Regional EV Charging Infrastructure Location Identification Toolkit

User Guide

Version 4.0 (released August 17, 2021)

1 INTRODUCTION

The Regional EV Charging Infrastructure Location Identification Toolkit (ILIT) represents the outputs of a project conducted by M.J. Bradley & Associates and the Georgetown Climate Center to support the Northeast, Mid-Atlantic, and Southeast states that participate in the Transportation & Climate Initiative (TCI)[1]. This project uses a Geographic Information Systems (GIS)-based analysis to evaluate the existing electric vehicle public fast charging network[2] across the region and uses EV charging, transportation, commercial, and demographic data to identify potential priority locations for future EV fast charging infrastructure development.

1.1 BASIC ANALYSIS METHODOLOGY

MJB&A utilized a GIS platform to collect data across the 14 Northeast, Mid-Atlantic, and Southeast jurisdictions that participate in the Transportation and Climate Initiative (TCI region). Version 4.0 uses a census tract -based approach to develop a detailed, statewide database of metrics for each jurisdiction and across the region, including:

- Proximity Metrics:
  - average distance from census tract to nearest existing (public) direct current fast charging (DCFC) station (or a subset of those stations based on DCFC connector type);
  - density of DCFC ports within and around each census tract;
- Demand Metrics:
  - density of points of interest and commercial establishments (restaurants, shops/stores, gas stations, etc.) within each census tract;
  - various traffic volume measurements on the roadways running through and near each census tract;
- Demographic Metrics:
  - population density by census tract; and
  - availability of home charger access (based on prevalence of multi-unit dwelling residence).

Using metrics drawn from this database, each census tract can then be assigned a cumulative "score" from 1 to 100 that reflects the potential relative suitability of that census tract for DCFC charging infrastructure development.

For additional details on the methodology, please see http://www.mjbradley.com/analytical-resources.

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1 The Transportation and Climate Initiative (TCI) is a regional collaboration of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, Virginia, and the District of Columbia that seeks to develop the clean energy economy and reduce oil dependence and greenhouse gas emissions from the transportation sector. For more information, see http://www.transportationandclimate.org/.

2 Data inputs to the Regional EV Charging ILIT, including the site of EV charging stations, are updated quarterly.

1.2 Toolkit Products: Location Analysis Model, Data Viewer, and Results Mapper

The Regional EV Charging Infrastructure Location Identification Toolkit includes three analytical components:

The **Location Analysis Model** is an Excel-based tool that allows users to evaluate and rank possible suitable locations for new DCFC infrastructure given specific inputs. This model allows users to customize the analysis based on differing priorities for new infrastructure (e.g., some users may want to focus on identifying "gaps" in the existing DCFC network, while others may prefer to identify locations with high traffic volume and commercial activity). The Location Analysis Model allows a user to adjust the weighting of different metrics and apply filters (e.g., to view results for a specific state, to limit the analysis to priority corridors, or to focus on locations that meet demographic criteria) and view updated census tract rankings.

The **Data Viewer** is a mapping application using ArcGIS that allows a user to visualize the main data sources behind the Toolkit and view region-specific location ranking outputs from preloaded weighting methodologies. The Data Viewer provides users a way to display both the underlying characteristics of the region (e.g., traffic volume, existing DCFC stations, census tract information), offers the ability to filter census tracts by metric data, and comes preloaded with region-specific outputs of the Location Analysis Model for certain weighting methodologies.

The **Results Mapper** is mapping application using Tableau that enables users to replicate the ranking analysis of the Location Analysis Model and simultaneously view interactive results. By extending the functionality and customizability of the Location Analysis Model to a web-based mapping tool, results are easier to visualize and formatted for discussions with policymakers, local decisionmakers, and other stakeholders.

1.3 Use and Terms

1.4 Questions and Contact

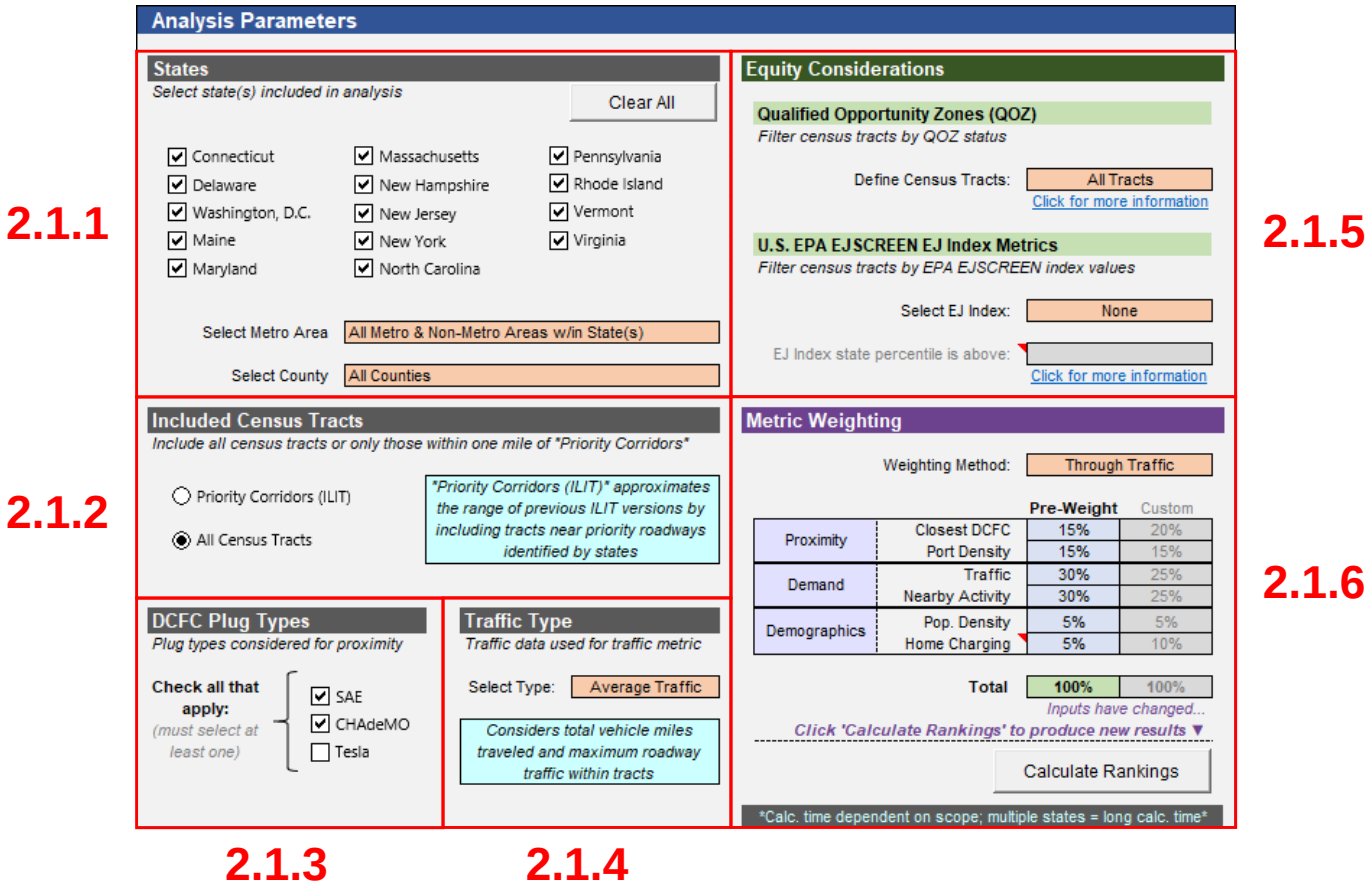
For questions on use of the Regional EV Charging Infrastructure Location Identification Toolkit, or for inquiries regarding expansion or further use of these products, please contact Grace Van Horn at gvanhorn [at] mjbradley.com.

