

MDOT Chapter 30

Transit Project Report – South Side Transit (Project ID 20-34)

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**MDOT Chapter 30 Transit Project Report
Project 20-34**

RENAISSANCE
PLANNING

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CHAPTER I. INTRODUCTION

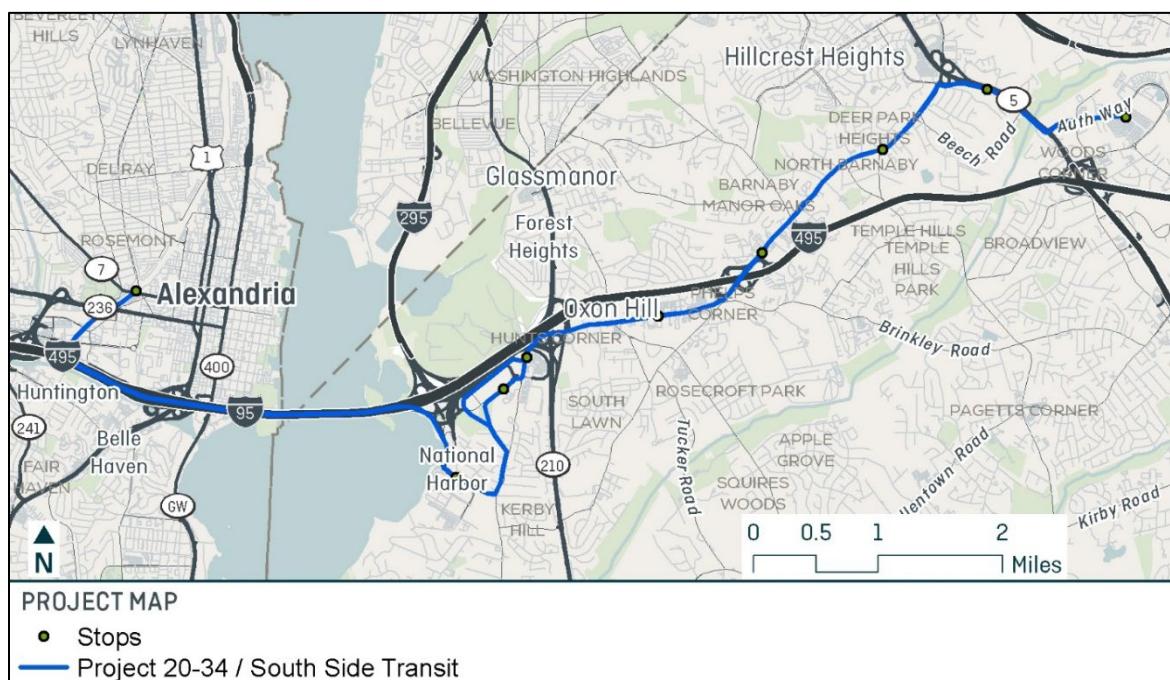
1. OVERVIEW OF PROJECT

Project 20-34 would add a light rail line between Alexandria, Va., and the Washington, D.C. suburb of Oxon Hill in Prince George's County. Also referred to as South Side Transit, the project would create a new connection between two existing Washington Metro stations serving the Green, Blue, and Yellow lines.

The line's 12-mile route would carry passengers between the Branch Avenue Metro Station, the southern terminus of the Green Line in Oxon Hill, and the King Street-Old Town Station in Alexandria, Va., the southernmost transfer point between the Metro Blue and Yellow lines. The proposed alignment would travel on dedicated right-of-way available in roadway medians and cross the Potomac River on the Woodrow Wilson Memorial Bridge.

The line would serve a total of 10 stations, including stops at National Harbor, a multiuse 300-acre development on the Potomac River with an estimated population of 3,799.¹ From east to west, the stops between the Branch Avenue and King Street-Old Town Metro Stations include MD-5 at Old Branch Avenue; four stops along MD 414 at Monument Avenue, Thompson Lane, Alice Avenue and Temple Hill Road; Monument Avenue & MGM National Avenue; National Harbor Boulevard & St. George Boulevard; and the Eisenhower Avenue Metro Station (which serves the Yellow line).

The line is expected to have an estimated 26-minute travel time. Service would span from 5 a.m. to midnight Monday through Thursday, 5 a.m. to 1 a.m. Friday, 7 a.m. to 1 a.m. Saturday and 7 a.m. to 12 a.m. Sundays. Headways would range from 10 minutes during peak travel periods and 15 minutes during off-peak periods.



