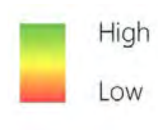
5. CONNECTIVITY ANALYSIS AND TOOLS

This chapter describes the connectivity metrics calculated to evaluate access to transit stops and stations and the tools the project team developed to calculate the metrics. The connectivity analysis tools were built for ArcGIS using Python scripts. Details on how the tools were developed and their specific analytic functions are summarized in **Appendix A** along with a handbook on applying the tools. This chapter also provides a brief description of the connectivity "surfaces" that are calculated by the tools and presents sample results.

Surfaces were calculated for each of the connectivity measures to help visualize the results and to facilitate the creation of a composite connectivity index that was used for ridership regression modeling. **Figure 5** below shows an example of the intersection density surface near the Federal Way Transit Center. While the surfaces will be described in more detail in the following section, there are several common features among all the surfaces.

- Color ramp: All the surfaces present the connectivity analysis results in a "color ramp" from red through yellow to green. Red areas denote a low/poor connectivity score, while green areas denote a high/good connectivity score. All the surfaces are based on ordinal scoring on a scale of 1-5, with 1 representing a poor score and 5 a good score.



- Masks: As shown in **Figure 5**, there are areas that are "masked-off" from the connectivity analysis. These areas include parks, water bodies, schools, colleges/universities, cemeteries, golf courses, and large commercial areas (e.g., malls). The reason for masking off these uses is that they tend to not have a lot of transportation infrastructure through the areas and therefore tend to score poorly. However, since these areas tend to be destinations, the project team did not want the lack of intersections or sidewalks in a park, for example, to negatively affect the connectivity score of an area. It is important to note that these masked areas do influence scores like route directness index (described below) since they can act as a barrier to traveling to a transit stop if a street or path does not pass through them.

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Figure 5

Example Connectivity Surfaces

ROUTE DIRECTNESS INDEX (RDI)

Typically, the distance traveled along a network between two locations is longer than the direct, "as the crow flies" distance between the same two points. The closer these two distance measurements are between a given set of locations, the higher the Route-Directness-Index (RDI), and the less circuitous the path is between two locations. This tool uses a set of origin points (in the case of this project, transit stop locations) and destination points (intersections within three miles of the transit stop) to create a "surface" or map that reflects the RDI for all destinations within the three-mile buffer around the transit stop. The figures below show an RDI surface for a one-mile radius[8] around the Northgate transit station and a bus stop in Capitol Hill. As shown in the Northgate example in **Figure 6**, an area scores poorly in the RDI metric (yellow and orange colors) west of the transit station as a result of a lack of access across the freeway. In comparison, the RDI around a Capitol Hill bus stop is very good (green colors) since the density of the street grid provides good access and connectivity outward from the station.

The score categories for the RDI calculation are defined below:

Table 4: RDI Scoring Categories

Ratio of Straight-Line to Network Distance	Score
>.8	5
.6-.8	4
.4-.6	3
.2-.4	2
<.2	1

[8] The one-mile radius is used for visualization. The tool calculates the surface over a three-mile radius.

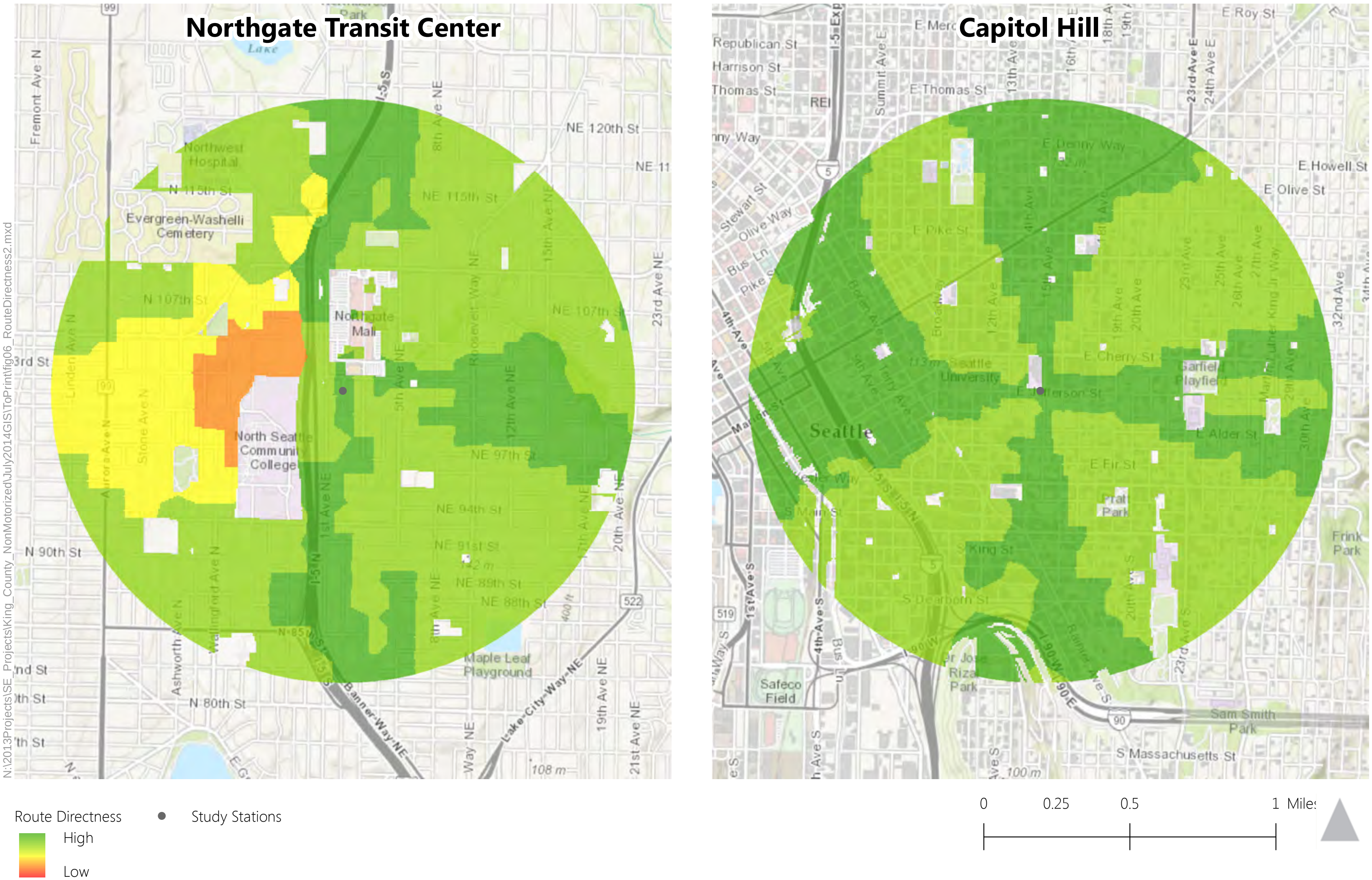


Figure 6

Examples of Route Directness in Northgate Transit Center (Left) and Capitol Hill (Right)

