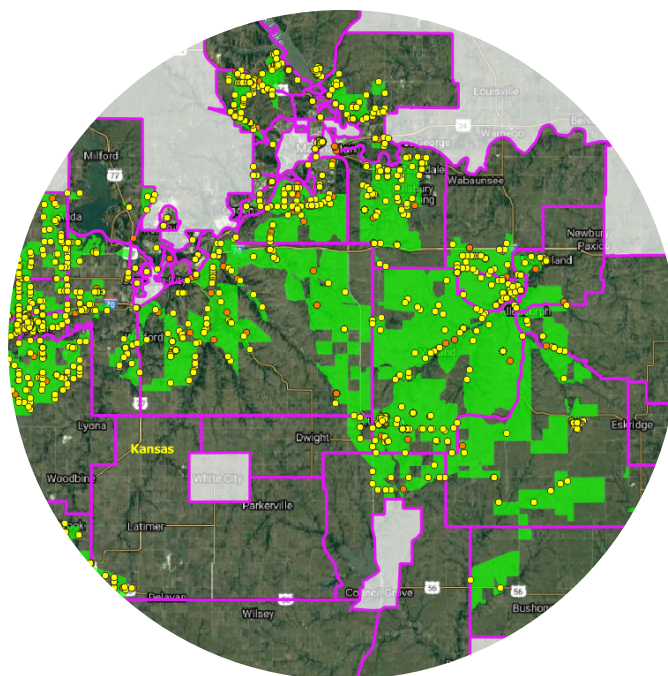


RDOF LOCATION Analyzer

Getting Started Guide



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SiGNALS
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Introduction

This guide describes how to install and launch the RDOF Location Analyzer. One can be up and running at a basic level in 15 minutes.

Users are encouraged to read this “Getting Started Guide” in its entirety and to watch tutorial videos as they are released. For additional documentation, new announcements, and training see:

<https://cbrstoolkit.com/pages/rdof>

Quick Start

To getting started:

1. *Download the RDOF Location Analyzer.* You will receive an e-mail with a link immediately following your purchase.
2. *Unzip the File.* Unzip the contents and place the contents in a convenient location on your computer.
3. *Download and Install QGIS.* The Visual Toolkit is an application built upon an open-source world class GIS tool. You need to download and install a copy. It’s free and is available to support every major operating system (Windows, macOS, Linux, BSD).

Recommendation: download the “Long Term Release” standalone installer, 64-bit version. Long Term Release means that is extremely stable. Virtually every computer today runs a 64-bit operating system. It leverages the hardware capabilities of your computer.

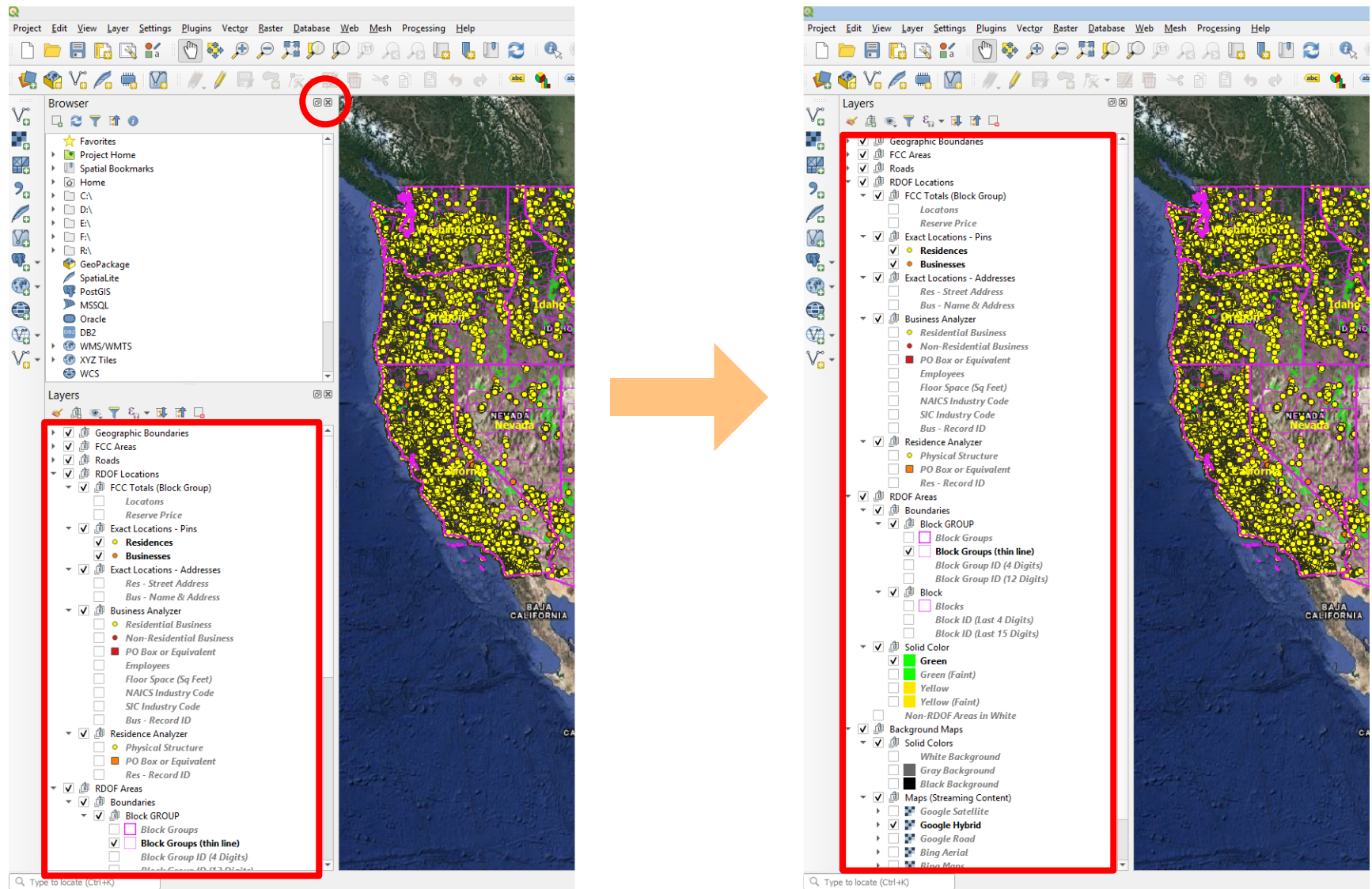
<https://www.qgis.org/en/site/forusers/download>

4. *Close Panels.* When you install QGIS it opens two panels by default, “Browser” and “Layers”. It is recommended that you close the “Browser” panel (see Figure 1). It is not needed and it consumes valuable screen real estate. If you want to see it again you can easily enable it from the “View” pull-down menu.
5. *Launch the Application.* Go to the Visual Toolkit folder within your unzipped Analyzer and double-click on *RDOF Location Analyzer.qgz* to launch the Visual Toolkit.

