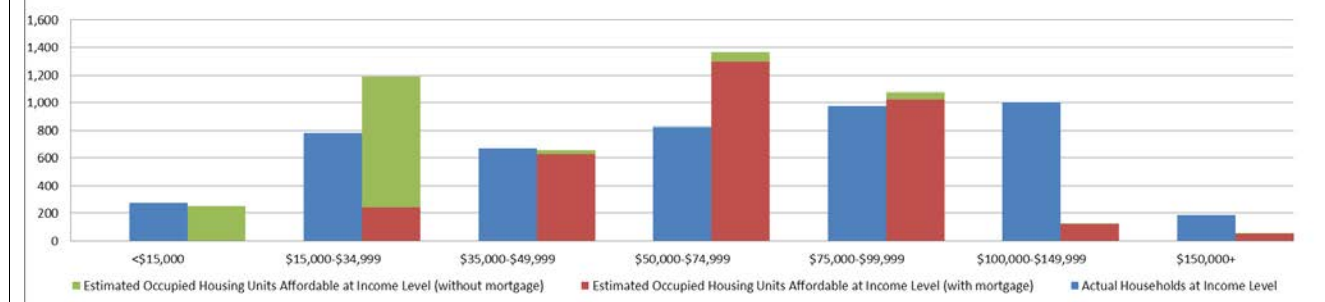
**Figure 1. Smallville comparison of rental household incomes with occupied units affordable at each income level**



Source: Chicago Metropolitan Agency for Planning analysis of Fregonese Envision Tomorrow Balanced Housing Model using American Community Survey 2008-12.

Both the owner and renter versions of this chart should be used to better understand important differences between the number of households and available housing units affordable at each of the seven income levels. For example, in Smallville upper income renters choose to pay less than 30 percent of their income on housing costs, as shown by the number of households exceeding the number of housing units at incomes above \$50,000. Conversely, the number of households exceeds the number of housing units at incomes below \$15,000, highlighting an important group that is struggling with housing costs.

**Figure 2. Smallville comparison of owner household incomes with occupied units affordable at each income level**



Source: Chicago Metropolitan Agency for Planning analysis of Fregonese Envision Tomorrow Balanced Housing Model using American Community Survey 2008-12.

The owner chart is slightly more complex, as it distinguishes between whether or not a unit is mortgaged at each income level. This distinction is very important, since typically the vast majority of units affordable to households earning less than \$35,000 are not mortgaged. These units will often be mortgaged when sold in the future and are unlikely to remain affordable to low-income owners. In turn, some units that are currently mortgaged will have their mortgages paid off. It is important for users to acknowledge these dynamics when considering future housing policies for low-income owners.

# Capacity Module

Reviewing current demographics can help explain existing housing issues, but considering these factors is only part of developing a housing plan, particularly for plans focusing heavily on potential needs of future populations. The other major component to consider is the local capacity for additional housing development. This module allows users to calculate the local capacity for additional housing units.

## Development redevelopment tab

The development/redevelopment analysis considers how a community could grow in the future based on current land use regulations, development approvals, and key development sites. Such calculations are common in many different planning processes and are sometimes referred to as “build-out analyses.” The process provides an estimate of the number of additional units that could be built for different housing types in the future. Those five types are large-lot single-family homes (lots over 8,000 square feet), small-lot single-family homes (lots under 8,000 square feet), townhomes, multi-family units, and other housing types (e.g. mobile homes).

For any build-out analysis, there are two core components:

1. Figuring out how much land is developable and redevelopable.
2. Calculating the number and type of housing units that can be developed on the developable and redevelopable land.

There are many different ways to develop such calculations, and it is important to emphasize that there is no “right” way to do this analysis, since the best approach often depends on local dynamics. The user should consider alternative methods that would better estimate development capacity in a community, based on local considerations and capabilities. What follows is a general guide:

Step 1: Appendix A of this document includes a detailed explanation of the process used by the *Homes* team to calculate the amount of developable and redevelopable land in a community using analysis based on a Geographic Information System (GIS) as the first step. While this appendix may be used as a guide, there are many different ways to generate land area totals using GIS and users should use the method that they find most appropriate.

Step 2: The second step in the process takes the acreages generated in step one and calculates the number of units by housing type (see screenshot below). If the user is following the method included in Appendix A—generating land area totals by zoning district—those totals can then be placed in the Development Redevelopment tab, with the zone name in each row and the land area placed in either column “e” for vacant land or column “g” for redevelopable land. To determine the number of units, the user must review

### **Why explore capacity?**

Capacity is key to understanding how current local land uses, land values, and land development regulations impact the ability of a community to accommodate the preferences of future populations. Its completion helps a community consider land use and zoning recommendations.



the standards for each local zone and determine the permitted density. This density can then be placed in the corresponding row in column "c". Please note that all figures in this column should reflect the number of square feet of land required per unit (i.e. lot size), not the number of units per acre.