2 ILIT Location Analysis Model User Guide

The ILIT Location Analysis Model (ILIT Model) is an Excel-based tool that allows users to identify possible locations for DCFC infrastructure given individual inputs. This User Guide will explain how to modify inputs and use the results.

2.1 Using The Tool: Setting Inputs

The Tool can be downloaded with a free registration at https://mjbradley.com/mjb_form/EV-tools. Using a Microsoft Windows operating system is recommended to ensure full functionality of the tool, as some macros may not be recognized or are severely limited in other operating systems. In addition, be sure to save the Tool in a known location; this is important for using the data export functions described below. Upon opening the ILIT Model, a user must first read and agree to basic user terms. The ILIT Model will then open to a page with ranking tool inputs along the left bar. The following image of the ILIT Model can be used as a visual guide as the inputs and outputs are discussed.



Here, peach-colored cells denote inputs that can be changed by the user. Other cells may be red or grey—red cells indicate that the user must update cells before running the ILIT Model, while grey indicates that the applicable function of the ILIT Model is disabled due to previous selections. When inputs are set appropriately, a user may press the "Calculate Rankings" button to calculate rankings among the subset of census tracts selected.

These basic inputs are described in more detail below.

2.1.1 States, County or Metro Region

Select the region of interest. This could be either the entire analysis region or one or more of the states (or District of Columbia) included in the analysis region. The user may also then select a specific county or metro area located within the selected region.

2.1.2 Included Census Tracts

Select which census tracts within the selected region are assessed. This allows a user to focus either on the entire state(s) selected or only those census tracts overlapping with roadways included in previous versions of the ILIT Model.

- *All Census Tracts*: all census tracts within the selected state(s) (or county/metro region, if selected)
- *Priority Corridors (ILIT):* only those census tracts within the selected state(s) (or county/metro region, if selected) that approximates the range of ILIT v3.0 (i.e., including tracts within one mile of priority roadways that had been identified by states)

2.1.3 DCFC Plug Types

Select the existing DCFC stations that will be included in the proximity metrics (i.e., the closest existing DCFC station to and the density of ports within a census tract). This allows the user to identify potential gaps in the network based on all in-scope (i.e., public) DCFC stations or just a subset based on connector type. A user may select any combination of SAE, CHAdeMO, and Tesla plug types.

2.1.4 Traffic Type

Select the traffic data that will be used for the traffic demand metric.

- *Average Traffic* (default): Considers total annual vehicle miles traveled and maximum roadway traffic within tracts.
- *Peak Traffic:* Considers peak-hour vehicle miles traveled and maximum peak traffic within tracts; peak-hour data are calculated using average annual daily traffic (AADT) and the "k-factor," a peak traffic ratio defined as the proportion of annual average daily traffic occurring in an hour, typically the 30th-highest hour of traffic density from the year's-worth of data.
- *Peak Traffic Ratio:* Considers tract-wide peak traffic ratio (k-factor) and maximum roadway peak traffic ratio within tracts; tracts with higher ratios indicate a large range between low and high traffic times. Peak traffic ratios are typically highest along corridors that experience substantial seasonal, holiday-, or event-induced traffic increases.

2.1.5 Equity Considerations

Further refine which census tracts within the selected region are assessed, to enable more targeted analysis and inform equitable planning and investment decisions. This allows the user to focus the analysis on a subset of census tracts based on demographic, environmental, and economic factors, as measured by two metrics.

- *Qualified Opportunity Zones (QOZ)*: An Opportunity Zone is an economically-distressed community where private investments, under certain conditions, may be eligible for preferential tax treatment. Opportunity Zones were created under the 2017 Tax Cuts and Jobs Act, to stimulate economic development and job creation, by incentivizing long- term investments in low-income neighborhoods.
- *U.S. EPA EJSCREEN EJ Index Metrics*: this measure allows the user to select an EJSCREEN index value and percentile to filter census tracts. EJSCREEN is an environmental justice mapping and screening tool that was developed by the U.S. Environmental Protection Agency (EPA) to provide a nationally consistent dataset and approach for combining environmental and demographic indicators. An EJ index is a combination of environmental and demographic information. EJ indices that can be selected in the ILIT Model include:
    - *Demographic*: the average of two EJSCREEN demographic indicators: percent Low-Income (the percent of households where the household income is less than or equal to twice the federal "poverty level") and percent People of Color (the percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals).
    - *Respiratory Hazard*: NATA (National Air Toxics Assessment) respiratory hazard index, which is an air toxics respiratory hazard index (ratio of exposure concentration to health-based reference concentration)
    - *Ozone*: Ozone summer seasonal avg. of daily maximum 8-hour concentration in air in parts per billion

- *Diesel 2.5*: NATA diesel PM index, which is diesel particulate matter level in air, µg/m3

Once a user selects a metric, the user must enter a value for "EJ Index state percentile is above." This will limit considered census tracts to only those that are at or above the given percentile within that state.