There’s More

- *Spreadsheets.* The “Excel Spreadsheets” folder includes all of the residence and business location data (addresses, business names, employees, square feet, etc) included in the Analyzer.
- *Web Site Links.* The folder Web Site Links includes links to important updates. It is likely that the Toolkit documentation will be updated and that the Toolkit functionality will be enhanced over time.
- *Still Need Help?* The Toolkit team is happy to answer quick questions by e-mail (support@CBRSToolkit.com) or more complicated questions via a Zoom meeting.

Figure 1: Reducing Clutter by Closing Unnecessary Panels in QGIS



Frequently Asked Questions

How do versions of the Analyzer differ?

The RDOF Location Analyzer is laser-focused on the Rural Digital Opportunity Fund.

The RDOF Location Analyzer is available in ten different versions. It is available as a *national* product, with data for all 48 contiguous US states plus Hawaii plus the District of Columbia. It is also available for each of the nine Census Bureau *divisions*:

1. *New England*. Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.
2. *Middle Atlantic*. New Jersey, New York, and Pennsylvania.
3. *East North Central*. Illinois, Indiana, Michigan, Ohio, and Wisconsin.
4. *West North Central*. Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota.
5. *South Atlantic*. Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia.
6. *East South Central*. Alabama, Kentucky, Mississippi, and Tennessee.

7. *West South Central*. Arkansas, Louisiana, Oklahoma, and Texas.

8. *Mountain*. Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming

9. *Pacific (less Alaska)*. California, Hawaii, Oregon, and Washington.



Every version of the RDOF Location Analyzer includes select RDOF data sets (coverage areas, boundaries, etc).

The RDOF Location Analyzer is designed to complement The RDOF Toolkit by providing a different set of data, visualized with a similar set of controls. There is no RDOF Location Analyzer for Alaska (since RDOF does not include Alaska) or for any of the *territories* of the United States.

CBRSToolkit.com publishes several suites of tools. The CBRSToolkit provides an exceptionally rich collection of demographic, behavioral, and economic data relevant to any telecommunications business plan. It also includes fixed and mobile competitive data. The RDOF Toolkit provides a comprehensive set of advanced tools for studying and comparing RDOF bidding areas. It includes a robust set of block-level demographic data plus a lot of spatial data (calculations of the area of each relevant polygon, tools to assessment densities, proximities, etc.) plus fixed competitive data. The RDOF Location Analyzer complements the RDOF Toolkit

by providing address-level locations for residences and businesses plus a few related data sets.

Figure 2 explains, at a high level, the relationship between data sets. The FCC includes an estimate of the number of locations in the RDOF-eligible portion of each block group. The RDOF Toolkit (a companion product) includes a broad range of demographic data, largely based on census studies, that enables an independent assessment of the number of eligible locations in each block group. The “Census View” (labeled to reflect the source of the underlying data) reflects households and housing units from the 2010 census, population growth rates by county over the ensuing decade (through 7-1-2020), and a separate census study of businesses at a county level. The census data allows the reader to distinguish between occupied housing structures (= households) and unoccupied structures (housing units minus households). The final view, on the right, represents the data included in the RDOF Location Analyzer plus the number of empty housing units. This Location Analyzer data reflects the number of households and businesses in a current high quality commercial address database. As one can see, each approach to sizing the market results in a slightly different result.

Importantly, housing units are meaningful to the engineering department (since they must be covered) whereas households are meaningful to the marketing department (since empty buildings don’t subscribe to services).

The address-level data set included in the RDOF Location Analyzer is valuable in several ways:

- It shows the exact street-level address of households and businesses, and distinguishes between the two. Knowing

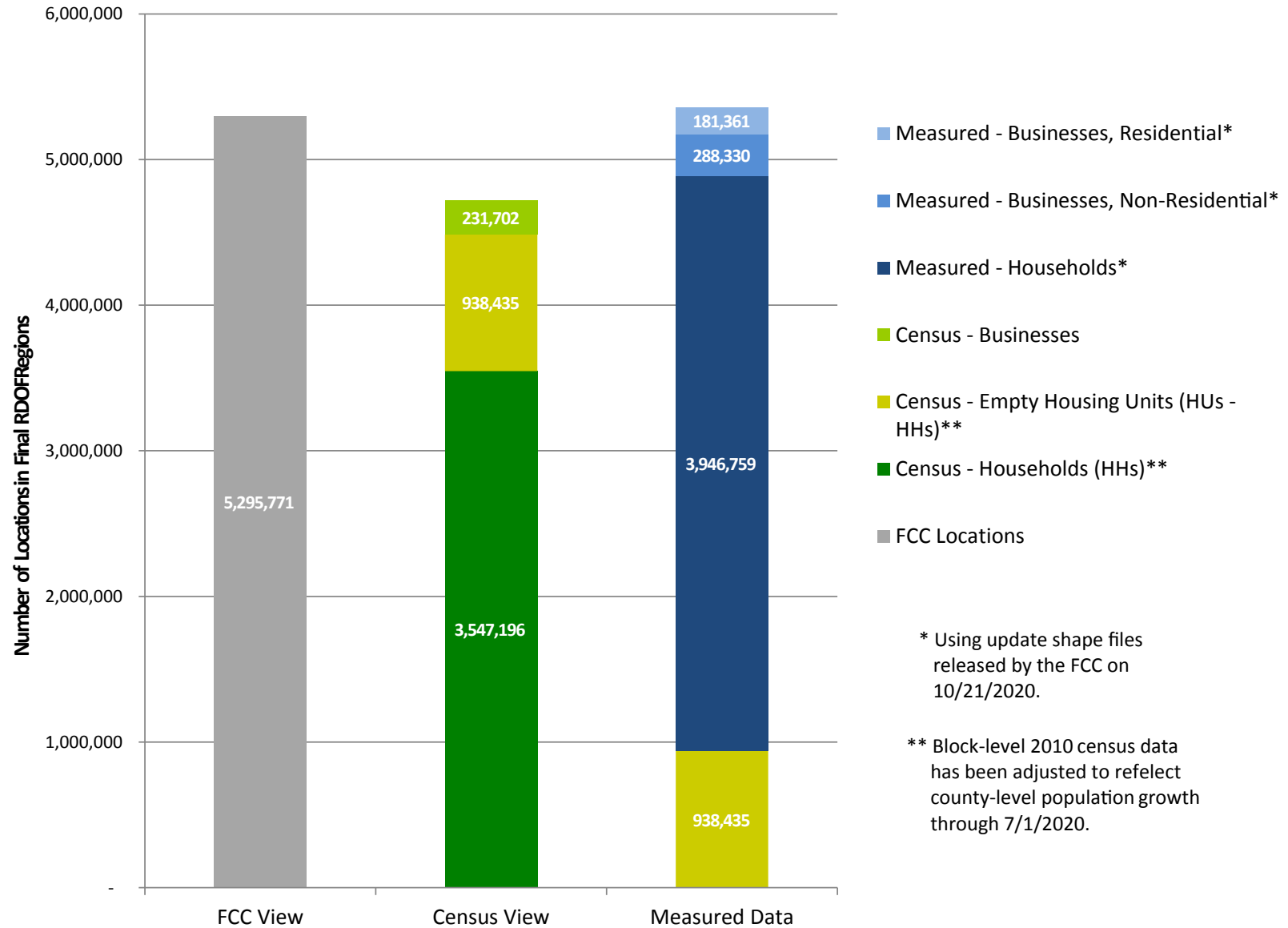
where the population resides enables a bidder to develop a cost-effective phased deployment plan.

