Where Matters: Methods

Introduction

The Where Matters tool provides place-based metrics that can be seamlessly integrated into corporate Environmental, Social, and Governance (ESG) strategies and initiatives. It equips companies with data and analytical insights that are directly applicable to their ESG objectives. The tool assesses sites across all metropolitan areas in the United States, utilizing key metrics related to:

- Access to Talent,
- Racial Equity and
- Commuter Emissions.

Users have the flexibility to input up to five site addresses, and the tool presents the respective site scores within the broader context of scores across all metropolitan areas. Metropolitan Statistical Areas (MSAs), are defined by the US Census Bureau as:

> "A geographic entity delineated by the Office of Management and Budget for use by federal statistical agencies. Metropolitan statistical areas consist of the county or counties (or equivalent entities) associated with at least one urbanized area of at least 50,000 population, plus adjacent counties having a high degree of social and economic integration with the core as measured through commuting ties."

A map of the 392 MSAs in the United States is displayed below.

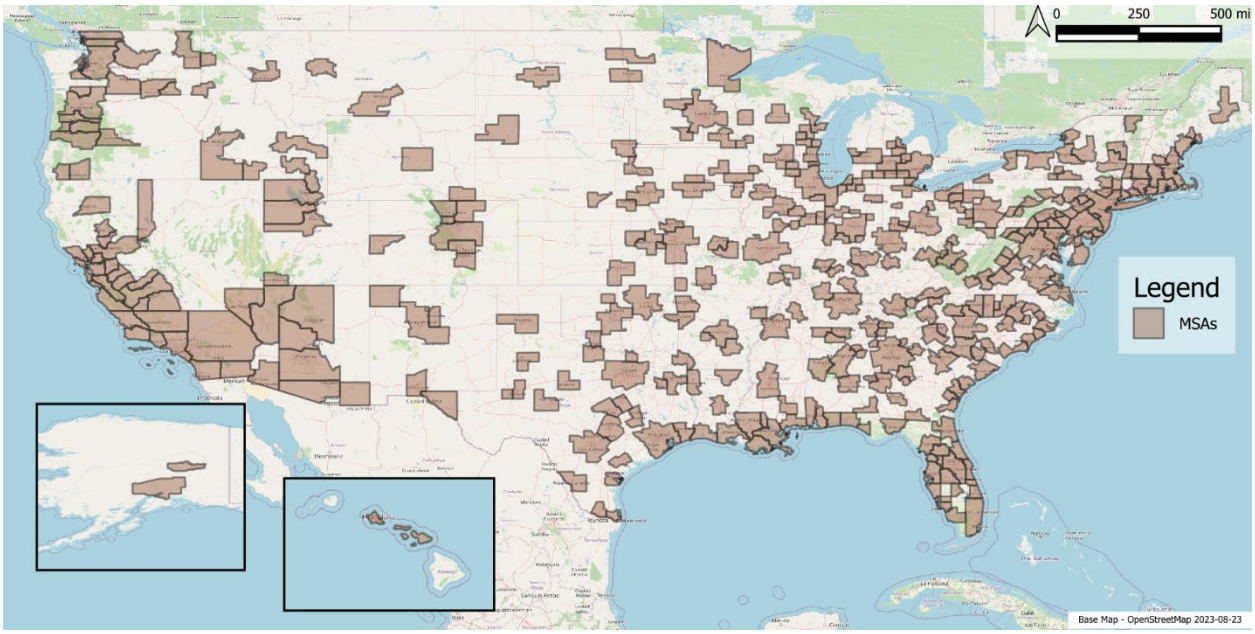

Figure 1: Map showing Metropolitan Statistical Areas (MSAs)

Scoring

Commute Sheds

The Where Matter tool's functionality is determined by two critical factors: who can reach a particular site and the mode of transportation they will use to commute to that location. The initial step involves defining the region that can be conveniently reached within a fixed timeframe using various transportation modes. These designated areas, or "commute sheds," have been developed for the 198,799 Census Block Groups that are within MSAs. A 30-minute commute time is employed to estimate commuting by driving, walking, and biking using Zoom Prospector's application programming interface (API) and the Center for Neighborhood Technology's (CNT's) AllTransit database's was employed to calculate 30-minute transit commute sheds during peak travel times.