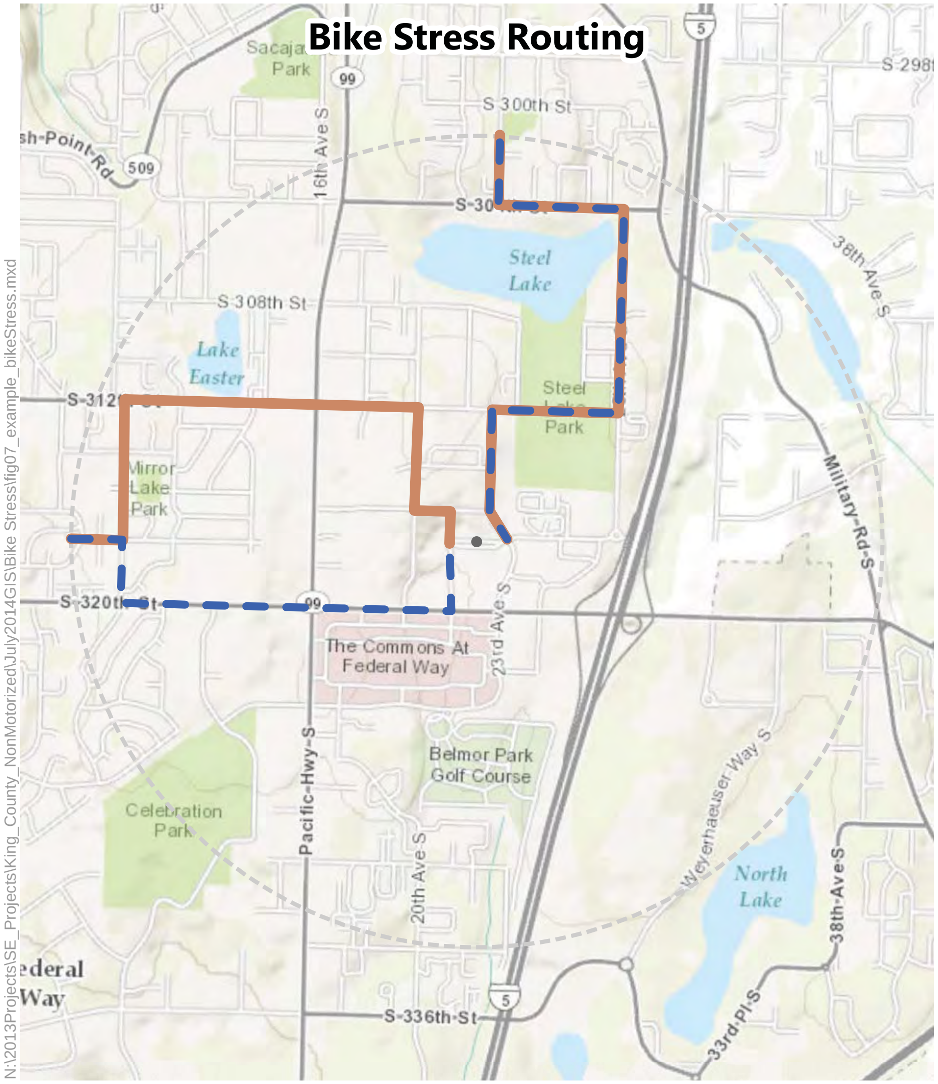
BIKE STRESS SURFACE

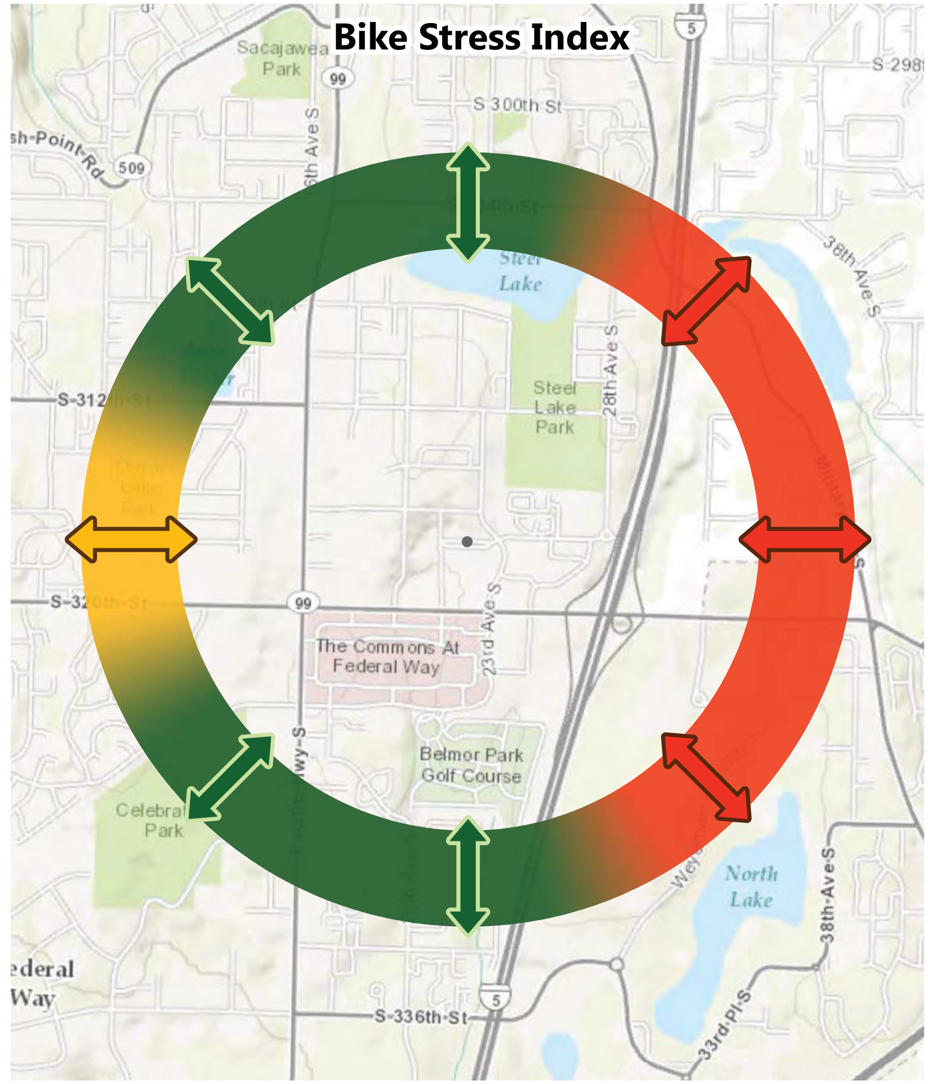
The bike stress tool compares the network distance required to reach each station from eight cardinal points located one mile away from the transit stop. As shown in **Figure 7** below, the network distance is first computed using the full network (in blue), regardless of the bike stress on each link. A second network routing analysis (in green) is conducted with a network constrained to only those links with a bike stress of 3 or below[9]. This constrained network is the "lower stress" network that a bicyclist would utilize and represents the routing options available. The distance required along the constrained network is compared to the full network in order to determine a difference ratio, or the amount of diversion required for a cyclist to remain on a lower stress network. The Mineta Institute research states that a majority of cyclists will travel at most 25% out-of-route in order to travel along a lower stress street segment if they approach a high stress option. Higher levels of diversion tend not to be tolerable and riders will not make the trip. The method described in the Mineta Institute research utilized relative person-trips from a travel demand model to determine an area average for bike stress. In the absence of travel demand model data, population density at each of the eight points serves as a proxy of the relative number of trips originating from those points. **Table 5** shows the bike stress scoring categories.

Table 5: Bike Stress Scoring Categories

Ratio of Low Stress Network Distance to Unconstrained Network Distance	Score
<1.05	5
1.05 - 1.10	4
1.10 - 1.15	3
1.15 - 1.25	2
>1.25	1

9 While research states that a bike stress level of 2 provides a suitable environment for a majority of potential cyclists (over 60%), it was assumed that people taking relatively short bike trips to transit would be willing to tolerate somewhat higher levels of stress, therefore a bike stress level of 3 was used in this study.





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Bike Stress
- Low
- Medium
- High

- Study Stations
- Most Direct Route
- Low Stress Route

0 0.25 0.5 1 Miles

Figure 7

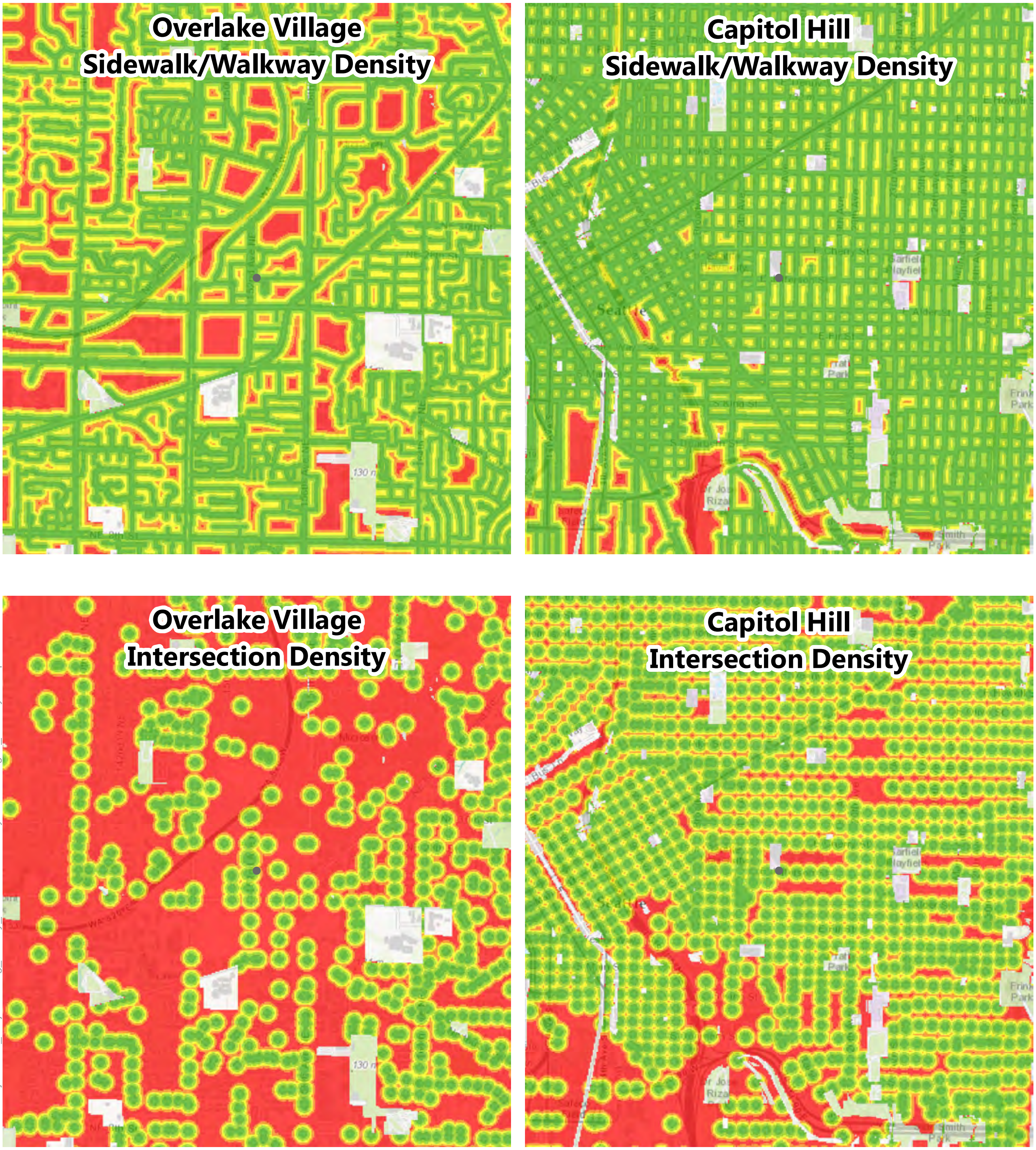
Example of Bike Stress Routing (Left) and Bike Stress Index (Right)

SURFACES: INTERSECTION AND SIDEWALK/WALKWAY DENSITY

In order to compute sidewalk/walkway and intersection density, the tool calculates the distance from the sidewalk/intersection feature and assigns a score. A score of five is defined at the sidewalk/intersection and decays linearly to one at a distance of 300 feet as shown in **Table 6**. This scoring is based on Seattle's 300 foot downtown grid as a good example of intersection and sidewalk/walkway grid density. Downtown gridded street networks are often used as a "standard" of good pedestrian permeability in other non-motorized analyses. This surface is calculated for the entire study area and then aggregated to each station area. Examples are shown in **Figure 8**.