- It provides a lot of metadata describing businesses, such as industry code, number of employees, and a flag that indicates if a business address is also a residence.
- It reveals businesses that might not have any external signage but could be served and therefore count toward the total number of locations passed. This is extremely important in valuing the opportunity and in post-auction reporting.



Since the data set is empirically derived from a broad range of public records, then cleaned, there are occasionally “holes” in the data where homes or businesses are missed. On average (as seen

Figure 2: How Different Data Sets Enable One to Calculate the Number of Locations.



in Figure 2) it is reflective in aggregate of what one would expect. The data set does not include vacant structures, since it reflects the current population.

How does the Visual Toolkit relate to the Excel Spreadsheets?

A sophisticated user will eventually use both. The Visual Toolkit allows the user to zoom in and zoom out and navigate to different geographies and turn on or off different data layers. Every area (county, tract, block group, etc.) has a unique numerical code.

A user can look up a single code and get a complete data set for that area (including information not displayed visually). Alternatively, the user can select an area using QGIS (that might include hundreds of tiny polygons) then save that list of areas to an Excel file then use the list to extract the corresponding data (by copying and pasting or via a lookup) from the Excel spreadsheet.

A business plan involving deployments in multiple cities might include selected geographies in each city and a corresponding P&L for each city.

What data is included?

Residential data includes:

- Exact address
- Longitude
- Latitude
- Physical structure vs. PO box or other box
- Unique ID (link to future product offerings)

Business data includes:

- Name of business
- Exact address
- Longitude
- Latitude
- Number of Employees
- Number of Square Feet
- SIC industry code
- NAICS industry code
- Residential or non-Residential business address
- Physical address vs. PO box or other box
- Unique ID (link to future product offerings)

The RFOF Location Analyzer, v 1.30 contains RDOF coverage areas based on the FCC's October 21st release of corrected GIS files. On October 8th the FCC released a final set of eligible areas but made some errors in generating the associated GIS files. A corrected set of data was published 13 days later.

Version 1.30 of the Location Analyzer also contains a large amount of relevant reference data (roads, state and county boundaries, etc).

Nearby locations:

Version 1.30 now includes *nearby* locations (Figure 10). These are addresses that fall within 100 meters of an RDOF boundary. One might ask "Who cares?". A thoughtful operator may wish to evaluate the opportunity because nearby locations significantly increase the addressable market. An RDOF participant serving locations within 100 meters of the boarder can, on average, double the number of potential serviceable locations at minimal

incremental cost. Nearby locations are not eligible for RDOF support, since they are outside of the RDOF eligible area, and they may be served by another provider (otherwise they would be included in the RDOF footprint). The RDOF Toolkit (a companion product) provides a complete picture of current competitors and of expected CAF II competitors.

Nearby locations are a valuable addition. The data is visualized and listed separately from RDOF-eligible locations since an auction participant will want to separate the two.

Elevation Data

Version 1.30 also includes a powerful new feature: an elevation view (right above maps). It allows the user to see the elevation of the RDOF area and all surrounding terrain (Figures 11 and 12). It provides a color-coded view that reflects the elevation. Imagery can also be shaded to show the texture of the terrain, simulating the effect of light shining across the surface of the earth. Finally, the user can activate a QGIS plugin that produces a terrain profile. The user can see a cut-out of the path. This is extremely powerful in identifying potential site locations for a wireless network (fixed wireless access or wireless backhaul). It is also helpful for a fiber provider that might prefer not to run dark fiber up a 300 foot cliff or for a geosynchronous orbit satellite provider that might be concerned about a nearby geographic feature obstructing the view of the southern sky.

The feature and its associated data set does not mitigate the need for a sophisticated radio planning tool and an associated high resolution elevation / clutter data set, for those planning wireless deployments. The elevation feature is designed to provide contextual awareness of the environment. The Location

Analyzer includes 7.5 arc-second USGS data (~ 225 meter pixels), reflecting the elevation of the earth's surface. It does not show man-made structures such as buildings. Many exceptional software tools exist for modeling the complexities of urban environments. The elevation feature makes it easy to quickly examine a large geography to draw high-level conclusions about its suitability to a particular technology / business model approach.

How is the data visualized?

Figures 3 - 11 at the end of this guide show a broad range of data visualizations. The RDOF Location Analyzer is a lot simpler than the RDOF Toolkit, but offers a similar ability to toggle data layers on and off and to control the background imagery.

Troubleshooting

How do I zoom?

The easiest way - by far - is to use a physical mouse with a zoom wheel. If you have a laptop with a mouse pad and don't happen to have a mouse with a zoom wheel you will find that a small investment in this important hardware accessory will make your life much easier, as you use the Toolkit and use GIS applications. Without a zoom wheel one can zoom in using the magnifying glass with a plus or minus sign (buttons along the top) but using a mouse with a physical zoom wheel is much easier.

The tool produces lots of beautiful pictures but does not display any numbers.

If you click on the triangle icon next to each set of data you will see a check box that enables the data labels. If you check it each polygon will have an associated numerical value. You should enable data layers when you are zoomed into a small area. As you zoom out labels for small geographic areas are likely to become unreadable. Ideally one would turn on labels appropriate to the zoom level.

When I turn on additional layers of data it gets cluttered.

The Analyzer includes multiple layers of data. In addition, most users are likely to turn on some labels. Each layer is translucent, primarily to enable the user to see hints of the map below the data layer. The Analyzer is designed to display a single layer at a time. The simple solution is to turn off any existing data layers

when you turn on a new one.

When I click the checkbox next to a data layer nothing happens.

The data layers are contained in "groups" (a.k.a. folders) to help users find everything in the Toolkit. A data layer will display only if each of its parent "groups" is enabled. If nothing is happening check to make sure that each of the parent "groups" is enabled with a check mark.