Driving

Zoom Prospector, developed by GIS Planning, generates a driving commute shed for a site location through an API. This API is applied using the centroid of each block group as the destination for the morning commute (specifically April 19th, 2023, at 8:00 am local time). As an example, the following map shows the driving commute shed for Census Block Group 080310017061 in downtown Denver, Colorado. This geographic shape is different for every location in the region and the tool uses location-specific information in its analysis.

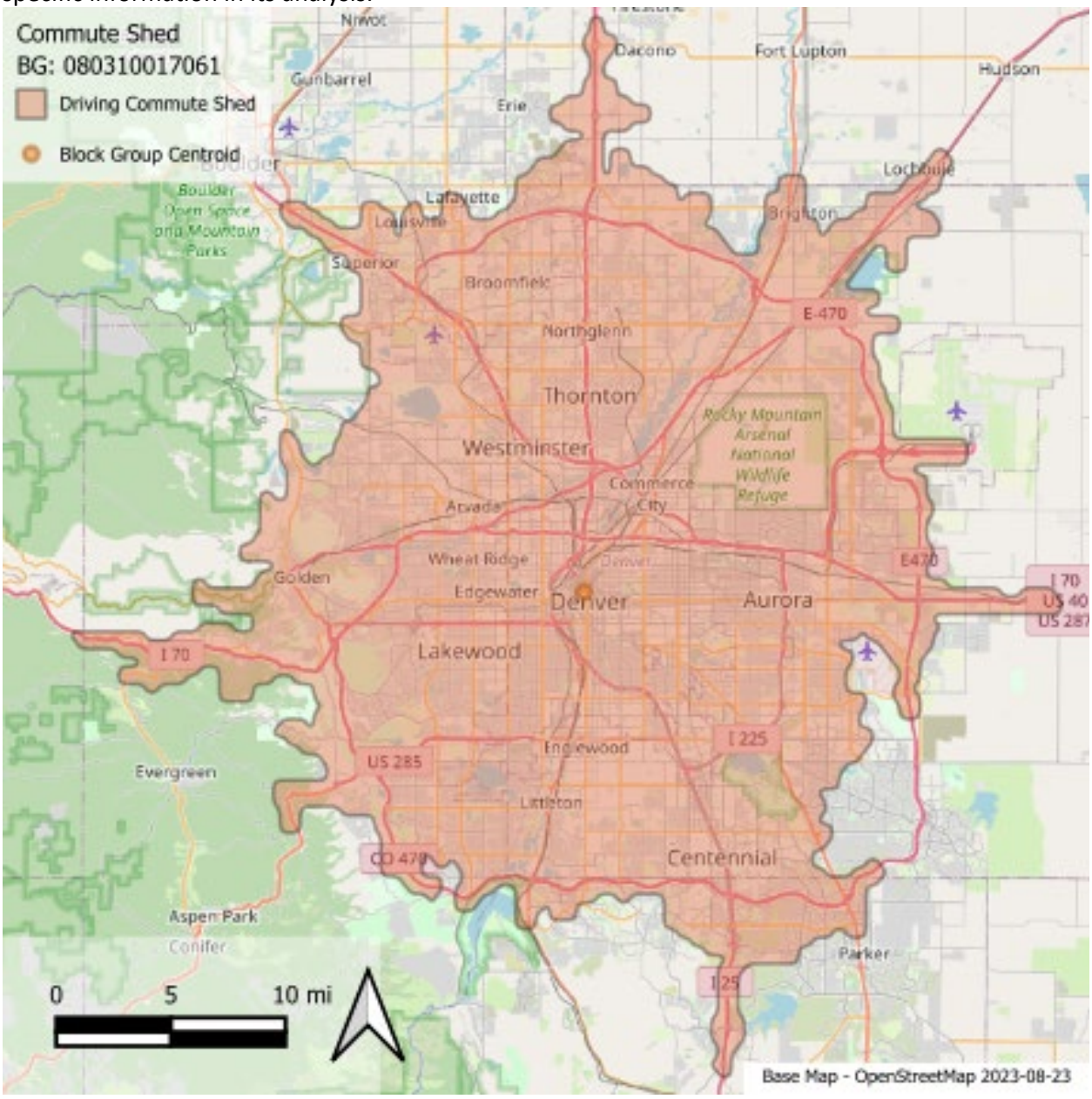

Figure 2: Driving Commute Shed Example

The size of the commute sheds for certain block groups exhibited unusual variations. These anomalies were observed predominantly in rural areas where the block group's centroid was distant from streets or roads. In some instances, these commute sheds were exceptionally small, while in others, they

were unusually large. To achieve a more accurate estimation of the size and extent of these commute sheds, an advanced algorithm was used for the 12,846 block groups whose car commute sheds fell below 77 square miles or exceeded 1,160 square miles. (the average size of the car commute shed is approximately 613 square miles). The enhanced algorithm uses all the blocks that make up the block group and chooses a point on each of the blocks that is the closest to the block group centroid as its destination. The point on the block's edge is likely to be on a street. Once the commute shed is calculated for each block, the destination point is chosen from all the possible locations where the commute shed area is the closest to the average size of all the block commute sheds.

Walking

Using the same API but changing the mode from “car” to “pedestrian” gives the walking commute shed. Note that this commute shed avoids limited access highways and other unsafe walking environments. The following map shows the walking commute shed for the same Census Block Group in downtown Denver.