Table 6: Intersection and Sidewalk/Walkway Density Scoring

Distance from Signalized Crossing	Score
<50 feet	5
50 - 100 feet	4
100 - 150 feet	3
150 - 300 feet	2
>300 feet	1



Density
High
Low

● Study Stations

0 0.25 0.5 1 Miles

Figure 8

Examples of Sidewalk/Walkway Density (Top Row) and Intersection Density (Bottom Row)

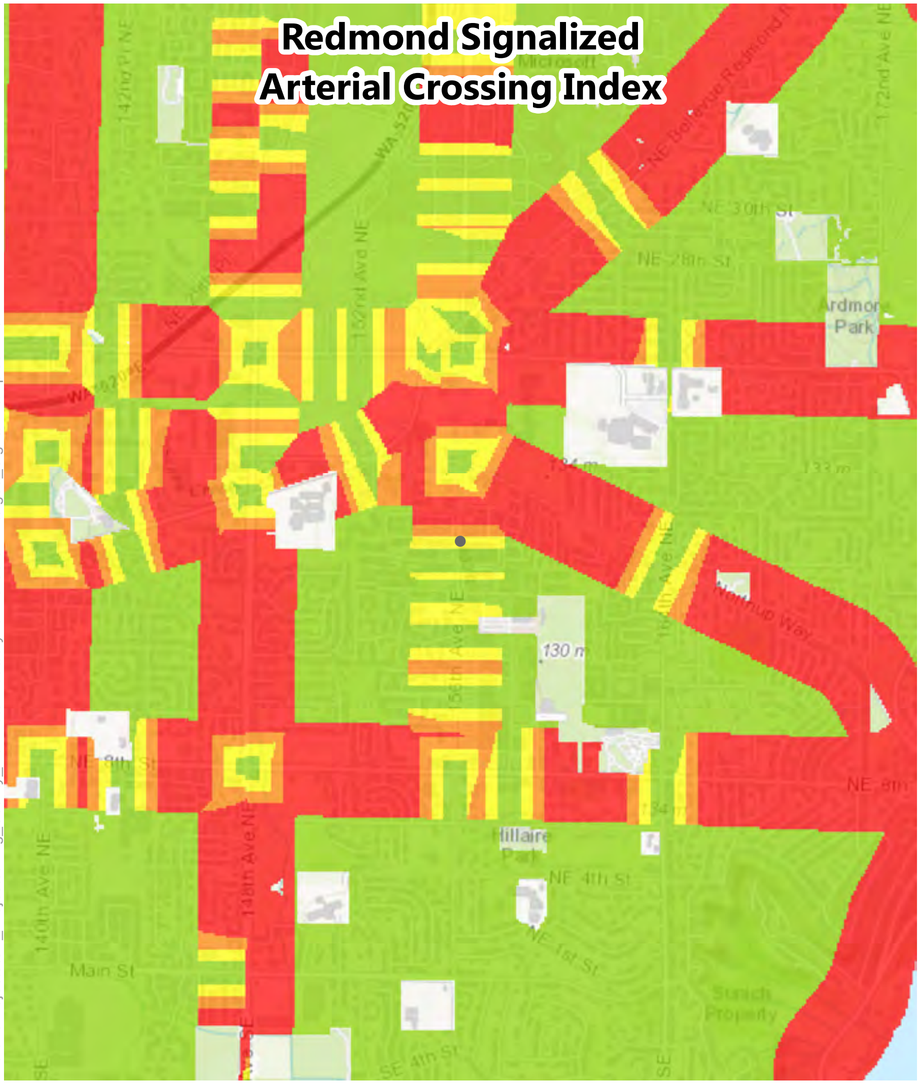
SURFACES: ARTERIAL SIGNALIZED CROSSINGS

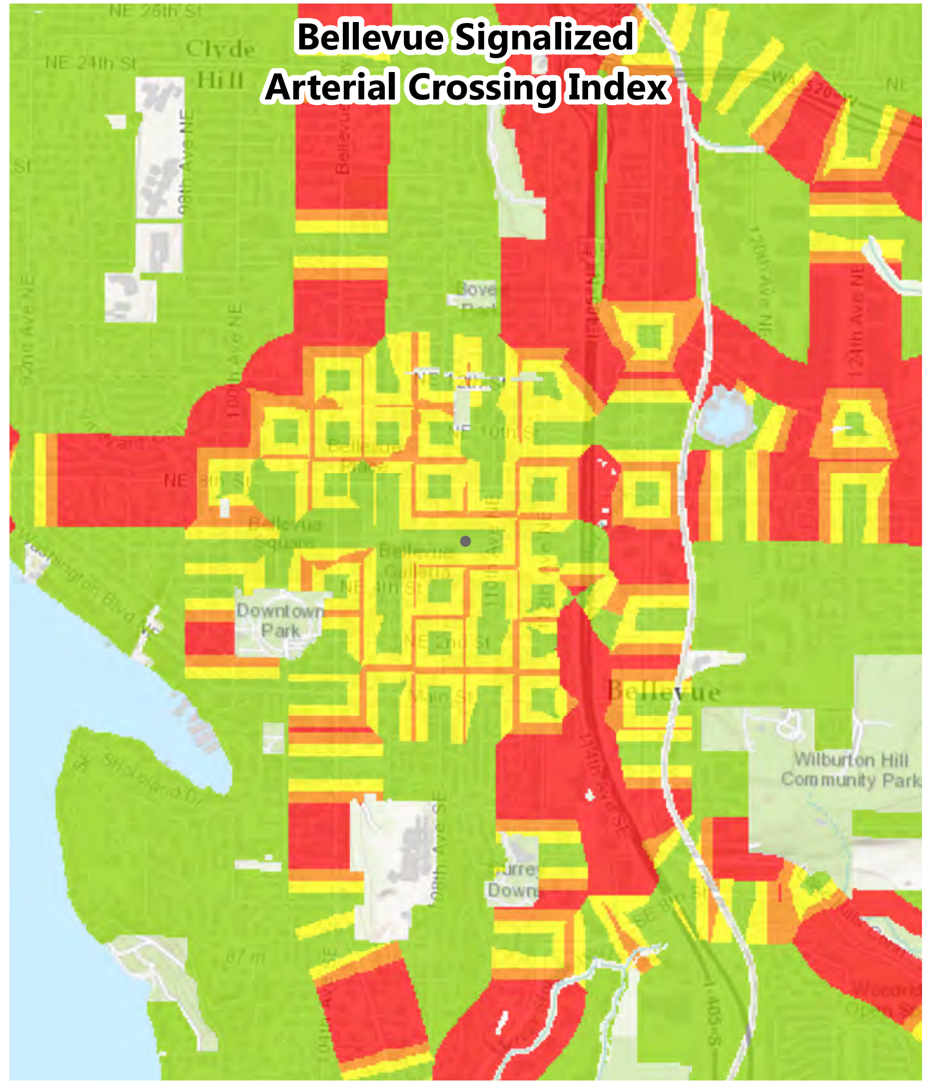
Similar to the intersection and sidewalk/walkway density tool, the signalized arterial crossing tool uses distance to develop a score. For this tool, the goal was to generate high scores in areas with 300 foot arterial signal spacing (as is present in Downtown Seattle). High scores (value of five) are defined for areas within 150 feet of a traffic signal, and the score decreases in 100 foot increments from there. **Table 7** summarizes the scoring.

Table 7: Arterial Signalized Crossing Scoring

Distance from Signalized Crossing	Score
<150 feet	5
150 - 250 feet	4
250 - 350 feet	3
350 - 450 feet	2
>450 feet	1

The arterial signal tool is unique in that the score is generated in a linear manner along the arterial. The score along the arterial is then assigned to areas 600 feet in either direction (perpendicular to the arterial) to summarize how easy it is for businesses and homes along the street and in the neighborhoods adjacent to the street to cross in order to access transit stops. At a point beyond 600 feet, the arterial crossing score is set to five. **Figure 9** below shows an example of this surface. The left image depicts an area with relatively large gaps in signalized arterial crossings whereas the downtown core of the City of Bellevue is characterized by a relatively high density of signalized crossings, as shown in the right image.





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Ease of Crossing
High
Low

● Study Stations

0 0.25 0.5 1 Miles

Figure 9

Examples of Signalized Arterial Index in Redmond (Left) and Bellevue (Right)

TRAVEL SHEDS

Current tools within ArcGIS provide the capability to calculate travel sheds based on walking and bicycling modes. The 15-minute bicycle shed is calculated based on a given “budget” of energy that is required to travel 15 minutes via bicycle along a flat surface. The budget of energy required to travel on a flat surface over that time span is 500,000 joules, or approximately 120 calories. Each street segment is assigned a slope from the underlying terrain data and the amount of energy required to travel each segment is calculated based on its distance and slope. The travel shed is computed by calculating the distance reachable from each station by utilizing the energy budget of 500,000 joules. **Figure 10** below shows the impact of terrain on bicycle shed areas, with the valley near Redmond allowing for an extensive reach to the north, while the hills in Seattle limit the shed’s area.