I'm lost! How do I know what geography I'm viewing?

The Analyzer includes a number of features to provide context. These include state, county, tract, block group, and other polygons. Most of these can be displayed with numbers and/or names. You can also turn on roads or roads with labels. Finally, you can change the underlying map in the "Maps" section near the bottom to a map that includes local names and places of interest. Each map blocks the maps that are below it, so if you wish to try a different map make sure you turn off the default map.

I already had QGIS installed. Its not launching the Toolkit.

The Toolkit expects the current release of QGIS (Long Term Release version 3.10) or later.

Download and install the current "Long Term Release". The Toolkit should then launch properly.



I downloaded the Analyzer and decided to rearrange all the file folders. Now I get a bunch of error messages when I launch the application.

It is critically important that “GIS Data” is in the same folder as the application icons and that the contents of “GIS Data” are not rearranged. The Toolkit needs to find and load each of these files.

Figure 3: Basic View with Residences (Yellow), Businesses (Orange), and Block Group Boundaries

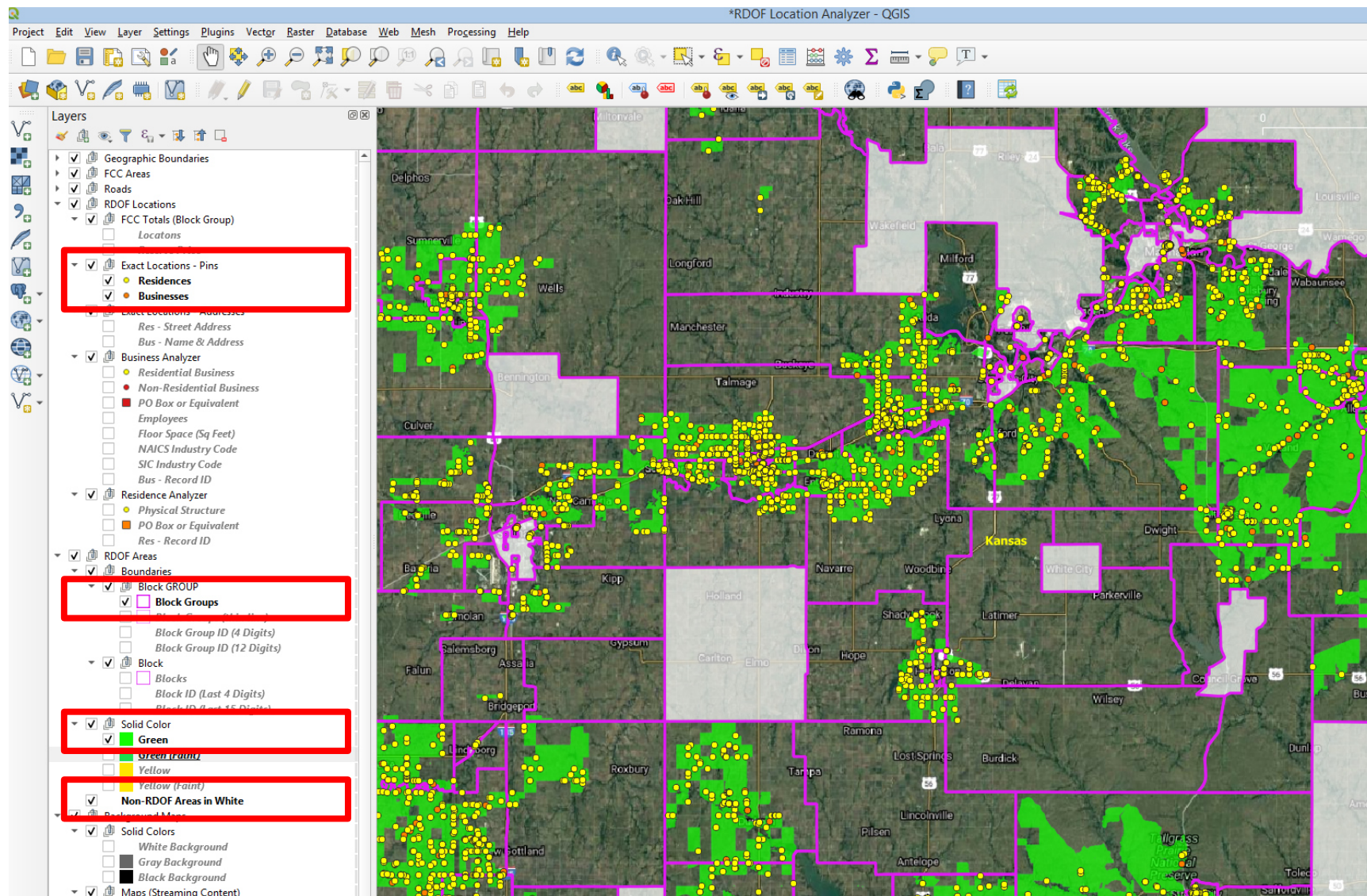


Figure 4: Data Overlays (FCC Reserve Price on left, FCC Locations on right)