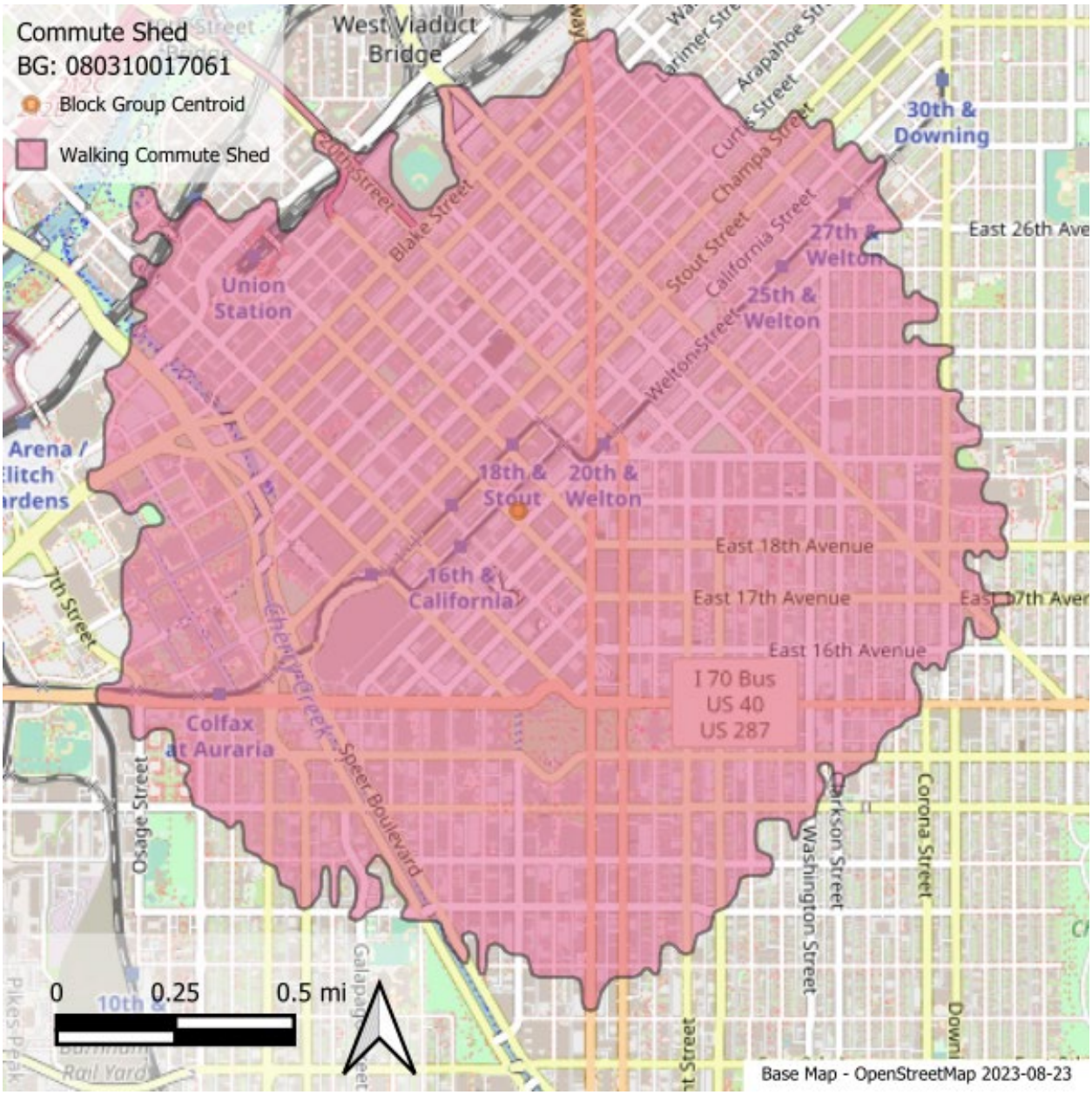

Figure 3: Walking Commute Shed Example

Like the car commute sheds, often the walk commute shed was abnormally small, and in some cases could not be found at all. Again, the same enhanced algorithm was used to better estimate walking commute sheds for the 8,148 block groups whose walking commute shed was less than 0.06 square miles (37 Acres) (the average walking commute shed is 0.98 square miles or 595 acres) or did not exist at all.

Biking

The API does not have a biking mode and since bike commuters, like walking commuters, cannot use limited access highways etc., a biking commute shed was estimated by using a longer walking commute shed. Given that walking speed is approximately three miles per hour, and biking is approximately 12 miles per hour, the API "drivetime" (really walking time but that is what the API calls it) was changed to 120 minutes for an effective biking commute time of 30 minutes. The following map shows the biking commute shed for the same Census Block Group in downtown Denver.