The 15-minute walk shed is computed based on a 15 minute walking distance with an assumed average walking speed of 3.5 feet per second. All walkable links are included in the walk shed analysis and terrain is not incorporated in the calculation[10]. No terrain adjustments are taken since none of the research in the literature review indicated that terrain was a major barrier when walking to access transit. **Figure 10** also shows the 15-minute walk sheds.

[10] Arterials without sidewalks are included in the walk shed as the sidewalk density score accounts for gaps in sidewalk coverage. Roads that prohibit walking are excluded (freeways).

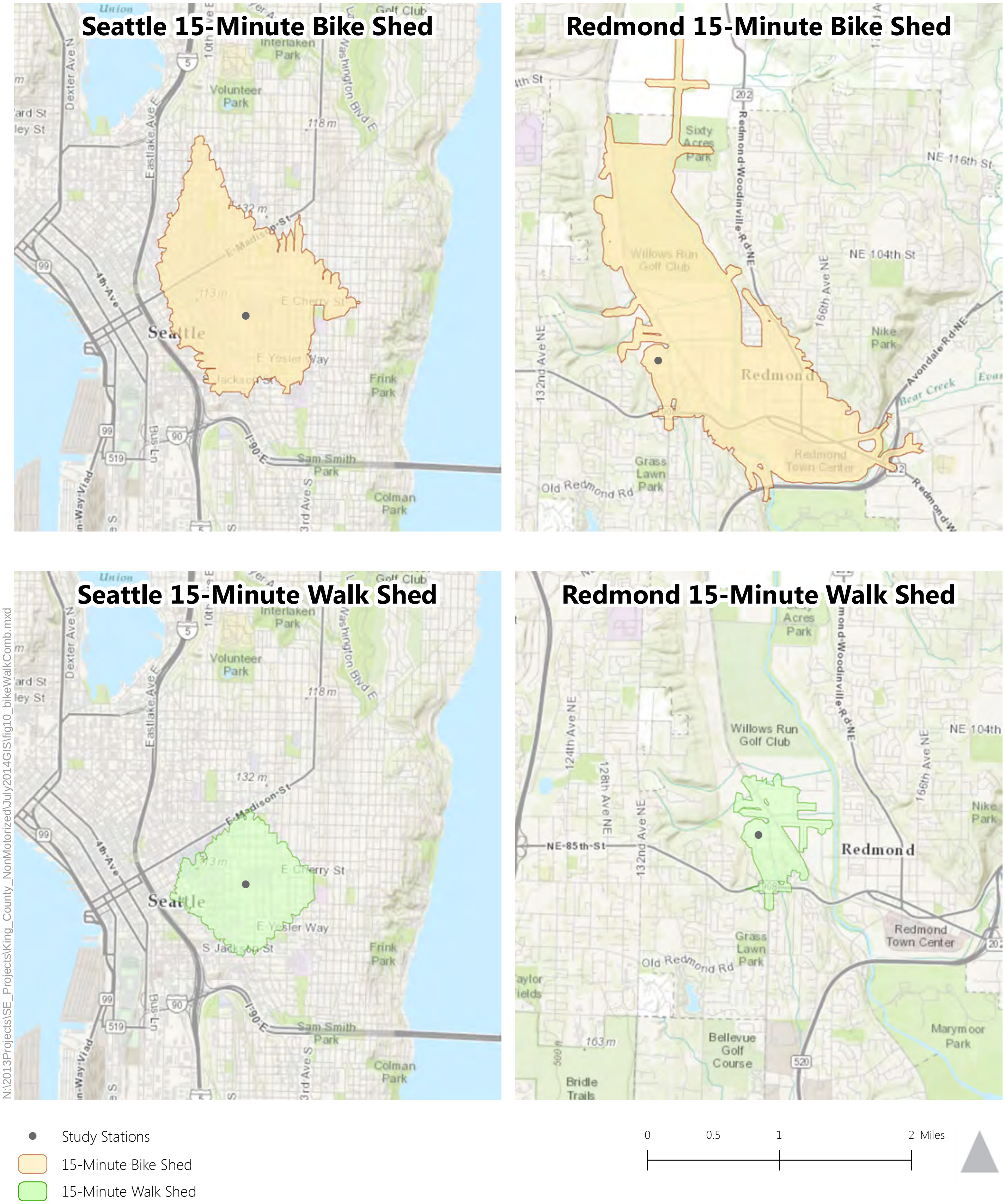

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Figure 10

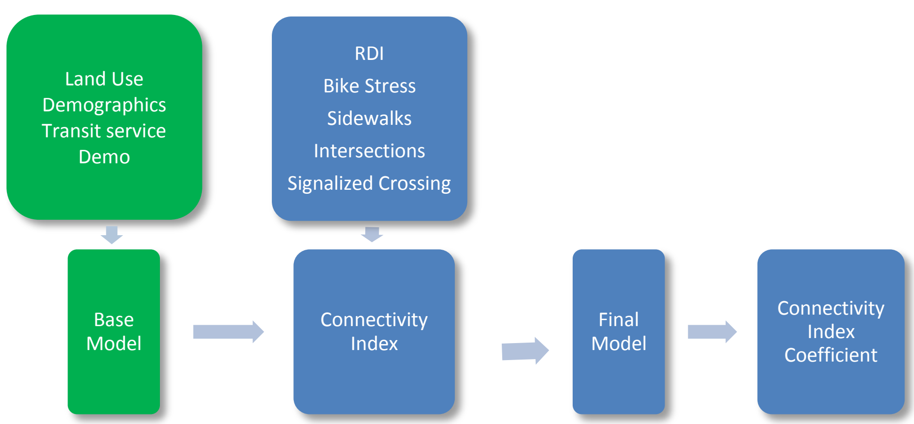
Examples of 15-Minute Travel Shed Areas in Seattle (Left) and Redmond (Right)

6. REGRESSION MODELING

A key goal of this project is to understand how the connectivity variables described in the prior chapter relate to transit ridership. In this way, we can better understand how non-motorized projects can help to improve access to transit and add transit riders. To understand this relationship between non-motorized connectivity and transit ridership, the project team used linear regression modeling techniques.

The first step in developing the regression model was to develop a "base" ridership model that relates land use, demographic, and transit-service factors to ridership. This step would allow for a clear comparison of station-areas to determine the relative impact that non-motorized connectivity has on ridership. For example, if two stations have similar land use, demographic, and transit-service characteristics, yet one station has poor connectivity and the other has good connectivity; the difference in the ridership at those stations can be attributed to the difference in connectivity. **Figure 11** highlights the regression process that identified the coefficient - and therefore the relative impact - of the connectivity index on transit ridership. The following section describes this process.

Figure 11. Connectivity Modeling Process



SAMPLE DETERMINATION

The analysis began with the full list of 544 transit stations provided by King County Metro and Sound Transit. To consolidate information at transit centers and to aggregate inbound and outbound stop pairs, ridership was totaled within a 450-foot buffer of each stop/transit center. After reviewing all the stop data, Downtown Seattle bus stops and train stations were removed from the sample. Downtown Seattle is unique in that there is a high density of stops/stations and high variability in ridership at those stops. The ridership variability is largely due to small-scale land use characteristics adjacent to the transit stops[11]. Unfortunately, the PSRC land use database is at a larger scale than can be analyzed at the Downtown Seattle stop level, so the project team removed these stops.

Sounder stations were also removed since Sounder has different travel characteristics (peak service only) and the travel sheds for Sounder stations tend to be much larger than for the other stops/stations in the sample set. For example, riders may arrive from as far as three miles from the Auburn station whereas the longest distance a rider would travel to access a RapidRide station in Seattle is most likely a mile or less due to density of available stops.

While Downtown Seattle and Sounder stops were not included in the base ridership model development, the final tools developed for this project are applicable for these areas and other locations in the region as the model's focus was on isolating non-motorized connectivity impacts on ridership rather than on land use or other characteristics. In other words, the model will be sensitive to non-motorized transportation improvements throughout the study area, including Downtown Seattle and Sounder station areas. The final chapter in this report summarizes how the model can be used along with its limitations.

From the original 544 stops, the regression analysis considered 170 locations. Note that most of the reduction was due to the pairing of inbound and outbound stops and transit center bays, which roughly reduces the total sample size in half.

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[11] Examples of land use characteristics include major regional services like the Seattle Central Library, regional facilities, like the King County Courthouse, and clusters of land uses like hotels or restaurants, or tourist attractions.

BASE MODEL

The first step in developing the regression model was to develop a "base" ridership model that relates land use, demographic, and transit-service factors to ridership. This is an important step since non-motorized connectivity variables are often correlated with the types of inputs in the base model. In other words, dense areas tend to have better non-motorized connectivity. By developing a strong base model, we reduce the likelihood that we overstate the ridership benefits of non-motorized access improvements[12]

A number of factors were tested when developing the base model to determine best-fit and statistical significance. The variables tested within the model runs are shown in **Table 8**.