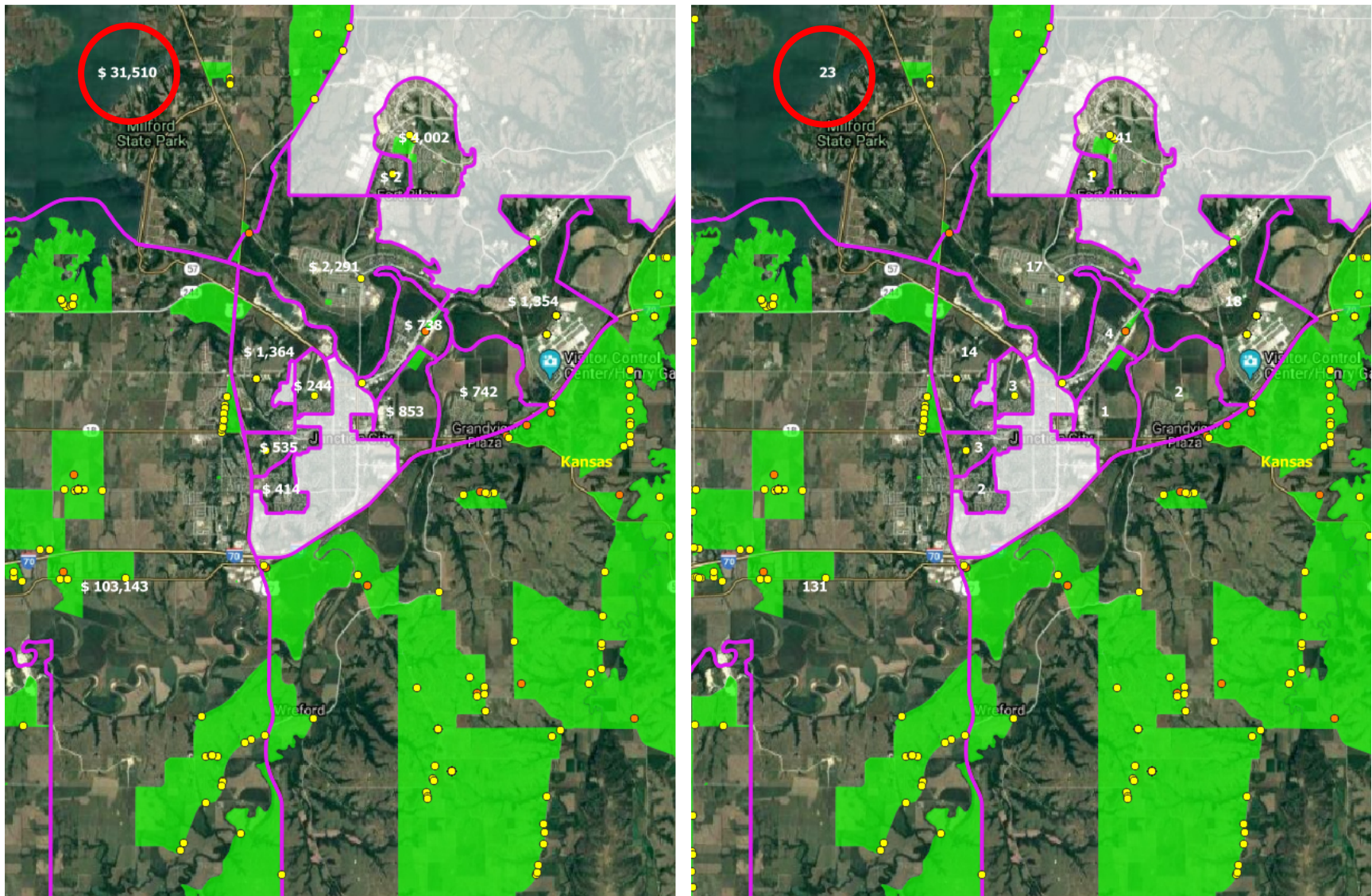


Figure 5: Residential Addresses