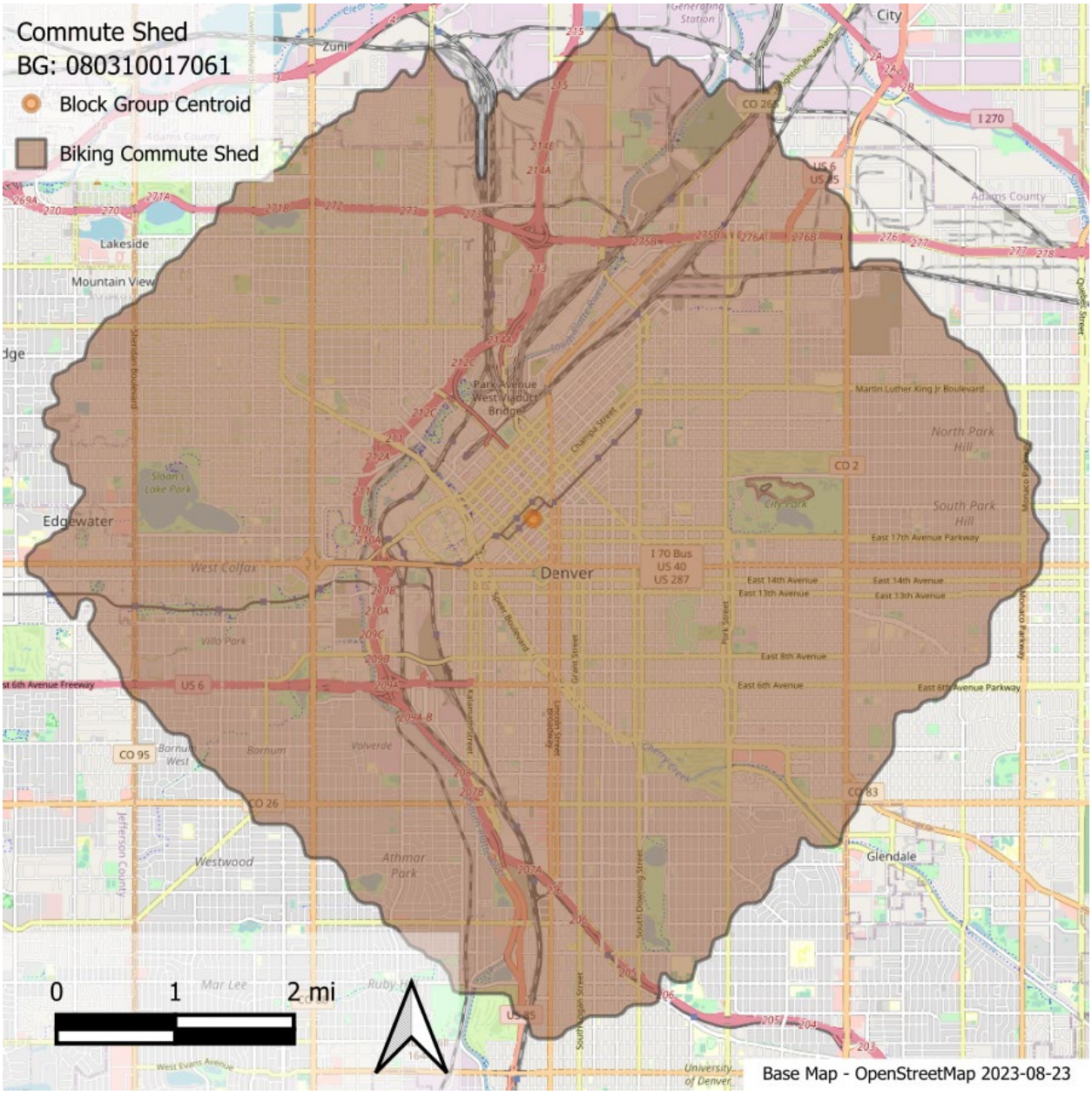

Figure 4: Biking Commute Shed Example

The enhanced algorithm was applied to all 198,793 block groups with biking commute sheds, as it is essential for biking that there is a nearby street available to ride on.

Transit

CNT's AllTransit database has GTFS (General Transit Feed Specification) data for transit agencies throughout the US for service in 2019. The AllTransit data allow CNT to develop 30-minute transit sheds (with one transfer) for a given location. This transit shed, calculated for trips in the morning peak commute time is used as the transit commute shed of every block group. The following map shows the transit commute shed for the same Census Block Group in downtown Denver.