Table 8. Regression Model Variables

Variable	*Scale*	*Source*
Population density	People per acre (half-mile buffer)	ACS Census Block Group
Employment density	Jobs per acres (half-mile buffer)	ACS Census Block Group
Stop type	Bus/Rail/Transit Center	KCM, ST, CT
Number of routes	Routes per stop	KCM, ST, CT
Number of transit trips	Trips per stop	KCM, ST, CT
Population below the poverty line	Station-area Percentage (half-mile buffer)	ACS Census Block Group
Population minority	Station-area Percentage (half-mile buffer)	ACS Census Block Group
Zero car households	Station-area Percentage (half-mile buffer)	ACS Census Block Group
Station-area median income	Thousands of dollars	ACS Census Block Group
Total hours that transit service is provided at the station	Total hours	KCM, ST, CT

[12] A major goal of the base model development is to ensure that non-motorized connectivity improvements do not "take credit" for other factors like land use, demographics, or service factors. By identifying the strongest non-connectivity variables that relate to transit ridership in the base model and retaining those variables in a model that includes connectivity variables, we reduce the likelihood of introducing connectivity variables that serve as a "proxy" for other non-connectivity factors.

Table 8. Regression Model Variables (cont'd)

Variable	*Scale*	*Source*
Employment reach of the routes that serve the station	Jobs/station	ACS Census Block Group
Population reach of the routes that serve the station	People/station	ACS Census Block Group

A number of variable transformations were also evaluated including logarithmic transformations of both the dependent (total boardings) and independent variables. Ultimately, the best performing model was based on a logarithmic transformation of ridership and linear independent variables. This type of relationship is not uncommon in transit ridership-type models that have a mix of lower ridership and higher ridership stops/stations, where the high ridership stops have many times the ridership of the median stop.

The base model before adding the connectivity index had an adjusted R-squared value of 0.633 as shown in **Table 9.** With a log transformation of total boardings, the coefficient results can be interpreted for a variable such as population density to mean that a ten-unit increase in population density will translate into a 7% increase in the transit station boardings[13].

[13] Standard practice in regression modeling states that a variable is "significant" at a level of 90 to 95% or better. However, in cases where particular variables need to be controlled for, they are often included in a model even if the significance level is not above 90%.

Table 9: Base Model Coefficients

	Estimate	Significance
Intercept	2.34	**
Population Density	0.007	**
Total Daily Trips	0.0054	***
Parking Spaces	0.001	***
Hours of Service	0.0905	***
Area Median income	-0.002	*
Employment Density	0.003	*

Sig. Levels: *** = > 99%, ** > 90%, * > 70% | R-Squared = 0.633

CREATING THE CONNECTIVITY COMPOSITE VARIABLE

A key objective of the regression modeling process was to determine a relative "connectivity composite" that incorporates all of the connectivity variables, weighting each variable based on its relative impact on transit ridership. The composite provides a single, straightforward measure of the connectivity characteristics that matter most to transit ridership. The variables included in the development of the composite index were:

- Route-directness Index (RDI)
- Sidewalk/Walkway Density
- Intersection Density
- Arterial Crossing Index
- Bike Stress Index

A number of regression models were created by including each variable separately with the base regression model. The relative correlation with ridership for each of the connectivity variables was evaluated by comparing the model coefficients[14]. The only potential issue with this method is multi-collinearity: in other words, the issue of whether the five connectivity variables measure truly independent connectivity characteristics. This question was addressed by creating a model including all of the connectivity variables together with the base regression model. In this expanded model, two variables were found to be collinear: sidewalk/walkway density and intersection density. The collinearity between sidewalk/walkway and intersection density is expected due to the related nature of how the two variables were computed (sidewalks and walkways are along the same streets that intersect). To account for this collinearity, the coefficients of these two variables were halved and the weighting percentages were re-calculated as shown in **Table 10**.

[14] Comparing coefficients is an effective means of evaluating the different connectivity variables because all the connectivity variables are defined using an ordinal scale from 1 to 5.

Table 10: Connectivity Coefficients

	Coefficient	Weight Percentage
RDI	0.860	36%
Bike Stress (BS)	0.145	6%
Sidewalk/Walkway Density (SW)	0.669	14%
Intersection Density (ID)	0.393	8%
Signalized Crossing (SC)	0.878	36%

The final connectivity composite was calculated by weighting the station-area score for each of the five connectivity variables by their relative weight percentages to result in a connectivity score between 1 and 5.

$$\boldsymbol{Connecitivty\ Composite} = \mathbf{.36}(\boldsymbol{RDI}) + \mathbf{.06}(\boldsymbol{BS}) + \mathbf{.14}(\boldsymbol{SW}) + \mathbf{.08}(\boldsymbol{ID}) + \mathbf{.36}(\boldsymbol{SC})$$

MODEL CALIBRATION

The initial regression model that included the connectivity composite variable along with the other base variables was calibrated as part of the Case Studies, which are described more thoroughly in a later chapter. The model calibration involved a review of model performance at the four Case Study locations, along with 20 other locations throughout the study area. The calibration sites included a mix of large transit centers, park and ride lots, and several lower-ridership locations. The model was calibrated by looking at how well the model performed under both static conditions (i.e., how well did the model match the observed ridership) and dynamic conditions (i.e., is the model appropriately sensitive to changes to independent variable values). Through the calibration process, the following issues were identified:

- A Link Light Rail factor was added into the model since ridership at Link stations is consistently higher than bus stop locations. This type of light rail "dummy" variable is often included in models to account for people's bias to ride rail more than other modes of transit.
- A "subgroup" analysis was performed to determine if there were any biases in different types of transit stop types. The subgroups included stops with low existing ridership, smaller park and ride stops, and large transit centers with and without

parking lots. In the case of the large transit centers with large parking lots, the Parking Space variable was consistently leading to an over-prediction of ridership. The coefficient on the Parking Space variable was reduced and all other of the coefficients were increased proportionally to improve the model fit for major transit centers, including Northgate, Bellevue, Redmond, Eastgate, Burien, and Tukwila International Boulevard.

- Based on feedback from jurisdictions, the predicted change in ridership from connectivity improvements was too sensitive to the bike stress variable. As a result, the weight of the Bike Stress component of the connectivity variable was modified to produce results that were more in line with the region's bike access-to-transit mode share of between 0.5% and 2%. The updated model was tested across a set of transit stops that were expected to have a large amount of bicycle infrastructure investments, including Northgate, Mt Baker, Burien Transit Center, and Bellevue Transit Center. The Bike Stress weight was refined to ensure that the expected number of new riders that were being predicted as a result of new bicycle infrastructure was not out-of-magnitude with observed bicycle mode shares in the region.

With these model calibration adjustments in place, the connectivity model was finalized and is shown in **Table 11**. The effect of the connectivity index variable on ridership can be interpreted as "a one unit improvement in the connectivity composite will result in 25% increase in daily boardings."

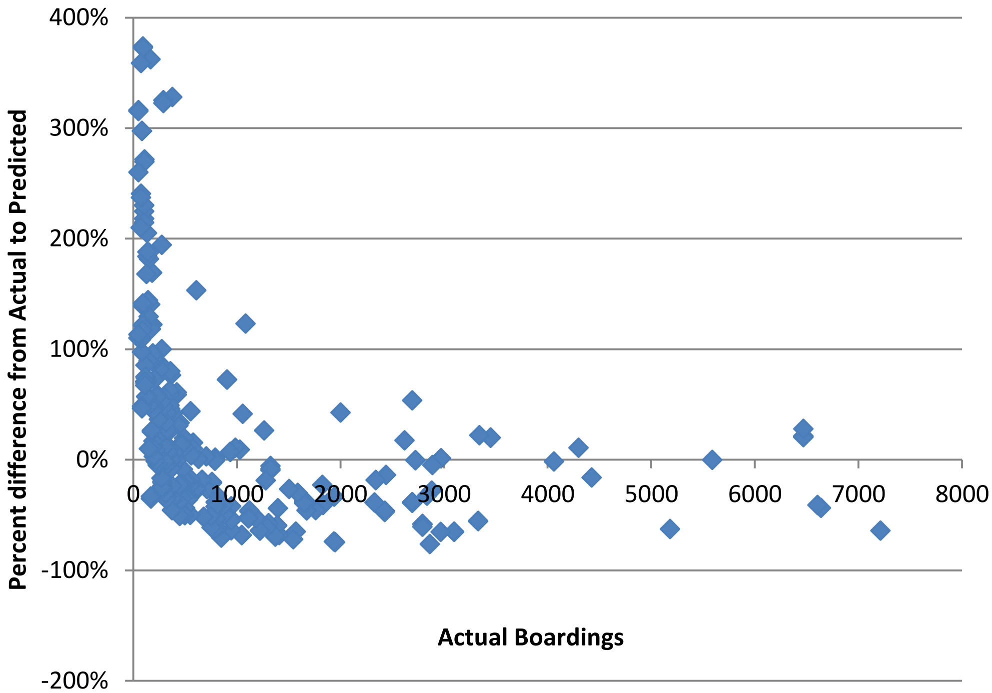
Table 11: Final Regression Results

	Coefficient	Significance
Intercept	*1.88*	**
Employment Density	0.002	*
Link factor	0.98	***
Population Density	0.005	*
Total Daily Trips	0.0049	***
Parking Spaces	0.0013	***
Hours of Service	0.097	**
Area Median Income	-0.002	*
Connectivity Composite	0.25	*

Sig. Levels: *** = > 99%, ** > 90%, * > 70%   R-square = 0.730

In our testing, the model performs best for transit stops and stations with more than 200 average daily boardings. For the lower ridership transit stops, the model tends to over-predict ridership as shown in **Figure 12**. However, it is important to keep in mind that the primary goal of the model was not to predict ridership exclusively (there are several other models in the region that are better predictors of transit ridership), but to understand the potential change in ridership that could result from improved non-motorized connectivity improvements. With this in mind, the model is well suited to estimate the change in transit ridership that could result from non-motorized connectivity improvements at both high and low-ridership transit stops. This ability to predict the effect on ridership is in large part due to the logarithmic structure of the model. Since the model predicts the percent-change in transit ridership as opposed to the absolute change in ridership, low-ridership stops are not as prone to being overestimated, particularly if the percent change is applied to observed ridership (appropriate for near-term analysis) or a more robust ridership forecast (for long-term analysis). The Case Study chapter will describe in additional detail how the project team suggests the connectivity model be used to obtain the most accurate results.