A user may select either, both, or neither Equity Consideration filter.

2.1.6 Weighting Method

The weighting method is used to emphasize specific metrics/characteristics of census tracts when ranking within the selected region and group. The Tool has five pre-loaded methods, described in more detail below. In addition, a user may turn on a "Custom Weighting" option that allows additional control in emphasizing specific attributes of census tracts in the weighting process. These options help a user adjust the weighting to reflect his or her own priorities for infrastructure development in the ranking process.

To select a built-in weighting method, use the drop-down menu. This will populate the table with the weights associated with this option. The built-in options are:

- *Through Traffic*: This is MJB&A's default method (for display on map and in analysis results). This equally emphasizes proximity to existing DCFC stations (split among the two proximity metrics), traffic volume, and nearby activity, and places low emphasis on demographic metrics. The mix of metrics is meant to prioritize areas that are likely to have high amounts of through traffic, due to traffic and commercial activity, but also are somewhat likely to be in DCFC infrastructure gaps.
- *Fill Gaps*: This method strongly weights proximity metrics, emphasizing those census tracts with low levels of nearby charging infrastructure. This method is designed to identify potential gaps in the DCFC infrastructure network.
- *High Traffic Gaps*: This method weights proximity metrics somewhat highly, and also highly weights traffic volume. The census tracts emphasized by this method are those that are more likely to be in gaps and receive high amounts of vehicle traffic.
- *Traveler Use*: This method is focused on those metrics related to the potential utilization of a certain freeway census tract: traffic volume, which approximates the number of cars passing by, and nearby activity, which indicates possible reasons for a driver to pass through a specific census tract when traveling. This method puts less emphasis on the proximity to existing charging infrastructure.
- *Resident Use*: In contrast to *Traveler Use*, the resident use methodology is focused on those metrics that indicate locations that are likely to be used by local area residents, with population density, access to at-home EV charging, and nearby commercial activity most heavily weighted.

Note that all pre-loaded methodologies were initially designed to utilize average traffic and all non-proprietary (i.e., non-Tesla) DCFC stations for proximity metrics. Accordingly, the ranking results shown in the Data Viewer reflect those default inputs. However, selecting a pre-loaded methodology will ***not*** reset any changes to DCFC connector type or traffic demand metrics if the user has changed them for prior weighting methodologies. A user should check these inputs before comparing results within the ILIT Model to visualized results within the Data Viewer, as rankings will change with different DCFC connector type or traffic demand inputs.

In addition to these options, a user may enter custom weightings to adjust based off of one of these methods or create a new personalized option. To use this option, select "Custom" under Weighting Method. This will highlight an additional six cells in orange. Enter custom weightings here, ensuring that when finished, the total reads 100 percent (it will show in green).

2.2 USING THE ILIT MODEL: OUTPUTS

After selecting input criteria, census tract rankings can be generated by clicking the "Calculate Rankings" button and waiting a few moments while rankings are calculated.

Results: Top Census Tracts

Tract ranking results calculated and ready for download

▼ *Download full results view all ranked/scored census tracts within defined scope*

Total Ranked Tracts in Scope: 2,002

Download Results (.csv) 2.2.2

2.2.1

		Metric Designations (1=low score, 10=high score)						
Rank	Census Tract	Closest DCFC	DCFC Density	Traffic	Nearby Activity	Pop. Density	Home Access	Final Score
1	Bergen, NJ (Tract 191.03)	7	6	10	10	9	10	89.0
2	Ocean, NJ (Tract 7229)	8	8	10	9	6	8	88.0
3	Monmouth, NJ (Tract 8024)	9	9	10	9	5	2	87.5
4	Ocean, NJ (Tract 7231)	8	9	10	9	4	6	87.5
5	Bergen, NJ (Tract 191.02)	7	5	10	10	8	10	87.0
6	Bergen, NJ (Tract 192.02)	7	5	10	10	8	10	87.0
7	Bergen, NJ (Tract 280.02)	7	6	10	10	7	5	85.5
8	Monmouth, NJ (Tract 8020)	9	9	8	9	6	7	84.5
9	Bergen, NJ (Tract 280.01)	7	6	10	9	7	7	83.5
10	Hunterdon, NJ (Tract 114)	9	10	7	9	6	8	83.5
11	Morris, NJ (Tract 436)	6	8	8	10	7	9	83.0
12	Morris, NJ (Tract 437)	7	8	8	10	6	7	83.0
13	Burlington, NJ (Tract 7040.06)	8	8	8	10	4	5	82.5
14	Bergen, NJ (Tract 191.04)	7	6	8	10	9	9	82.5
15	Atlantic, NJ (Tract 12)	9	9	6	10	7	7	82.0
16	Mercer, NJ (Tract 1)	8	8	7	10	7	7	82.0
17	Monmouth, NJ (Tract 8032.01)	9	9	8	9	4	4	82.0
18	Burlington, NJ (Tract 7040.04)	8	7	8	10	4	7	82.0
19	Morris, NJ (Tract 417.04)	8	7	10	8	4	7	82.0
20	Monmouth, NJ (Tract 8021)	9	9	8	9	5	2	81.5