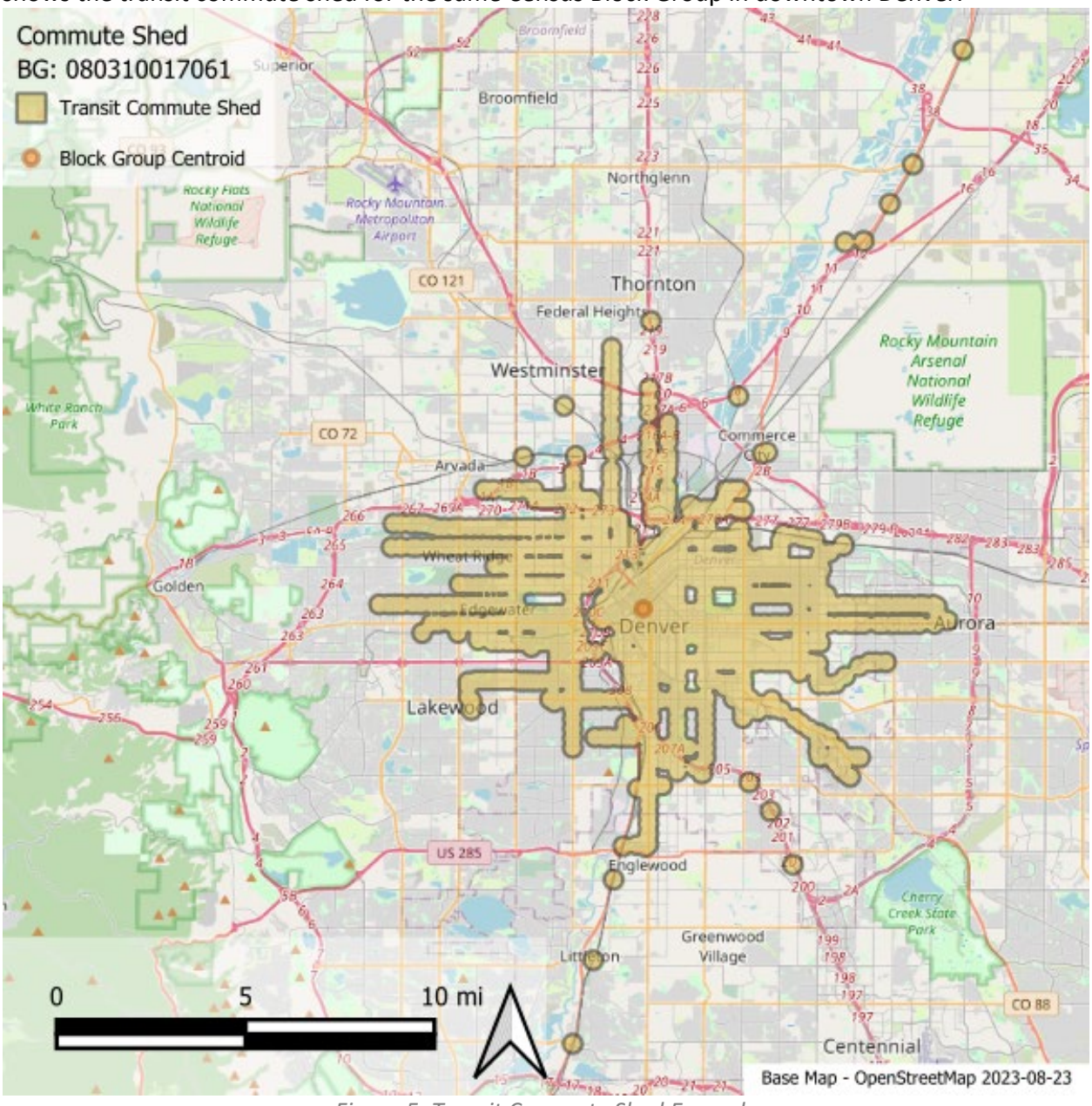

Figure 5: Transit Commute Shed Example

Variables

Information from the US Census American Community Survey (ACS) and other sources were collected at the Census Block Group (BG) level. These data are then aggregated to the commute shed for each BG centroid. This aggregation is simply a proportional sum of the various indicators listed below. The proportional sum uses the fraction of all the BGs that overlap the commute shed times the value of the indicator. For average and fractions/percentage this overlap is used as the weight for the weighted average.

ACS Data

The following table lists all the ACS variables that were collected to develop the various metrics used to compare locations. All data used in this tool were from the 2017-2021 5-year estimates.

Table 1: ACS Variables

Variable (ACS title)	ACS Code	Description
population	B01003	Total population
Hispanic or Latino origin by race	B03002	These data are used for the racial Equity Score. Latinx is not a race but since we want to use this as an indicator for people of color, Latinx workers are counted separately. The rest of the races are counted only for people who identify as non-Latinx. This is used to calculate the Black, Indigenous and people of color (BIPOC) population.
sex by work status in the past 12 months by usual hours worked per week in the past 12 months by weeks worked in the past 12 months for the population 16 to 64 years	B23022	This variable is used for all the scores in calculating the number of working aged people. Using the total gives the population to only those of working age (16-64 years old). In the descriptions of the scores below (see Table 3, Table 4 and Table 5 below) where “Working-Age Population” is listed.
means of transportation to work	B08301	These data are used for all the scores in calculating the means of transportation of the workers who commute. The modes used are auto, transit, bicycle, and walking.