Figure 12. Scatter plot of Actual vs. Prediction for Daily Boardings



7. EXISTING CONDITIONS CONNECTIVITY ANALYSIS RESULTS

Using the final calibrated model, non-motorized connectivity was analyzed across the full study area. To facilitate this analysis, a GIS tool was developed to aggregate individual connectivity surface scores into a composite connectivity index, which can be mapped and tabulated. Overall, the results of the composite connectivity analysis met expectations. Areas within and near Downtown Seattle exhibited the highest composite connectivity scores while the low scoring areas were concentrated in industrial and large commercial areas in the suburban cities. The connectivity scores ranged from a high of 4.05 to a low of 2.81. **Table 12** highlights the top 15 and bottom 15 station locations.

Table 12: Top 15 and Bottom 15 Station Locations for Composite Connectivity Index Scores

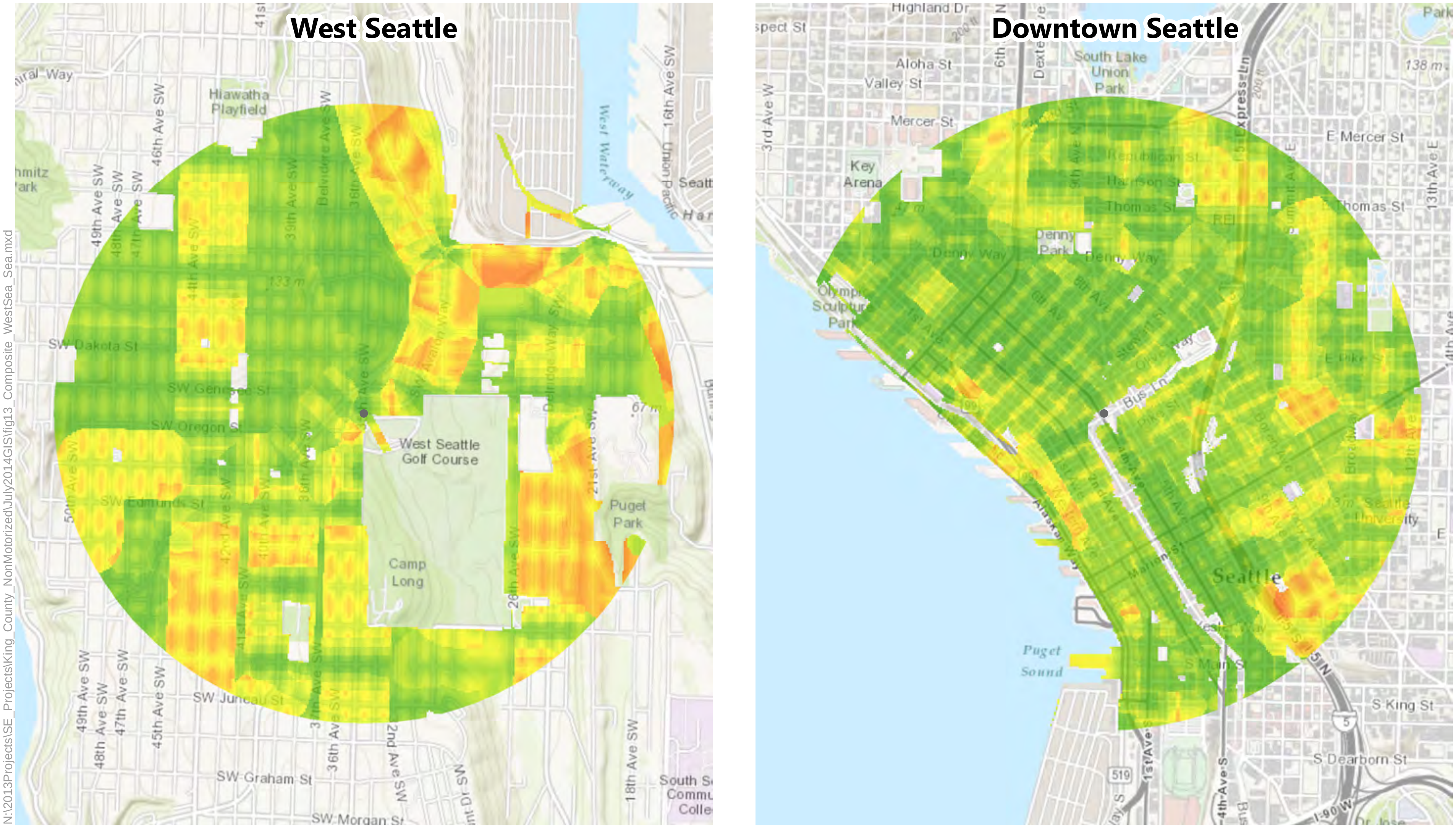
Stop Location (Highest Scoring)	*Area*	*Score*	*Stop Location (Lowest Scoring)*	*Area*	*Score*
CONVENTION PLACE	Seattle	4.05	INTERNATIONAL BLVD & S 208TH ST	SeaTac	3.01
SENECA ST & 4TH AVE	Seattle	4.03	WEST VALLEY HWY & S LNGARES WAY	Tukwila	2.99
BELLEVUE AVE & E PINE ST	Seattle	3.99	INTERNATIONAL BLVD & S 182ND ST	SeaTac	2.99
WESTLAKE STATION	Seattle	3.98	ELLIOTT AVE W & W PROSPECT ST	Seattle	2.98
SENECA ST & BOREN AVE	Seattle	3.98	EVERETT SOUNDER	Everett	2.97
VIRGINIA ST & 6TH AVE	Seattle	3.97	OVERLAKE VILLAGE	Redmond	2.95
3RD AVE & COLUMBIA ST	Seattle	3.97	PACIFIC HWY S & S 260TH ST	Des Moines	2.93
3RD AVE & UNION ST	Seattle	3.95	MUKILTEO SOUNDER	Mukilteo	2.90
PREFONTAINE PL S & YESLER WAY	Seattle	3.92	ANDOVER PARK W & MINKLER BLVD	Tukwila	2.90
DENNY WAY & DEXTER AVE N	Seattle	3.91	PACIFIC HWY S & S 240TH ST	Des Moines	2.89
3RD AVE & VINE ST	Seattle	3.90	EDMONDS SOUNDER	Edmonds	2.88
DENNY WAY & STEWART ST	Seattle	3.89	PACIFIC HWY S & KENT-DESNES RD	Des Moines	2.87
NE PACIFIC ST & NE PACIFIC PL	Seattle	3.87	ANDOVER PARK W & TRILAND DR	Tukwila	2.87
5TH AVE S & S JACKSON ST	Seattle	3.86	SODO BUSWAY & S LANDER ST	Seattle	2.81
1ST AVE N & DENNY WAY	Seattle	3.86	WEST VALLEY HWY & STRANDER BLVD	Tukwila	2.81

The connectivity composite maps demonstrate how the station area scores can be visually interpreted. **Figures 13 through 17** highlight a sample of station areas that score across the range of the connectivity composite scores.

Areas in Seattle generally scored moderate to high in the connectivity composite score, primarily due to the City's gridded network. A fine street grid typically improves the RDI, intersection density, sidewalk/walkway density, and bike stress scores. The West Seattle location scored 3.64, with some notable gaps due to arterial crossing difficulties along Delridge, Admiral Way, and Fauntleroy. In contrast, the downtown Seattle location on the right scored 4.05 in the connectivity composite score. Some of the terrain constraints near the waterfront, and surrounding hills can be seen in **Figure 13**.

Similar to the West Seattle location, the Othello LRT and Mt. Baker LRT station areas in **Figure 14** have a robust street grid, but with some noticeable gaps in arterial crossings and some areas with high bike stress. The hill to the west of the Mt. Baker station is apparent, as it limits connectivity, while the Othello area has good connectivity along Dr. MLK Way, but limited crossing opportunities of Seward Park Avenue. The Mt. Baker station scored 3.56 while Othello scored 3.63.

The maps in **Figure 15** highlight two key barriers in the areas' connectivity composite: the I-5 crossing barrier near Northgate Transit Center and the SR-520 barrier in the street grid near Overlake Village. The Northgate Transit Center scored 3.15 while the Overlake Village station was 2.95.