2.2.1 Final Ranks and Final Scores

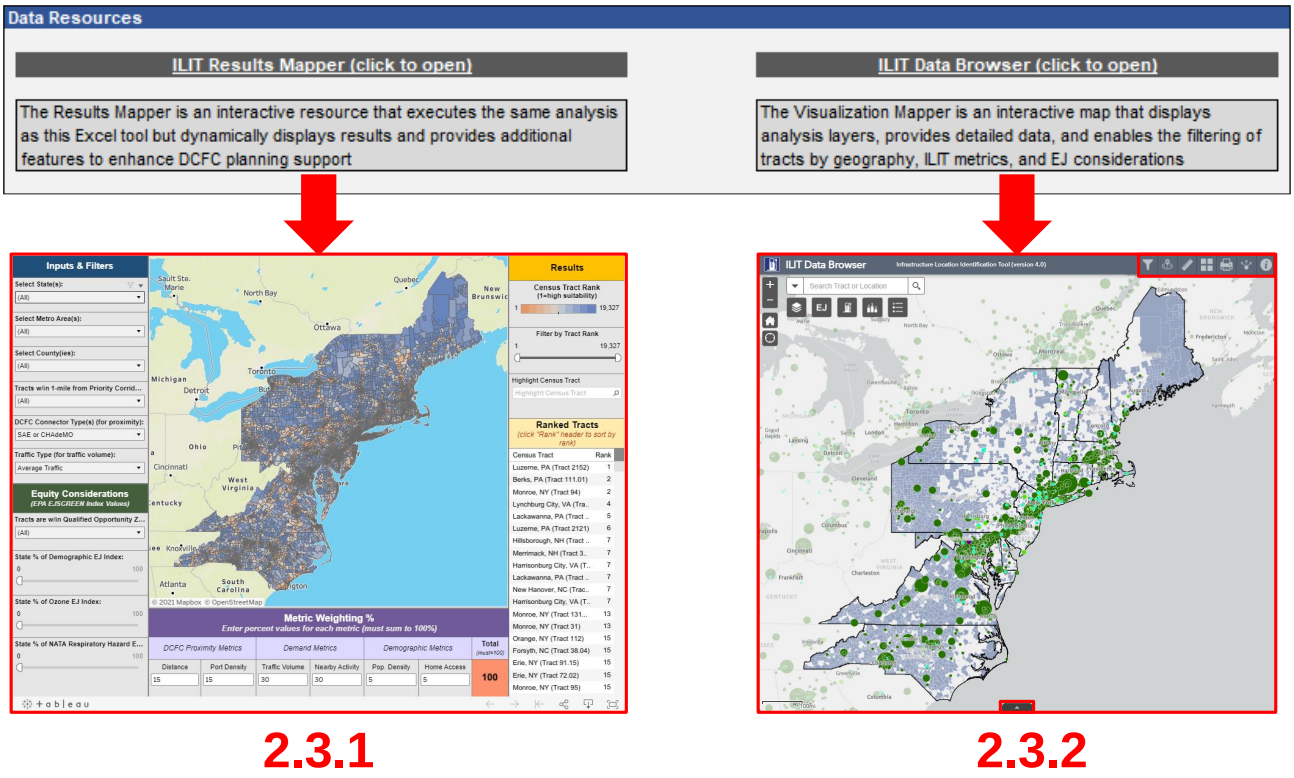
The primary outputs shown on the main page ("Dashboard" tab) is a ranking of top-ranked census tracts in the select group, listed from high to low (limited to top 20 tracts; full rankings can be downloaded, described below). The values shown on the left of the table reflect the relative position/rank of each census tract as compared to others within the analysis selection. In the rightmost column is listed the Final Total Score for each census tract. In between are the metric-specific values and weights that determine this score. Note that there may be numerous census tracts with equal scores.

Note: the Rankings and Final Scores for census tracts are relative to the subset of census tracts included in each analysis run. For this reason, it is important not to compare rankings, metric values, or final scores across multiple, separate analyses. Because the analysis is based on a distribution of census tract data within each metric, the group of census tracts included can dramatically change a metric value. For example, when comparing scores across census tracts in New Hampshire, a census tract may be relatively high-valued for traffic volume. However, when analyzing this census tract in the context of all census tracts in the TCI region, which includes very highly trafficked census tracts in major metropolitan areas like New York City, Boston, and Washington D.C., this census tract would likely receive a lower overall traffic volume value. Therefore, Final Scores and Rankings should not be compared across weighing runs and are specific to the specified criteria.

2.2.2 Exporting Results

In addition, the ILIT Model has a function to export a file for further analysis. Once a user has ranked a subset of census tracts per a chosen methodology, the user can use the "Download Results (.csv)" button to export data on all analyzed census tracts. This will export a .csv file to the user's desktop using the file name convention of "ILIT_Analysis_[*Selected State(s)*]_[*Date*]_[*TimeStamp*]." This spreadsheet provides the active inputs and assumptions utilized in the user-defined scenario, metric decile information associated with the tracts in scope, and a list of the ranked census tracts.

2.3 Data and Results Visualization



2.3.1 Results Mapper

Click this link to access the Results Mapper. This tool enables users to replicate the ranking analysis of the Excel tool and simultaneously view interactive results. By extending the functionality and customizability of the Excel tool to a web-based mapping tool, results are easier to visualize and formatted perfectly for discussions with policymakers, local decisionmakers, and other stakeholders.

2.3.2 Data Viewer

This ArcGIS-based mapping tool allows a user to visualize the main data sources behind the ILT Model and view region-specific DCFC location ranking outputs from preloaded weighting methodologies. The Data Viewer provides users a way to display the underlying characteristics of the region (e.g., traffic volume, existing DCFC stations, census tract information) and offers the ability to filter census tracts by metric data. The Data Viewer comes preloaded with region-specific outputs of the ILIT Model for certain weighting methodologies