Table 1 above lists the various populations used to calculate the number of commuters by race/ethnicity and mode of commute, and since these are not given for working-age populations, the values were scaled by the number of working-age populations in the total population. To aggregate the data from the commute shed for the various working-age populations, the following equation was used:

$$T = \sum_{i=1}^{n} \frac{(f_i \times W_i \times D_i)}{Pop_i}$$

Equation 1: Proportional Sum of Working-age Population, Scaled by Fraction of Population in each Demographic Cohort

Where T is the total for a given BG with the corresponding commute shed, n is the number of BGs intersecting the commute shed, f_i is the fraction of the BG overlapping the commute shed, W_i is the number of working-age people in the BG, D_i is the population in the demographic segment, and Pop_i is the total population in the BG. Note that for the "Access to Talent" score D_i is equal to Pop_i.

Other Variables

The various indicators used in developing the scores, that are not from the 2017-2021 5-year average ACS data, are listed below:

Table 2: Other data source

Variable	Description
One-way Commute Price	The commute costs calculation uses the IRS (Internal Revenue Service) 2021 standard of $0.56/mile for the auto commute price and the price of a local monthly transit pass[1] where that is available. If the local transit provider does not have a monthly pass available, the one-way fare is used. When neither are available an established value of $1.52[2] /trip is used for transit cost.
Walkscore	Walkscore is a statistic that has been calculated nationwide and is available through an API – see https://www.walkscore.com/ for details. These were obtained in August 2023.
Bikescore	Bikescore is another statistic the is generated by the Walkscore, again obtained in 2023.
Commuter Emissions--Auto	The commuter emissions calculation uses 0.39 kg carbon dioxide equivalent (CO_2e) per vehicle mile for personal vehicles (direct tailpipe greenhouse gas emissions only). See U.S. EPA (Environmental Protection Agency) for more information see: https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references
Commuter Emissions—Transit	The commuter emissions calculation uses 0.34 kg CO_2e per passenger mile for transit riders. (greenhouse gas direct tailpipe and electricity generation emissions only). See https://www.trb.org/Main/Blurbs/181941.aspx

[1] pro-weighted for one trip for every workday i.e., price $= \frac{pass \times 12}{(2 \times 5 \times 52)}$

[2] https://www.statista.com/statistics/186845/us-average-passenger-fares-in-transit-since-1990/

Calculating the Scores

The scoring system is based upon relative scores of a set of variables. These relative scores are translated into a percentile for each variable. Then these percentiles are averaged for a given set of variables to develop the component scores (Access to Talent, Racial Equity and Commuter Emissions). A weighted average of these component scores is calculated to form the combined score. In summary the scores:

- Use a suite of indicators to characterize each Census Block Group.
- Use a limited set of indicators to keep the model simple.
- Use percentiles to assign scores for each of the indicators in every Census Block Group.
- Use a scoring system in which the percentiles are averaged for the set of indicators in each of the components.

Access to Talent

The variables used in the Access to Talent score are listed below:

Table 3: Variables used in Access to Talent Score

Variable	Min	Max	Mean	Median	Standard Deviation
Driving Commute Shed Total Working-age Population.	0	5,663,721	802,802	533,058	816,698
Transit Commute Shed Total Working-age Population.	0	2,766,666	126,241	52,677	222,305
Walking Commute Shed Total Working-age Population.	0	175,307	6,287	1,884	14,441
Bike Commute Shed Total Working-age Population.	0	2,104,976	102,088	47,844	195,357
Commute Cost/Day	$0	$43	$16	$16	$4

The estimate the total commute cost (per commuter) is broken out by car and transit costs and then a weighted average is used to combine the two, with the weights being the number of car commuters in the car commute shed, and the number of transit commuters in the transit commute shed. See the equation below:

$$C = \frac{2 \times \left(D_{price} \times N_{car} + T_{price} \times N_{transit}\right)}{N_{car} + N_{transit}}$$

Equation 2: Estimate Commute Cost Calculation

Where C is the estimated total commute cost, D_{cost} is the one-way driving commute price, N_{car} is the number of car commuters in the driving commute shed, T_{cost} is the one-way transit commute price, $N_{transit}$ is the number of transit commuters in the transit commute shed and the factor of 2 considers that the commuter must go to and from work each day.