Connectivity
High
Low

● Study Stations

0 0.25 0.5 1 Miles

Figure 13

Composite Connectivity Scores
West Seattle (Left) and Downtown Seattle (Right)

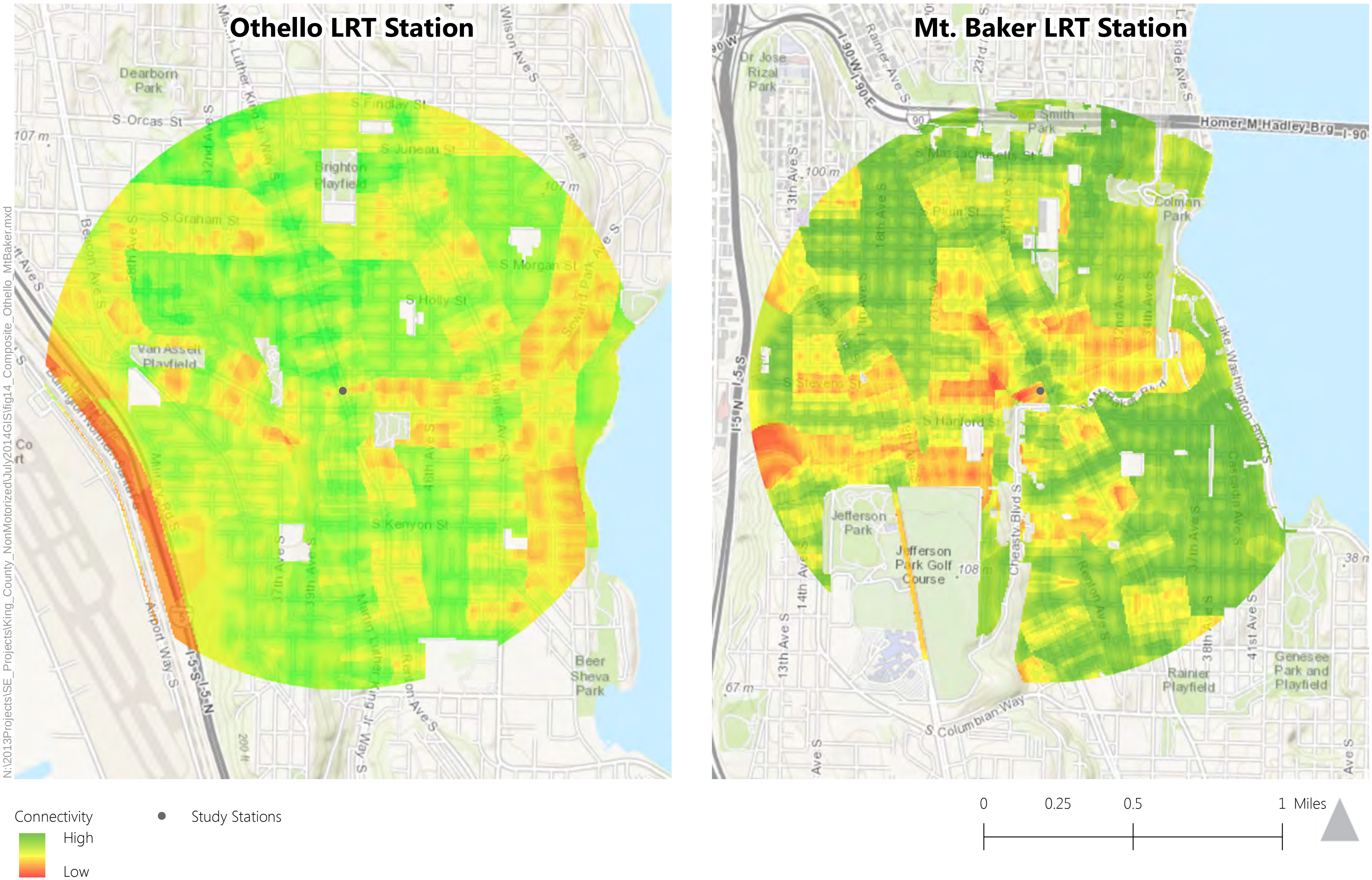


Figure 14

Composite Connectivity Scores
Othello (Left) and Mt. Baker (Right) LRT Stations

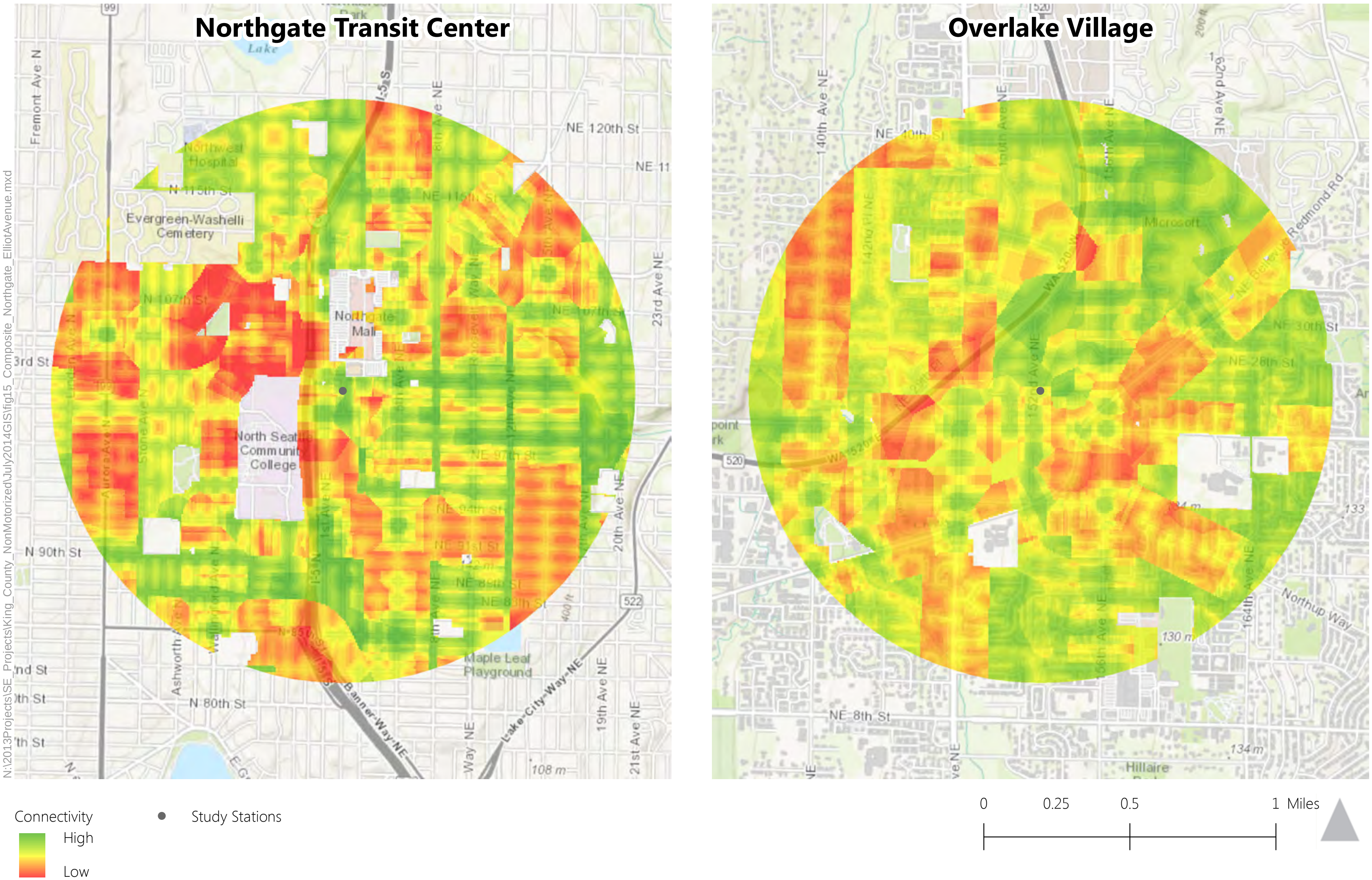
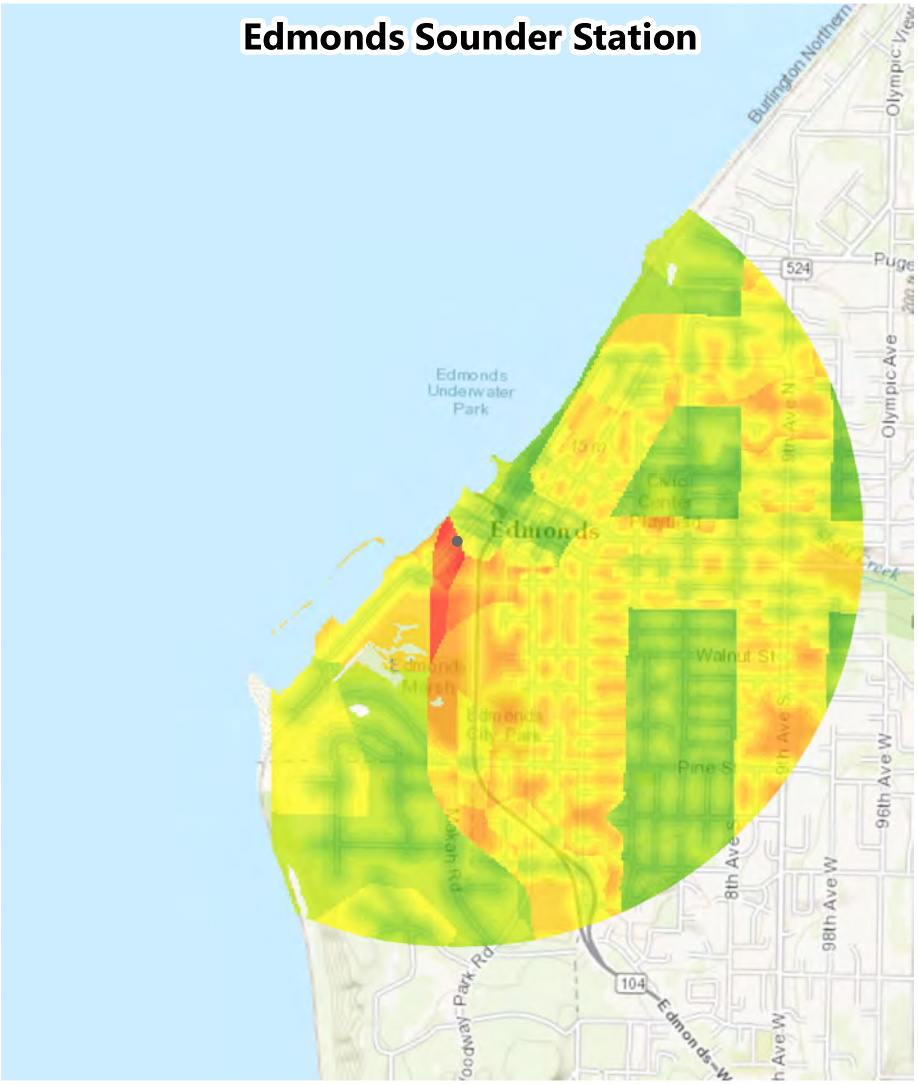