3 Data Viewer: User Guide

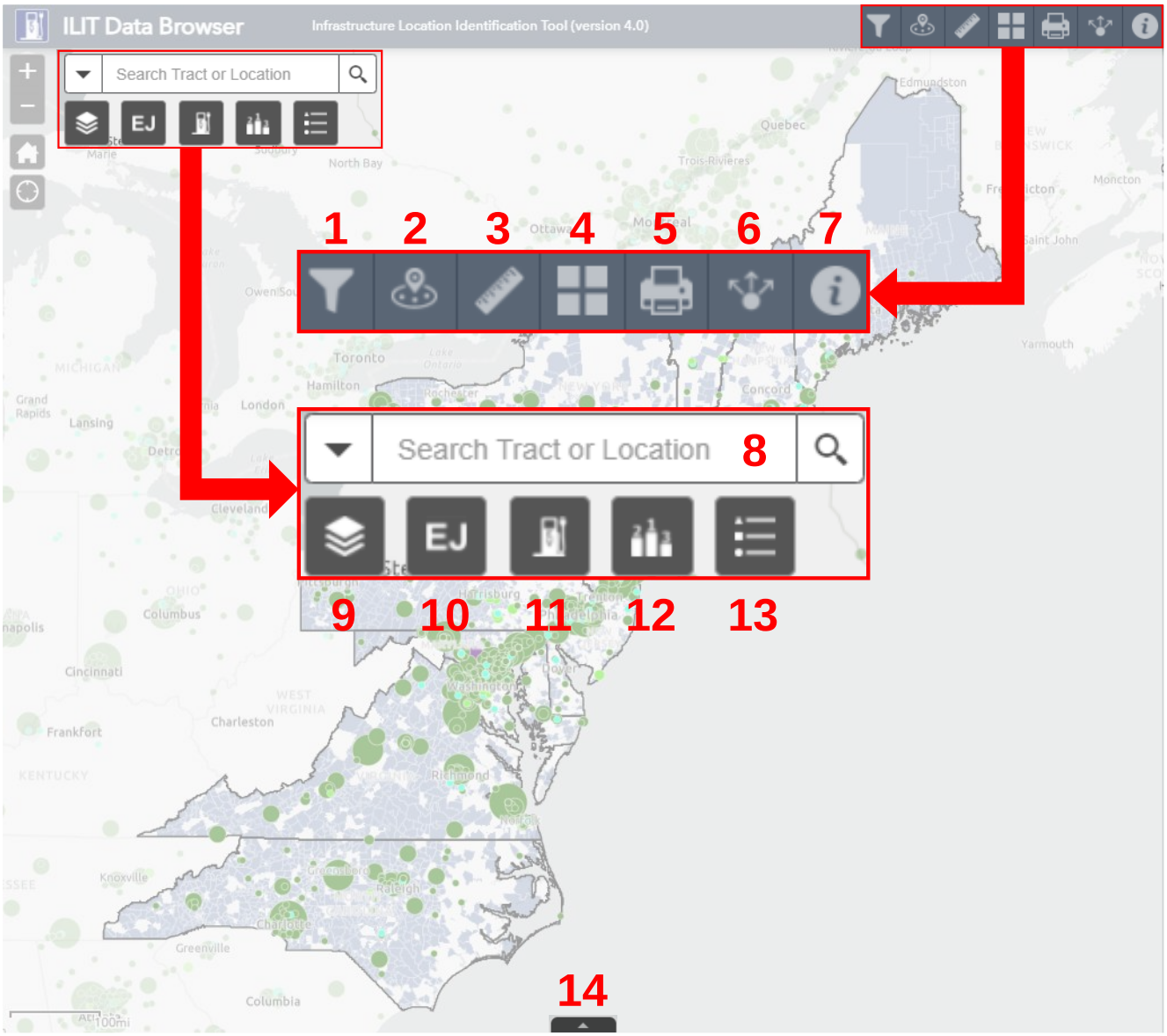
The Data Viewer can be found after registering at https://mjbradley.com/mjb_form/EV-tools. This Data Viewer was developed to display three primary data layers:

1. Existing public DCFC infrastructure;
2. Potential metrics that may guide or assist DCFC infrastructure development planning; and
3. Results from the ILIT Model, especially pre-loaded weighting methodologies.

This mapping application projects the data used by the ILIT Model and offers interactive resources to further the user's understanding of how areas can be prioritized for future charging infrastructure development.

3.1 Using The Map: Orientation

The Data Viewer uses several functions, or "widgets," that allow the user to customize the view of the map. Before learning how to configure the widgets, it is useful to understand how to navigate the mapping application. The following image and table display where these widgets are located on the map and provide a brief description of the functionalities.



Orientation of Map Functions

Map Location	Icon	Description
1		*ILIT Model Filters* • Filter census tracts by geographic scope, equity considerations, and ILIT Model weighting metrics • Filter DCFC stations by plug type and charging network
2		*Nearby Tracts and DCFC* • Find DCFC/census tracts that are within a selected radius of a location
3		*Measurement* • Area, length, and coordinate measurements made by user
4		*Basemap Gallery* • Underlying map layer options
5		*Print* • Export snap of current map view to PDF or physical print
6		*Share* • Get a shareable link for the map (Toolkit and User Guide available through www.mjbradley.com) and the code to embed the map in another webpage
7		*About* • Basic information of map and link to User Guide
8		*Search Tract or location* • Search for census tracts or specific locations within the analysis region
9		*ILIT Model Layers* • Turn visibility of metric layers on/off
10		*EJSCREEN EJ Index Layers* • Turn visibility of EJ filter layers on/off
11		*DCFC Charging Stations* • Turn visibility of existing charging network on/off
12		*Tract Rankings Layers* • View location and data of pre-loaded/uploaded census tract rankings
13		*Legend* • View how each visible layer is displayed
14		*Attribute Table* • View tabular data of selected data layers

3.2 Using The Data Viewer: Visible Layers

After agreeing to terms and conditions to continue to the map, the default extent and layers of the mapping application are visible. The default layers that are visible include:

- State and census tract boundaries of TCI region
- Existing DCFC stations within the region (as defined in scope)

Along with the default layers, additional layers that contain supplementary data and analytical inputs used in the ILIT Model can be turned on/off by using the "ILIT Model Layers," "EJSCREEN EJ Index Layers," DCFC Charging

Stations," and "Tract Rankings Layers" widgets and marking the check box next to each operational layer. To view how each layer is/will be displayed, either select the layer anywhere outside of the check box or select the "Legend" widget, which will show currently visible layers. Although multiple census tract layers can be turned on simultaneously, note that the layer that is listed highest on the list of the layer widgets will be most visible.