**Capacity Analysis**

	Abbreviation	Zone		Density	Vacant		Redevelopable		Total Units	Large Lot single-family	Small Lc
		Name	Lot Size Per Unit Square Feet		Units Per Acre	Acres	Units	Acres			
5				0.0	-	-	-	-	-	-	-
6				0.0	-	-	-	-	-	-	-
7				0.0	-	-	-	-	-	-	-
8				0.0	-	-	-	-	-	-	-
9				0.0	-	-	-	-	-	-	-
10				0.0	-	-	-	-	-	-	-
11				0.0	-	-	-	-	-	-	-
12				0.0	-	-	-	-	-	-	-
13				0.0	-	-	-	-	-	-	-
14				0.0	-	-	-	-	-	-	-
15				0.0	-	-	-	-	-	-	-
16				0.0	-	-	-	-	-	-	-
17				0.0	-	-	-	-	-	-	-
18				0.0	-	-	-	-	-	-	-
19				0.0	-	-	-	-	-	-	-
20				0.0	-	-	-	-	-	-	-
21				0.0	-	-	-	-	-	-	-
22				0.0	-	-	-	-	-	-	-
23				0.0	-	-	-	-	-	-	-
24				0.0	-	-	-	-	-	-	-
25				0.0	-	-	-	-	-	-	-
26				0.0	-	-	-	-	-	-	-
27				0.0	-	-	-	-	-	-	-
28				0.0	-	-	-	-	-	-	-
29				0.0	-	-	-	-	-	-	-
30				0.0	-	-	-	-	-	-	-
31				0.0	-	-	-	-	-	-	-
32				0.0	-	-	-	-	-	-	-
33				0.0	-	-	-	-	-	-	-
34				0.0	-	-	-	-	-	-	-
35				0.0	-	-	-	-	-	-	-
36				0.0	-	-	-	-	-	-	-
37				0.0	-	-	-	-	-	-	-
38				0.0	-	-	-	-	-	-	-
39				0.0	-	-	-	-	-	-	-
40				0.0	-	-	-	-	-	-	-
41			Total			0.00	-	0.00	-	-	-
42	<b>HOUSING CAPACITY BY ZONE</b>				<b>Maximum Capacity by Unit</b>						
43	<i>Zone</i>	<i>Units</i>		<i>Type</i>	<i>Units</i>						
44	0	-		Large-lot single-	-						
45				Small-lot single-							

Annotations in the spreadsheet:

- The density in square feet for each zone goes in this column. (points to Column C)
- Vacant land totals in acres go in this column. (points to Column F)
- Redevelopable land totals in acres go in this column. (points to Column G)

Once all of this information has been entered, the sheet will automatically calculate the total units (column "i"). That said, the spreadsheet does not know what types of units are permitted in any given zone. Therefore, enter the total from column I in either columns "j", "k", "l", "m", or "n" depending on the unit type permitted by the zone (see screenshot below).

Capacity Analysis														
Zone		Lot Size Per Unit	Density	Vacant		Redevelopable		Total Units	Unit Mix Assumptions by Zone					
Abbreviation	Name	Square Feet	Units Per Acre	Acres	Units	Acres	Units		Large Lot single-family	Small Lot single-family	Townhome	Multifamily	Mobile Home/Other	
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
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			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
			0.0	-	-	-	-	-						
Total						0.00	-	0.00	-	-	-	-	-	-

Transfer the totals in this column...

Into one of these five columns depending on the requirements of the zone.

Some zones permit multiple unit types with different densities. The *Homes* team often assumes that any person developing the parcel would attempt to develop the densest product possible. In some communities this may be an inappropriate assumption. Users should consider their local development framework to determine how many of each type would likely be built. In some circumstances, the community may have already approved developments for some parcels, including planned unit developments. Unit totals by housing type should be entered separately in the appropriate columns on the Development Redevelopment tab.

***Large-lot vs. Small-lot***

In past *Homes* projects, the team has defined large-lot, single-family units as a home on a lot greater than 8,000 square feet. Small-lot single-family homes have been defined as a home on a lot smaller than 8,000 square feet.

Completing this table will fill out the *Maximum Capacity by unit type* chart and table on the Tables and Charts tab in the Capacity module workbook. This chart allows a user to summarize which types of units could be developed in the future in the community. Such an analysis can help communities consider potential focus areas for additional analysis. Moreover, it can help communities to identify connections between specific unit types and specific zones, aiding in the exploration of zoning code changes that would allow for the construction of different unit types.