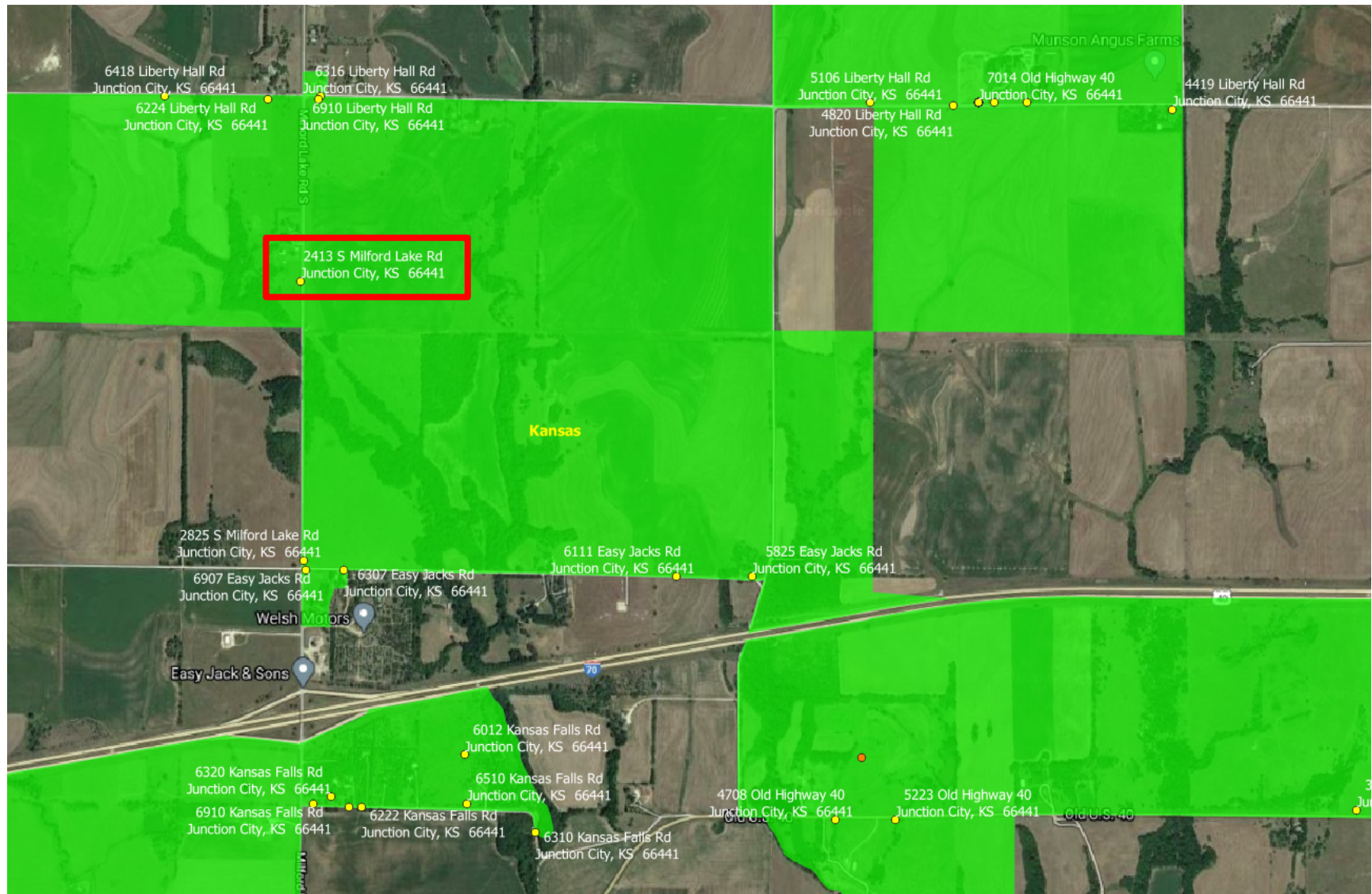
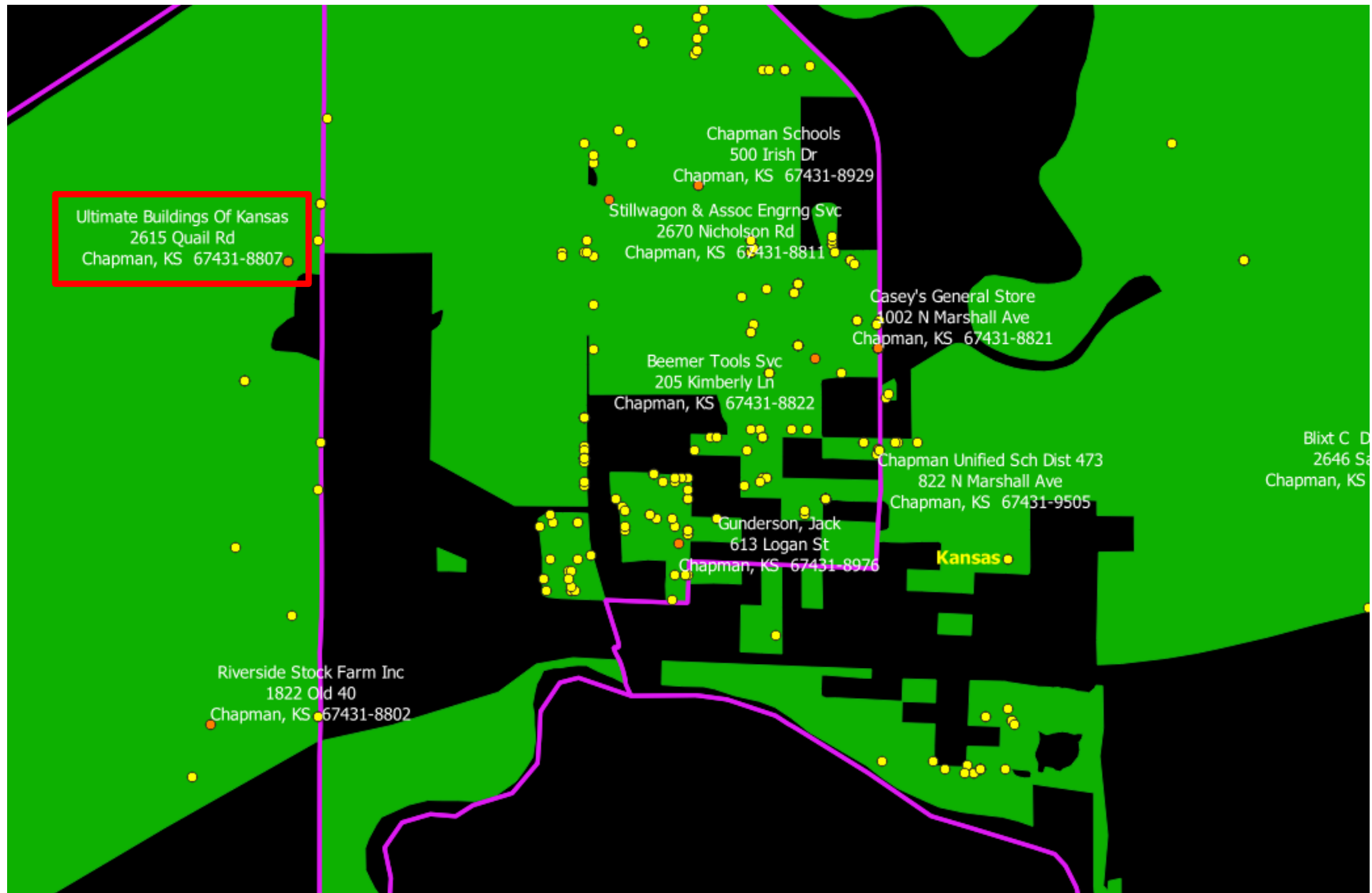