Layers within the "ILIT Model Layers" widget:

- *Census Tracts*: all census tracts included in analysis; tracts can be further filtered by geography, equity considerations, and ILIT Model metrics using the "ILIT Model Filters" widget (described below).
- *Tracts w/in One Mile of Priority Corridors*: census tracts that approximate the range of ILIT v3.0 (i.e., including tracts overlapping and within one mile of priority roadways that had been identified by states)
- *DCFC Proximity*: census tracts shown by distance from census tract to nearest existing (public) direct current fast charging (DCFC) station
- *DCFC Port Density:* census tracts shown by the relative DCFC port density (non-Tesla only)
- *Average Roadway Traffic:* census tracts shown by the relative magnitude of the default traffic data metric (Average Traffic)
- *Nearby Activity:* census tracts shown by density of gas stations, restaurants, stores, and other commercial points located within the tract
- *Population Density*: population density (population per square mile) of census tracts within the analysis region
- *Access to Home Charging*: metric based on percent of population living in multi-unit dwellings to approximate (lack of) access to home charging
- *Utility Service Territories:* all electric utility distribution company service territories shown. Note that there is some overlap.
- *State Deciles of ILIT Model Metrics (pop-up data only):* all metric decile data in one layer; when checked, layer will not display but will allow the user to click on a census tract and view all metric deciles (by state) for that tract.

Layers within the "EJSCREEN EJ Index Layers" widget:[3]

- *State Percentile: Demographic Index*: based on the average of two demographic indicators; Percent Low-Income and Percent People of Color.
- *State Percentile: People of Color*: percent of individuals in a block group who list their racial status as a race other than white alone and/or list their ethnicity as Hispanic or Latino. That is, all people other than non-Hispanic white-alone individuals.
- *State Percentile: Low-Income*: percent of a block group's population in households where the household income is less than or equal to twice the federal "poverty level."
- *State Percentile: Ozone EJ Index*: uses the summer seasonal average of daily maximum 8-hour ozone concentration in air (parts per billion, ppb)
- *State Percentile: NATA Respiratory Hazard EJ Index*: per EPA, the "sum of hazard indices for those air toxics with reference concentrations based on respiratory endpoints, where each hazard index is the ratio of exposure concentration in the air to the health-based reference concentration set by EPA."

Layers within the "DCFC Charging Infrastructure" widget:

[3] EJSCREEN is an environmental justice mapping and screening tool that provides EPA with a nationally consistent dataset and approach for combining environmental and demographic indicators. EJSCREEN uses demographic factors as very general indicators of a community's potential susceptibility to the types of environmental factors included in this screening tool. EJSCREEN provides reports and maps that can show each environmental indicator and each demographic indicator, one at a time. To summarize how an environmental indicator and demographics come together in the same location, EJSCREEN uses an EJ Index. The EJ Index is higher in block groups with large numbers of mainly low-income and/or minority residents with a higher environmental indicator value. For more details on the U.S. Environmental Protection Agency's EJSCREEN, see: https://www.epa.gov/ejscreen

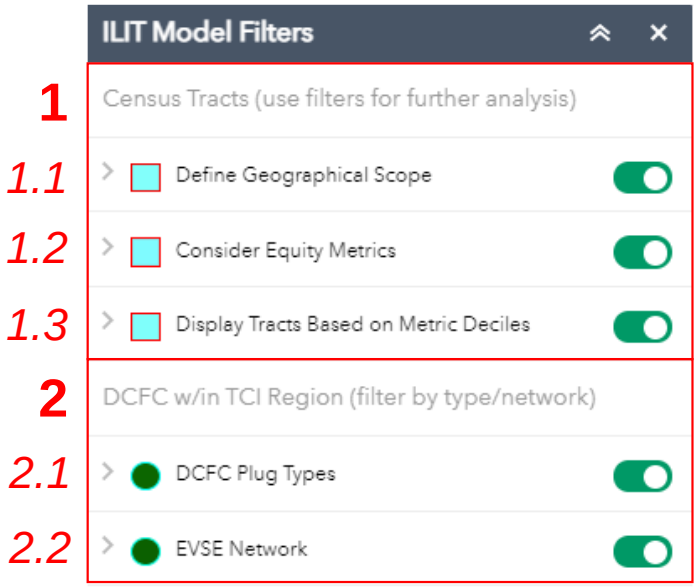
- *DCFC w/in TCI Region*: all DCFC stations (SAE, CHAdeMO, and Tesla) within the TCI region; the charging network and plug type can be further filtered using the "ILIT Model Filters" widget, described below.
- *Non-Tesla DCFC Stations outside TCI Region*
- *Tesla DCFC Stations outside TCI Region*

Lastly, census tract rankings layers generated using the ILIT Model can be made visible in the Data Viewer. Five layers of ranked census tracts representing the pre-loaded ILIT weighting methodologies discussed above (see 2.1.6 Weighting Method) have been pre-loaded and can be accessed through the "Tract Rankings Layer" widget (using the same method when using the "Layers" widget).

3.3 Interactive Capabilities

In addition to displaying and viewing data, the Data Viewer has a few interactive functions (introduced in Section 3.1) to enable data analysis. These include:

ILIT Model Filters



This filter widget (shown above) provides multiple filters to only display specific 1) census tracts and 2) DCFC stations based on selected criteria, described below:

1. *Census Tracts*: This tool allows the user to filter visible census tracts to show only those that meet certain criteria. This can be used to highlight tracts in certain geographic areas or that are above a set threshold for a given metric to help a user visualize tracts of interest. This filter requires that that "Census Tracts" layer in the "ILIT Model Layers" widget is turned on (see Section 3.2 for more detail on how to use this layer). There are three categories of data that can be used to filter visible tracts:[4]
    - *1.1 - Geographic*: filter visible tracts based on state, metro area, county, and proximity "priority corridors"
    - *1.2 - Equity Metrics*: filter visible tracts based on three EJSCREEN EJ indices (Demographic, Ozone, and NATA Respiratory Hazard). This will show those tracts that have higher environmental burden due to a combination of environmental indicators and demographics. The user may enter an integer from 1-100 reflecting a percentile; for example, an entry of 75 will only show those tracts that are in the 75th percentile or higher, compared to all other census tracts in their respective state(s). The user may enter values for multiple metrics; only those census tracts that meet all criteria will be shown.

[4] Note that only those census tracts that meet all criteria in ALL filters within each of the three categories will be shown.

- *1.3 - ILIT Model Metrics*: filter visible tracts based on those that are at or above a user-defined threshold per metric. This will show those tracts that are ranked highest in suitability compared to other tracts within a given state. The metrics here match those that are used as prioritization metrics in the ILIT Model, i.e., DCFC Proximity, DCFC port density, average traffic, etc. The user may enter an integer from 1-10 reflecting a decile; for example, an entry of 8 will only show those tracts that are in the eighth decile or higher, compared to all other census tracts in their respective state(s). The user may enter values for multiple metrics; only those census tracts that meet all criteria will be shown.