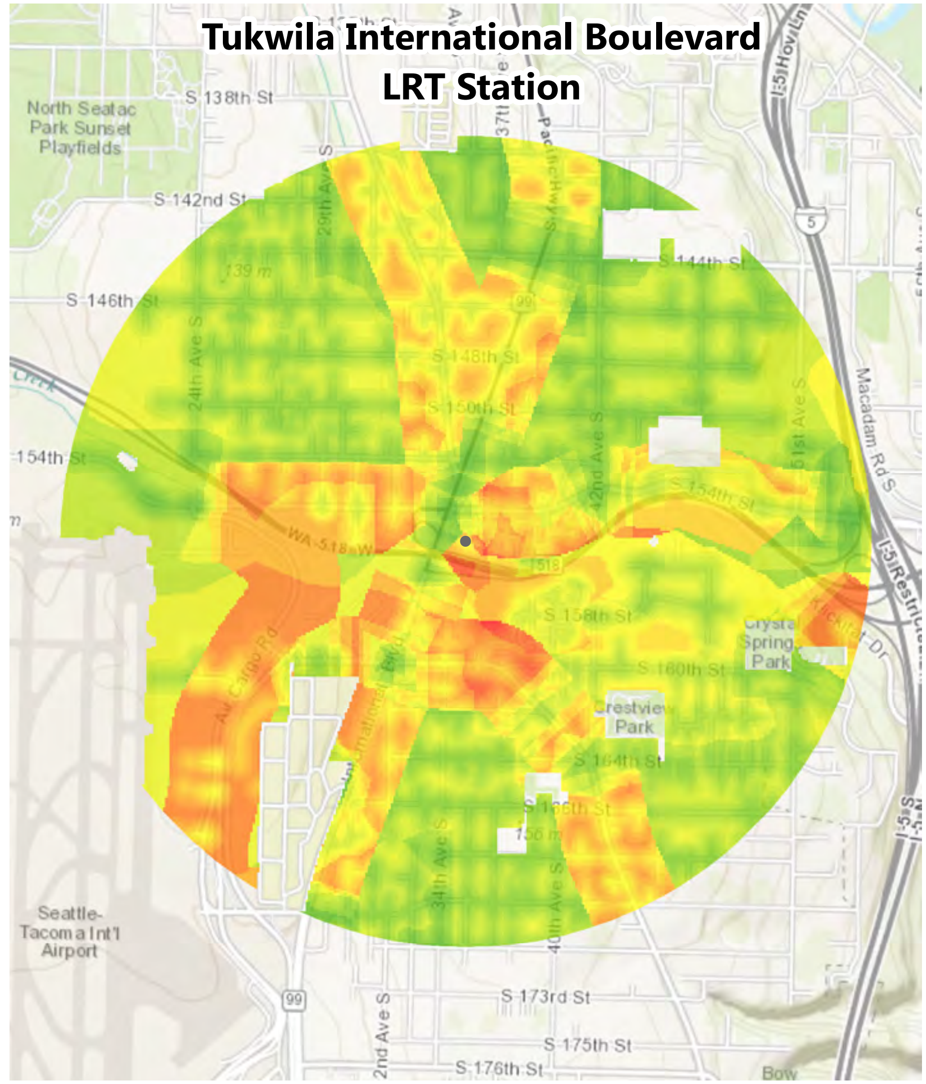
Figure 15

Composite Connectivity Scores
Northgate Transit Center (Left) and Overlake Village (Right)

In more suburban areas, connectivity is typically impacted by long gaps in signalized crossings, higher bike stress environments, and lower RDI scores. As shown in **Figure 16,** the Edmonds station area scored 2.88 due to many of these factors and the barrier of SR-104. The Tukwila International Boulevard Station scored 3.06 due to arterial crossing difficulty and high bike stress. Notice that the connectivity scores within the residential neighborhoods tends to be good, but that the main barriers are often near the main arterial streets around the stations.

The maps in **Figure 17** highlight additional examples of suburban area connectivity scores. Notable gaps in these areas are due to barriers across freeways and arterials as well as large spacing between intersections. The Kent-Des Moines Road stop scored 3.13 while Federal Way TC scored 3.10.





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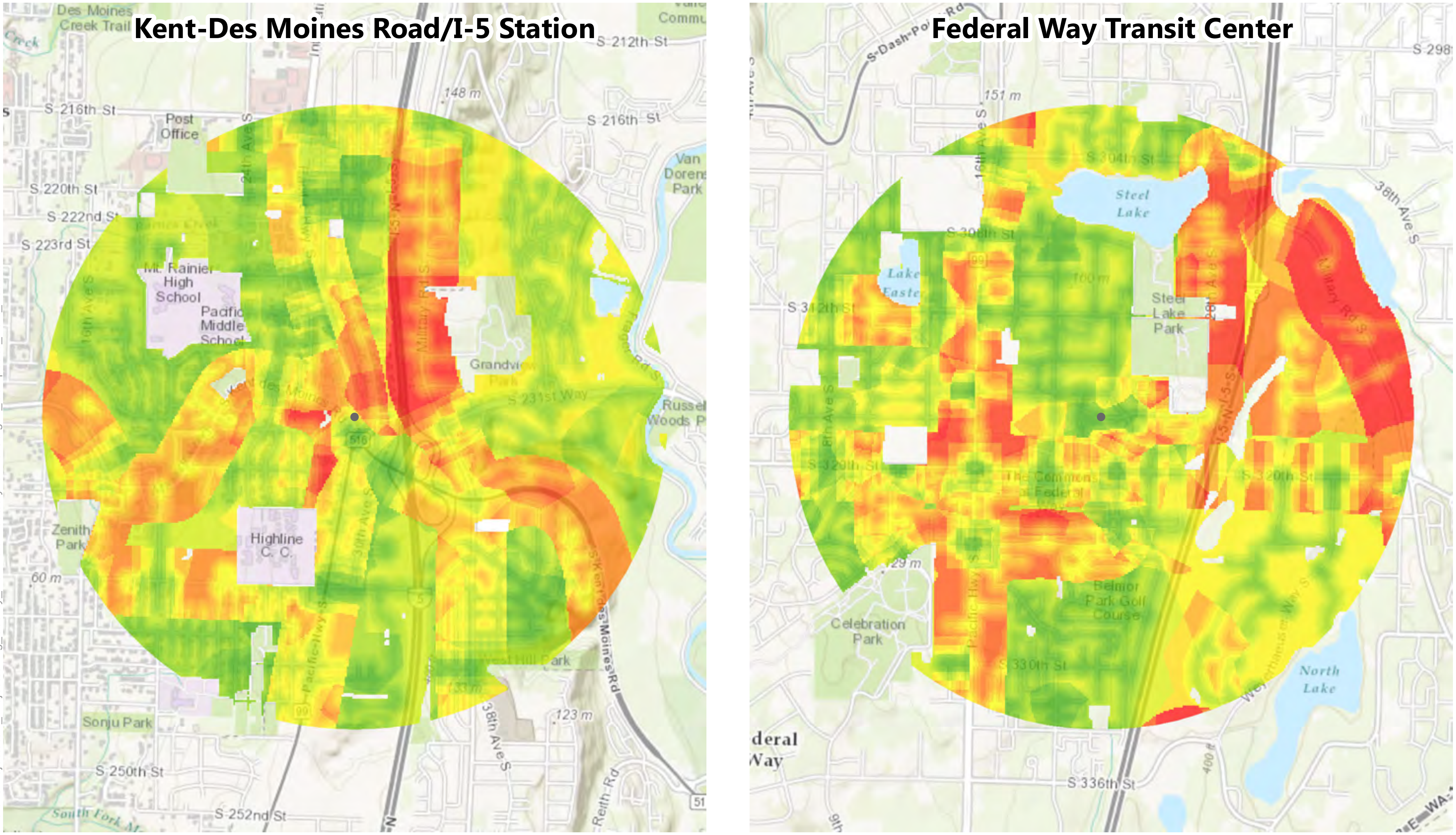
Connectivity
High
Low

● Study Stations

0 0.25 0.5 1 Miles

Figure 16

Composite Connectivity Scores
Edmonds Sounder Station (Left) and
Tukwila International Boulevard LRT Station (Right)



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Connectivity
High
Low

● Study Stations

0 | 0.25 | 0.5 | 1 Miles

Figure 17

Composite Connectivity Scores
Kent-Des Moines Road/I-5 Station (Left) and Federal Way Transit Center (Right)

As highlighted above, the connectivity maps visually depict areas with poor non-motorized connectivity around transit stops and stations. While these maps can be helpful in identifying where improvements may be warranted, a more detailed look at the individual connectivity surfaces can also be helpful. The following chapters on Project Prioritization and Case Studies provide more ideas on how planners can use the connectivity analysis results to identify station areas that could benefit most from additional projects and which types of projects may be of the greatest value.