Figure 6: Business Addresses on Solid Background, for Readability



The figure consists of two side-by-side maps of the same geographic area, illustrating different data layers. The left map displays 'Employees' data, with labels such as 'Employees: 1 to 4', 'Employees: 10 to 19', and 'Employees: unknown'. The right map displays 'Floor Space (Sq Ft)' data, with labels such as 'Floor Space (Sq Ft): 0 to 2,499', 'Floor Space (Sq Ft): 2,500 to 9,999', and 'Floor Space (Sq Ft): 10,000 to 39,999'. Both maps feature a red rectangular highlight on a specific location, indicating a point of interest or comparison between the two data sets.

Figure 8: Businesses with Residential (Yellow) versus Non-Residential (Red) Addresses

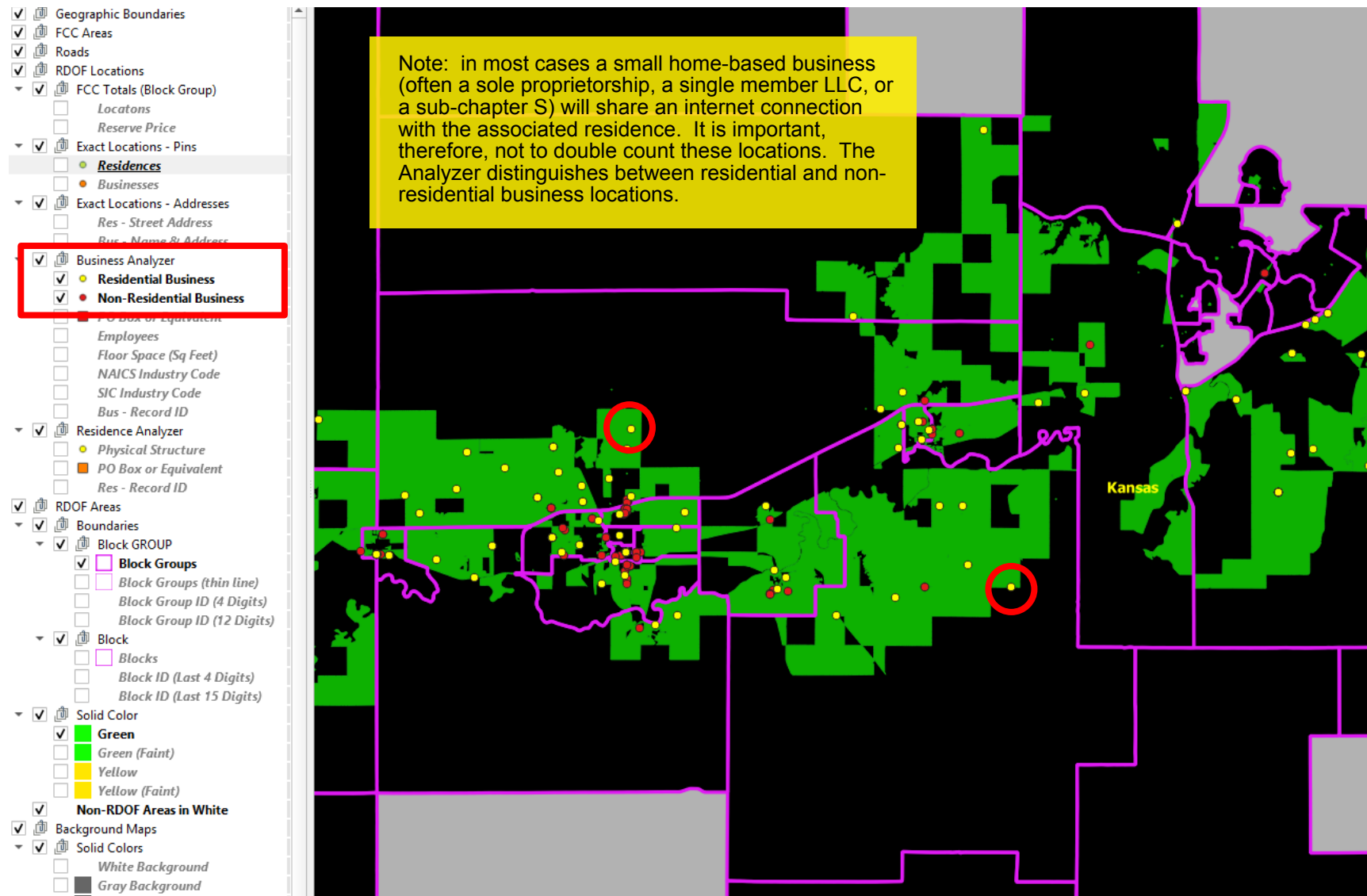


Figure 9: Post Office Boxes (and private boxes) flagged with an orange square.

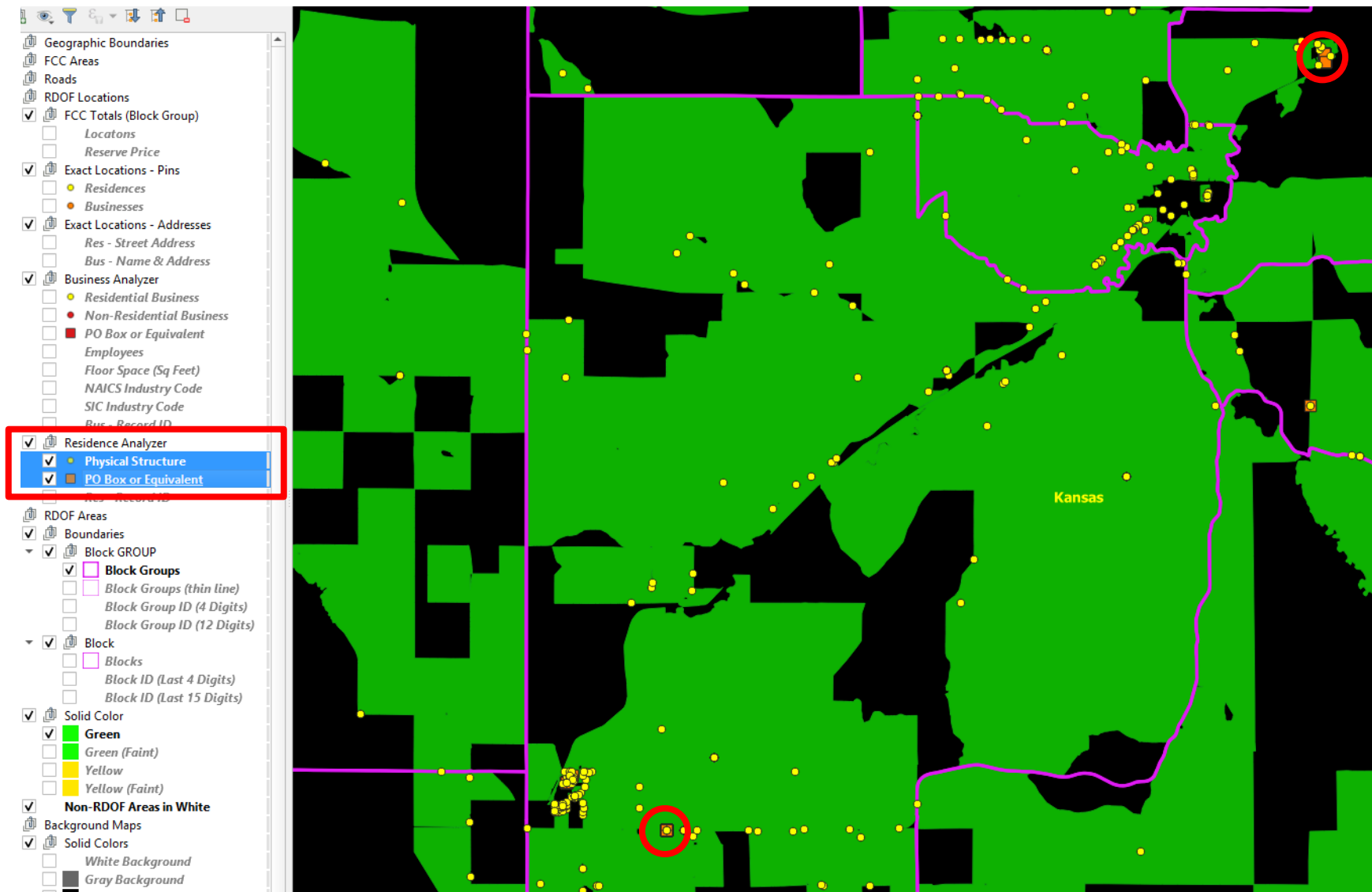


Figure 10: Locations in RDOF-eligible areas (left, in yellow and orange) juxtaposed with locations in non-subsided nearby (within 100 meters) areas (right, in magenta).