2. *DCFC w/in TCI Region*: This tool allows the user to filter DCFC stations to show only those that meet certain criteria. This can be used to highlight stations that have specific connector types or are part of selected charging networks. This filter requires that that "DCFC w/in TCI Region" layer in the "DCFC Stations" widget is turned on (see Section 3.2 for more detail on how to use this layer). There are two categories of data that can be used to filter visible tracts:[5]
    - *2.1 - DCFC Plug Types*: filter DCFC stations by plug type(s), including SAE, CHAdeMO, and Tesla
    - *2.2 - EVSE Network*: filter DCFC stations by charging network (if applicable), such as Electrify America, ChargePoint, etc.

Additional Features

- *Search Tract or Location (#8 in section 3.1)*: Begin by selecting "All," "Census Tracts," or "Location" by clicking the arrow on the left of the search bar to open a drop-down menu. Enter a census tract number (from the ILIT Model) into the search bar to view the location of the census tract. This tool allows for quick visualization of top-rated exits found using the ILIT Model. Any location within the analysis region can also be searched using the search bar.
- *Nearby Tracts and DCFC (#2 in section 2.1)*: This tool can be used to identify public DCFC stations and tracts within a specified distance from a point (such as a business of interest to the user). After opening this widget:
    - Search for a point or location within the analysis region by entering an address in the search bar or selecting the "pin" (located to the right of the search bar) and "Set location" by clicking on any point on the map
    - Specify the distance/radius from the selected point within which DCFC station and census tract data will appear using the slider bar.
    - DCFC stations and census tracts within specified radius will appear with corresponding data

4 Results Mapper User Guide

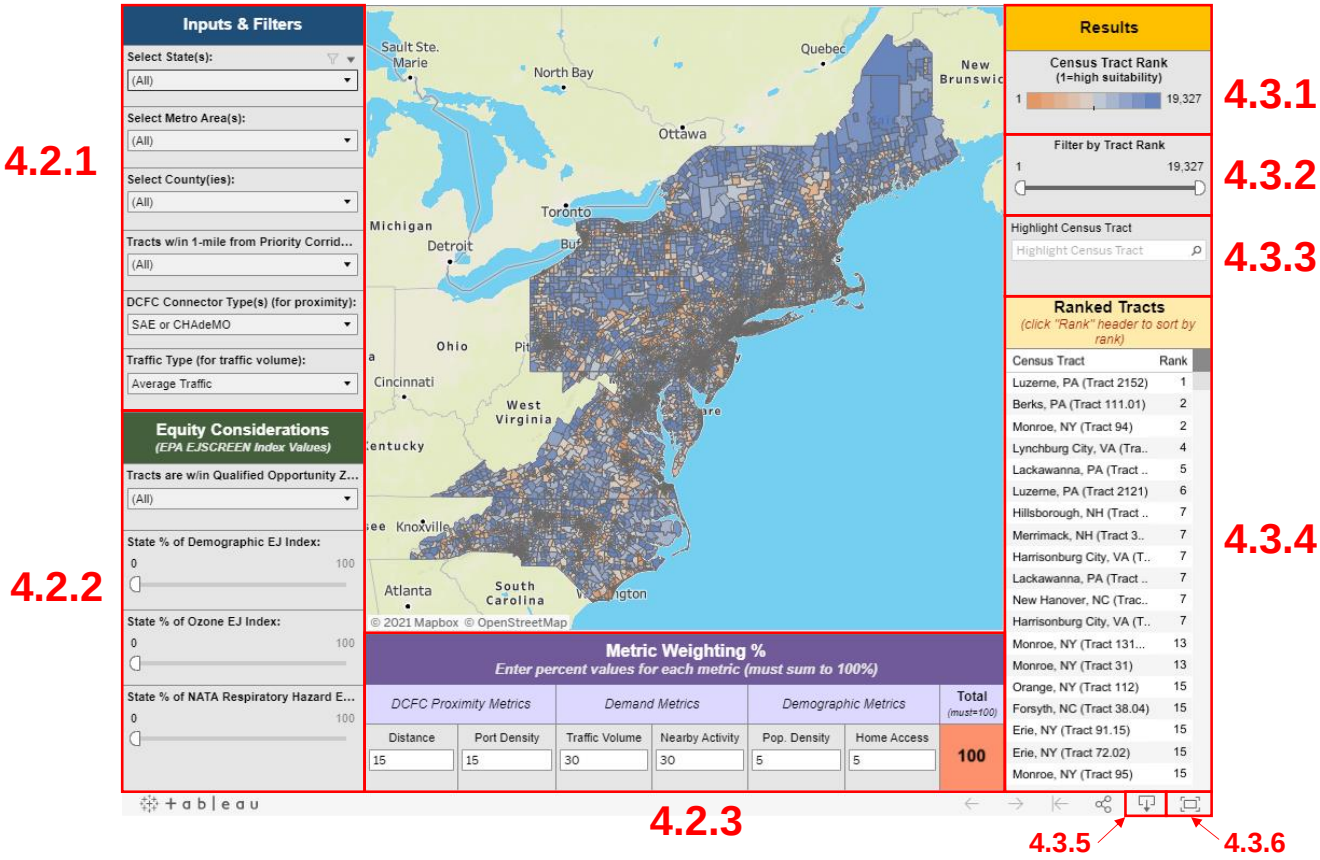
The Results Mapper can be found after registering at https://mjbradley.com/mjb_form/EV-tools. This Results Mapper was developed to replicate the Excel-based tool and display real-time results of a user's personalized weighting methodology. The Results Mapper provides a one-step user experience and creates visualizations of census tract suitability rankings that are formatted for easy assessment and sharing with additional stakeholders. It also includes various functionalities for users to drill down on certain census tracts by location or suitability rank.

4.1 Using The Map: Orientation

The Results Mapper includes several functions to build and refine displays of census tract suitability results. Along the left of the Results Mapper is the inputs dashboard, which mirrors the dashboard of the Tool (see Section 2.1). Once a user inputs a weighting methodology and produces a set of census tract suitability rankings, various functions on the right allow a user to refine which census tracts are displayed on the map.