# Appendix A: Capacity Analysis and GIS

CMAP has found that the preferred method for undertaking the capacity analysis is the use of geographic information systems (GIS). Using programs such as ArcGIS for Desktop allows for the calculation and display of spatial information (spatial analysis), presents results in the context of other features on the ground (maps), and puts the power of planning in the hands of residents, since GIS maps can be excellent tools for collecting public input at workshops and other public engagement activities. Using GIS to complete the capacity analysis will require spatial data analysis in ESRI's ArcGIS for Desktop software, specifically the Clip, Field Calculator, Spatial Join, and Summary Table tools.

## Overview of Steps

1. Define the Study Area.
2. Collect all the required spatial data and identify zoning for all parcels.
3. Assign vacant and redevelopable parcels.
4. Eliminate the parcels that do not qualify.
5. Share the file with municipal staff to verify vacant and redevelopable parcel coding.
6. Update the parcel coding based on local knowledge (municipal staff feedback).
7. Calculate the capacity of all vacant and redevelopable areas by zone.

## Instructions

### Capacity Analysis in ArcGIS

**Goal:** To provide housing capacity in acres in all zones and additional planning areas (if relevant). This will be an input for further model calculations.

**Create** a map document for Capacity Analysis: MuniName\_CapacityAnalysis\_MMDDYY.mxd

- 1. Define the study area.** If the municipality would like to extend analysis beyond its corporate limits, please confirm the additional study area outside municipal boundaries. In many cases, the planning jurisdiction extends beyond current municipal limits. In some, annexations are considered. For both of these cases, any additional areas should be included in the analysis.
  - 1.1. Create a simple map of the current boundary and additional planning areas.
  - 1.2. Confirm with the municipality which areas should be included in the analysis. Let them draw on the map or provide a description.
  - 1.3. Create the study area polygon (or use municipal boundaries if no other areas are considered) based on municipality's answer—it will be used to clip county-wide parcels file.
  - 1.4. Once the study area is confirmed, use its shape to clip the county-wide parcel file (if you are starting from the county-wide parcel file). Use the "Clip" tool or "Select by Location" with the option of parcels to "have their centroid in the source layer feature" where Study Area is "Source layer."
  - 1.5. Export the selected records and use the new file for further calculations.
  - 1.6. Title this new file "Muni\_Parcel\_Clipped."
- 2. Collect all the required spatial data and identify zoning for all parcels.**
  - 2.1. Ask each municipality for a GIS-friendly zoning file. If they don't have a shapefile or feature class available, you may need to digitize zoning based on a different format (like .jpg or .pdf). If you have a .jpg file, georeference it (add the toolbar) and trace polygons when editing to save time.
  - 2.2. Add the zoning file to your working map document. Use the "Spatial Join" tool to identify zoning for each parcel in the Study Area. Select "Analysis Tools" → "Overlay" → "Spatial Join". The "Muni\_Parcel\_Clipped" file will be "Target Features" and the zoning file will be "Join Features". Choose the "have\_their\_center\_in" matching option and the "join\_one\_to\_one" join operation. The output will have all parcels within the study area with zoning identified and stored in a new field.
  - 2.3. This file (the result of the Spatial Join operation) will be used for assigning vacant and redevelopable parcels in the study area.
    - Please note that Kane County stores farm and non-farm land and improvement (buildings) values in separate fields/columns. These need to be added (summed) together to obtain the total land value and total building values (see below).

Description	Field Name	Field Type	Field Calculator
Land value	Land_Val	Double (numeric)	= non-farm + farm land value
Improvement value (buildings)	Imp_Val	Double (numeric)	= non-farm building + farm building value
Improvement/Land Ratio (I/L ratio)	I_L_ratio	Double (numeric)	= Imp_Val/ Land_Val
Redevelopable parcels	Redev	Short Integer (numeric)	= selected I/L ratios (see below)
Vacant parcels	Vac	Short Integer (numeric)	= Use code = vacant

- 2.4. In the “Muni\_Parcels\_Clipped” file, select “Attribute Table” → “Add field...” → “Field Calculator” to populate the new fields with values.
- 2.5. Do not perform this calculation for records that have Land Value = 0 since it is not possible to divide by 0 (an error message will result).