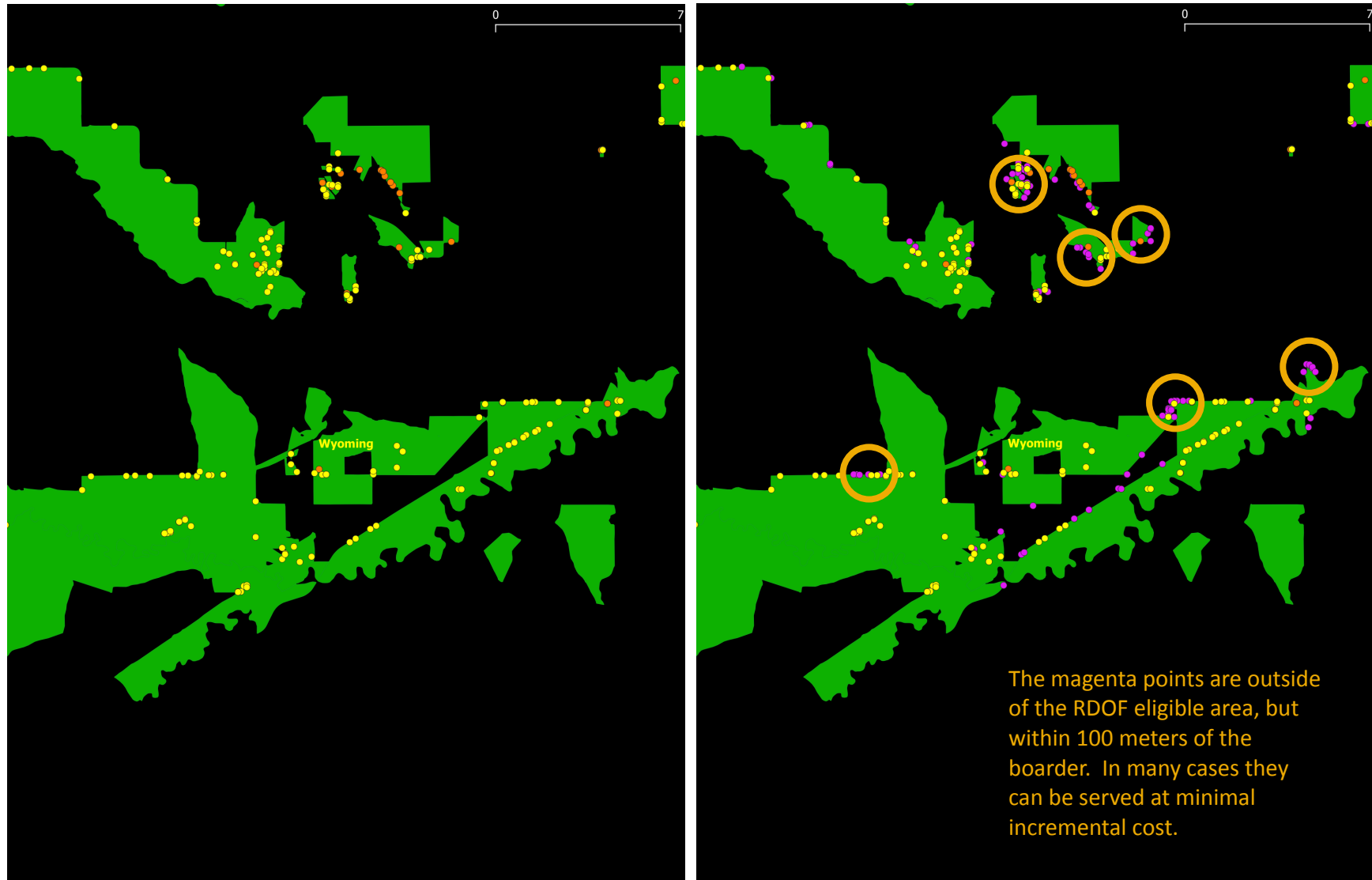


Figure 11: Elevation feature, showing elevation as a solid color (left) or a translucent color over a map with a texture representing variation in elevation (right).

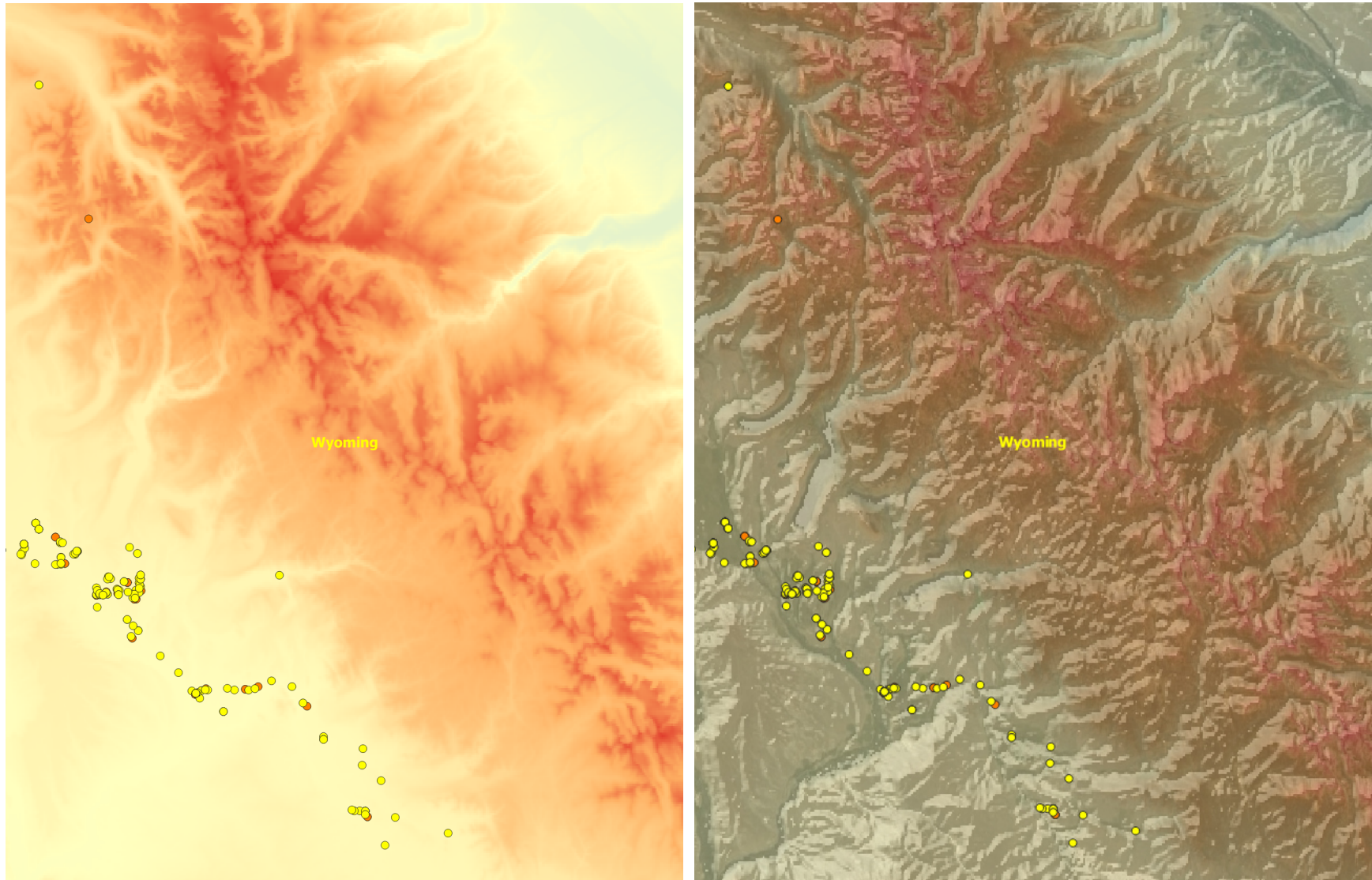


Figure 12: A terrain profile, showing whether an elevated site is obstructed or has line of sight or near line of sight to a valley floor.