[5] Note that only those census tracts that meet all criteria in ALL filters within each of the three categories will be shown.

The following image and table display where these functions are located on the map and provide a brief description of the functionalities.



Orientation of Map Functions

Location/User Guide Section	Name / Symbol	Description
4.2.1	Filters & Inputs	• Selections to identify the analysis geographic scope • Options for which DCFC plug type(s) and traffic data should be used in analysis
4.2.2	Equity Considerations	• Mirrors the option in the ILIT Model to limit analysis area based on Qualified Opportunity Zones or the EJSCREEN Demographic Index
4.2.3	Metric Weighting %	• Mirrors the option in the ILIT Model dashboard for a user to input personalized metric weightings
4.3.1	Results	• Key showing color convention for tract rankings as well as minimum and maximum ranking values for included tracts
4.3.2	Filter by Tract Rank	• Limit tracts shown on map to only those within a certain range of ranks (highest tract score corresponds with rank of 1)
4.3.3	Highlight Census Tract	• Select a census tract from a list to highlight this location on the map • Of all census tracts included in the analysis (based on the Filters), show only a subset without re-running the rankings.
4.3.4	Ranked Tracts	• Table of ranked census tracts reflecting active user-defined scenario (click "Rank" header to sort tracts in ascending order of rank)
4.3.5	(Download)	• Download an image of the map results

4.3.6	 (Full Screen)	• Make Results Mapper full-screen (good for increasing the size of the map)

4.2 Using The Map: Inputs

The inputs panels of the Results Mapper will be very familiar to users of the ILIT Model: these filters and metrics are the same as those used in the ILIT Model in order to allow a user to create a visualization of identical scenarios as created in the ILIT Model with an associated list of census tracts. We encourage a user to review Section 2.1 of this User Guide if unfamiliar with the options here. A relatively brief summary is provided below.

4.2.1 Filters & Inputs

The user may select among four geographic-based filters to limit the scope of census tracts that the Results Mapper will analyze and display. These filters are:

- State: limit the analysis to one or more states by checking the appropriate boxes. To unselect all states to start, uncheck "(All)" at the top of the list
- Metro area: within the selected state(s) limit the analysis to one or more metro areas by checking the appropriate boxes. The user may also search at the top of the drop-down list to quickly find a specific metro area to include or exclude. To unselect all metro areas to start, uncheck "(All)" at the top of the list.
- County: within the selected state(s) limit the analysis to one or more counties by checking the appropriate boxes. The user may also search at the top of the drop-down list to quickly find a specific county to include or exclude. To unselect all counties to start, uncheck "(All)" at the top of the list.
- Tracts w/in 1 Mile of Priority Corridors: within the selected geographic region, limit the analysis to only those census tracts that approximate the range of ILIT v3.0 (i.e., including tracts overlapping and within one mile of priority roadways that had been identified by states).

Like the ILIT Model, the user must also select two data inputs that will determine how the metrics are calculated. These are:

- *DCFC Connector Type(s)*: select the existing DCFC stations that will be included in the proximity metrics (i.e., the closest existing DCFC station to and the density of ports surrounding a location). This allows a user to select all DCFC stations, or any combination of stations with SAE Combo connectors, stations with CHAdeMO connectors, and Tesla stations.
- *Traffic Type:* select the traffic data that will be used for the traffic demand metric. A user can select the three traffic data options described in section 2.1.4: Average Traffic, Peak Traffic, and Peak Traffic Ratio

4.2.2 Equity Considerations

The user may select among two Equity Consideration filters to limit the scope of census tracts that the Results Mapper will analyze and display. Described in section 2.1.5, these filters are:

- *Qualified Opportunity Zones (QOZ)*
- *State % of Demographic Index (EJSCREEN state percentiles)*
- *State % of Ozone EJ Index (EJSCREEN state percentiles)*
- *State % of NATA Respiratory Hazard EJ Index (EJSCREEN state percentiles)*

4.2.3 Metric Weighting

The weighting method is used to emphasize specific metrics/characteristics of census tracts when ranking within the selected region and group. A user selects the values across five metrics, totaling 100, to create a scenario that reflects his or her own priorities for infrastructure development in the ranking process. To change the values, click within a box and replace the number, pressing enter when finished. The Results Mapper will automatically update after each change. If the

values entered across all metrics do not equal 100, the Results Mapper will return no rankings, scoring all census tracts at "0."

The Proximity and Traffic Volume metrics will calculate using the data selected in the Filters & Inputs dashboard (e.g., average traffic and all DCFC connectors).

4.3 Using The Map: Results and Result Filters

The Dashboard to the right of the map within the Results Mapper contains various functions that allow a user to refine which census tracts are displayed on the map.

4.3.1 Results

This key shows the range of exit scores, which may be from 1 – 100. It also shows the color scheme of exit markers on the map.

4.3.2 Filter by Tract Rank

A user may choose to only show a subset of exits included in the analysis by dragging the half-circles on either end of the slide bar. The numbers above the slider will update to reflect the exit ranks that are included. A user may also click on these numbers and directly enter a value here, pressing enter when finished. The map will update automatically to display only these selected exits after any change. To reset, drag the sliders to the far end of each end of the scale.

4.3.3 Highlight Census Tract

This section allows a user to highlight a subset of census tracts included in the analysis based on geographic characteristics or by specific census tract. Unlike changing the geographic filters in the "Filters and Inputs" section, this will not re-run the analysis for only those census tracts, but instead simply creates a visual emphasizing this group of census tracts.

4.3.4 Ranked Tracts

This table provides a list of ranked census tracts based on the active user-defined criteria. Note that the user will likely need to click the "Rank" header and select the button that indicates "Sort Census Tract ascending by Measure Values" to order census tracts by rank.

4.3.5 Download

Select the download function to export a screenshot of the full Results Mapper screen at a given point. Results data cannot be downloaded in spreadsheet form. Select between file formats. The download should automatically start.

4.3.6 Full Screen

Select full screen by clicking the appropriate icon to increase the width of the Results Mapper. This may take a few moments to load. Depending on screen size, this may significantly increase the view area of the map. To exit full screen, click the  image at the bottom right corner of the screen or by pressing Esc.