### 3. Assign vacant and redevelopable parcels.

- 3.1. *How to code Vacant parcels:* Use the Land Use descriptions from the parcels’ attribute table. Select all vacant records in the Land Use field and code them as 1 in the Vac field. Switch selection and assign 0 values to the rest of parcels.
- 3.2. *How to code Redevelopable parcels:* Use the I/L ratio field by dividing Imp\_Val by Land\_Val. Do not perform this calculation for records that have 0 Land Value . Code these records as 0.
  - *About I/L ratio:* Usually, for residential single-family, residential multi-family and mixed commercial/residential parcels, Improvement/Land Ratios of 1.0, 1.5, and 1.5 are used, respectively. For residential multi-family and mixed commercial/residential properties, higher cut-off points are used because they typically have higher assessed values, compared to a single-family home on a similarly sized parcel. A cut-off point of 0.5 is used for commercial and industrial.
- 3.3. For the purpose of *Homes* projects, thresholds may be adjusted. Try a few cut-offs for I/L ratio values by using the “Select by Attribute” method and checking the table and map view.
- 3.4. Examine the selected parcels and choose an appropriate cut-off value (after consultation with your Project Manager).

- For northeast Kane County communities, all parcels for which the I/L ratio was equal to or less than 0.75 were selected and coded as Redevelopable by assigning a value of 1 to the Redev field.
- 3.5. Switch the selection to access all the remaining records (parcels) and code them as 0, not redevelopable.
- 4. Eliminate the parcels that do not qualify.**
- 4.1. Inspect and clean-up/recode parcels that do not qualify as vacant or redevelopable based on environmental constraints.
  - 4.2. Cross-reference them with other available spatial data representing wetlands, designated open spaces, floodplains, and water bodies to exclude parcels for potential housing development.
  - 4.3. Display and use aerial photography for reference.
  - 4.4. Be careful when excluding parcels. Some are partially covered with water but still can be considered for development. This is why we rely on local knowledge. If you are not sure about a given parcel, leave it as it is coded, and let the municipal staff decide.
  - 4.5. *How to display and pre-select parcels for municipal verification*
    - Symbolize vacant and redevelopable parcels with contrasting colors to present this initial assessment on the map. Select “Symbology” → “Categories” → “Unique values, many fields” → “Redev” and “Vac”. Use the symbol transparency property to see what is on the ground, displayed on the aerials and other layers.
    - Exclude all parcels for which the area falls completely or mostly within any environmentally constrained areas like water bodies, floodplains, wetlands, or publicly designated open spaces (if there are no plans to re-zone them). Use context layers to make informed decisions.
    - Use aerial photographs to identify other parcels that should be disqualified from the capacity analysis, for example: detention areas, condominiums or townhouses, common open space areas that show up as vacant, already-built-out lots that are not updated in the parcels file, etc.
    - Ask for a summary of minimum lot size requirements by zone and use that to eliminate/re-code parcels that do not fall within the specified size bracket.
- 5. Share the file with municipal staff to verify vacant and redevelopable parcel coding.** The easiest way to transfer the file is to save a spreadsheet excluding all but the PIN, vacant, and redevelopable columns. These files are small enough to send as an email attachment and can easily be joined to the parcel shapefile (based on PINs).
- 5.1. Export the attribute table as a text file (.csv format), open it with Excel, and save it as a worksheet.
  - 5.2. Remember to re-format the PIN column since it will be displayed as a number by default.
  - 5.3. Format the column as “Custom” with (0000000000) for the 10-digit PIN to keep zero in front of other numbers. This is required for further joining to the parcel geometry file.

You can also share the shapefile itself, if it is allowed by the data sharing agreement specified by the parcel file provider.

- 6. Update the parcel coding based on local knowledge (municipal staff feedback).**
  - 6.1. After vacant and redevelopable parcels are verified by the muni, transfer them back to your shapefile.
  - 6.2. If the Study Area extends outside of muni area, include all future Land Use/Zoning/Planned Development information provided by municipal staff.
  
- 7. Calculate the capacity of all vacant and redevelopable areas by zone.**
  - 7.1. Select vacant parcels (records coded as 1) and use the Summarize function in the file's attribute table to create an output table presenting zone, count of qualified parcels (Vac or Redev), and a sum of all the shape areas for selected records. ArcGIS will perform this function on the Shape Area field that is referenced, and the result will be the sum of the square footage in a given zone.
  - 7.2. In the output table generated as a result of the Summary, create a new field "Acres" and recalculate square footage to acreage (1 acre = 43,560 square feet).
  - 7.3. Clear the selection.
  - 7.4. Select the redevelopable parcels (records coded as Redev = 1) and repeat the process as just described.
  - 7.5. Transfer the results into an Excel spreadsheet and share them with the Project Manager and the person responsible for further modeling.
  - 7.6. These numbers will be used as an input for the Envision Tomorrow Balanced Housing model Calculations in Excel format, resulting in the number of Single- and Multi-Family units based on zoning regulations and population projections. Please note and inform the muni staff that only parcels zoned for residential uses are included in the modeling. These include all districts for which residential development is allowed by right.



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