Racial Equity

The variables used in the Racial Equity score are listed below:

Table 3: Variables used in Racial Equity Score

Variable	Min	Max	Mean	Median	Standard Deviation
BIPOC working-age population in Driving Commute Shed	0	3,888,113	454,037	222,843	597,370
BIPOC working-age population in Transit Commute Shed	0	1,724,472	80,375	27,595	149,260
BIPOC working-age population in Walking Commute Shed	0	131,590	3,904	643	10,380
BIPOC working-age population in Bike Commute Shed	0	1,140,300	61,614	19,015	133,408
Percent BIPOC working-age population in Driving Commute Shed	0	100%	44%	42%	20%
Percent BIPOC working-age population in Transit Commute Shed	0	100%	36%	38%	31%
Percent BIPOC working-age population in Walking Commute Shed	0	100%	43%	37%	29%
Percent BIPOC working-age population in Bike Commute Shed	0	100%	44%	42%	25%

Commuter Emissions

The variables used in the Commuter Emissions score are listed below:

Table 4:Variables used in Commuter Emission Score

Variable	Min	Max	Mean	Median	Standard Deviation
Estimated average driving distance (miles) for all Census Block Groups in driving commute shed (Note that a high score counts against the overall average)	0	34	9	9	2
Percent of Working-age people using transit as their mode to get to work in Transit Commute Shed	0%	100%	1.66%	0%	6%
Percent of Working-age people using walk as their mode to get to work in Walking Commute Shed	0%	41%	0.06%	0%	0.3%
Percent of Working-age people using bike as their mode to get to work in Bike Commute Shed	0%	65%	0.15%	0%	0.4%
Average Walkscore in Walking Commute Shed	0	100	37	36	27
Average Bikescore in Bike Commute Shed	0	99	41	40	17

To estimate the effective greenhouse gas emissions (GHGs) for the daily commute to the given location the following formula were used:

$$GHG_{mode} = Distance_{mode} \times 2 \times f_{mode\ (kg\ CO_2e)}$$

Where mode is either driving or transit, and f is the factors given in Table 2 and the factor of 2 is to account for both the trip to work and back home.

Combined Score

A weighted average of the component scores is calculated and mapped on the tool. The relative weighting of each individual score in this weighted average is adjustable, to a degree, by the user. Initially all weights are set to two – each component score is equally weighted. The user can drop any of these scores if they want by unchecking the component score's checkbox. The user can also lower the relative score to one by sliding the slider to the "less" position or raise it to three by choosing the "more" position. The map automatically adjusts to this combination as does the Combined Score value for each chosen location.

For example, if the user wants to focus on Racial Equity, the user can change the settings in the "Scoring Criteria" box below the map by unchecking the other two components so only Racial Equity is shown on the map. Alternatively, the user could keep all three components checked, but use the sliders to focus less on Access to Talent and Commuter Emissions and more on Racial Equity.

Minimum Wages

For context, commute costs for driving and transit are also reported as the number of hours per day for a minimum wage worker required to cover those costs. The minimum wage used in this calculation is the highest minimum wage (for non-tip workers) set by the city, county, state or federal law for each site location (as of the Summer of 2023). The following sources were used:

- The Economic Policy Institute Minimum Wage Tracker https://www.epi.org/minimum-wage-tracker/

- UC Berkley Labor Center Inventory of US City and County Minimum Wage Ordinances https://laborcenter.berkeley.edu/inventory-of-us-city-and-county-minimum-wage-ordinances/

Walk Score and Bike Score Calculations

Walk Score[3] is the leading measure of neighborhood walkability shown on more than 30,000 real estate websites. Bike Score[4] measures whether an area is good for biking on a scale from 0 to 100 based on bike lanes, hills, destinations, and the number of bike commuters. Both indicators are accessed for a given location with an API[5]. Where Matters uses this API and the location of the point in each block groups that was used for the walking commute shed. The API returns both Walk Score and Bike Score. The Bike Score assigned to the block groups is obtained from this point, however, there are some block groups where using the walk shed point in the API does not give a Bike Score; for these block groups the API was rerun using the bike commute shed point.

[3] https://www.walkscore.com/methodology.shtml
[4] https://www.walkscore.com/bike-score-methodology.shtml
[5] https://www.walkscore.com/professional/api.php