¹ American Community's Survey 2017 Five-Year Population Estimate

Figure 1: Project 20-34 Map

CHAPTER II. CODING ASSUMPTIONS

Analyzing Project 20-34 required developing General Transit Feed Specification (GTFS) files to model the light rail's impact on regional accessibility and travel-time savings. A GTFS feed is a common data format used by public transit agencies to publish information about their service. The feed is comprised of multiple text files, each one detailing a different aspect of service, such as vehicle frequencies, stop times, and stop locations.

The GTFS feed created for Project 20-34 represents the light rail line, its 10 stations, and typical weekday frequencies and service times. The following sections describe assumptions made about the proposed line's alignment, stop locations, and other characteristics while assembling the feed.

1. ALIGNMENT

The light rail line would run in dedicated right of way available in roadway medians. From east to west, the line would travel the following alignment:

- Beginning at the Branch Avenue Metro Station on Auth Way, vehicles travel west along Auth Way and then northwest along Branch Avenue to reach MD 414 / St. Barnabas Road
- Vehicles travel southwest on MD 414 / St. Barnabas Road / Oxon Hill Road for approximately four miles to reach the National Harbor development.
- Vehicles access National Harbor via National Avenue, then travel west along I-494 / Woodrow Wilson Memorial Bridge to cross the Potomac River. (Note: When traveling east, vehicles access National Harbor via Harborview Avenue)
- The alignment then crosses northeast to access the Eisenhower Avenue and King Street-Old Town metro stations.

The details of how Project 20-34 was represented in GTFS are provided below by describing four key tables in the feed: Stops.txt, Trips.txt, Stop_times.txt, and Frequencies.txt. Other tables in the new Project 20-34 feed are based on standard tables defined in the Chapter 30 Transit Accessibility Scoring Guide (“Standard GTFS Tables” section) and are not described here.

i. Stops.txt (stop locations)

Table 1: Project 20-34 Stops Table

stop_id	stop_name	stop_lat	stop_lon
1	King Street	38.80708	-77.0605
2	Eisenhower Avenue	38.80023	-77.071
3	National Harbor South	38.78539	-77.0129
4	National Harbor South (SB)	38.7957	-77.0058
5	Oxon Hill Park & Ride	38.79937	-77.0024
6	Oxon Hill	38.80415	-76.9828
7	St. Barnabas South	38.81152	-76.9674
8	St. Barnabas North	38.82355	-76.9493
9	Old Branch Avenue	38.8305	-76.9338
10	Branch Avenue	38.82726	-76.9131

11	Branch Avenue	38.82729	-76.9131
12	Old Branch Avenue	38.83056	-76.9338
13	St. Barnabas North	38.82357	-76.9493
14	St. Barnabas South	38.81155	-76.9674
15	Oxon Hill	38.8042	-76.9828
16	Oxon Hill Park & Ride	38.79941	-77.0027
17	National Harbor North (SB)	38.79715	-77.0076
18	National Harbor South	38.78543	-77.0128
19	Eisenhower Avenue	38.80021	-77.071
20	King Street	38.80707	-77.0605

ii. **Trips.txt (vehicle-trip enumeration)**

The trips file represents a single route with a seven-day travel profile. The file further splits the route into trips, each identified by a specific ID, that reflect the various frequencies of the line. For instance, trip ID “early_1” corresponds to the light-rail line’s 15-minute headways during early service hours. Trip IDs “peak_1” and “peak_2” correspond to the morning and evening peak headways of 10 minutes. A portion of the trips.txt file is shown below.

Table 2: Project 20-34 Trips Table

route_id	service_id	trip_id
Southside	mtwtfss	early_1
Southside	mtwtfss	early_2
Southside	mtwtfss	peak_1
Southside	mtwtfss	peak_2
Southside	mtwtfss	mid_1
Southside	mtwtfss	mid_2
Southside	mtwtfss	peak_3
Southside	mtwtfss	peak_4
Southside	mtwtfss	evening_1
Southside	mtwtfss	evening_2

iii. **Stop_times.txt (transit schedule)**

The stop times table was developed by determining an average travel speed based on the proposed 26-minute travel time and the approximate 12-mile length of the line. Given these attributes, the line would have an average speed of approximately .46 miles (or 2,436 feet) per minute. At this speed, the line would traverse the 1.28-mile distance between the Branch Avenue and Old Branch Avenue stations in 2 minutes, 43 seconds.

A portion of the stop times file is shown below.

Table 3: Project 20-34 Stops Times Table

trip_id	arrival_time	departure_time	stop_id	stop_sequence
early_1	0:00:00	0:00:00	1	1
early_1	0:01:37	0:01:37	2	2
early_1	0:09:39	0:09:39	3	3
early_1	0:12:31	0:12:31	4	4
early_1	0:13:17	0:13:17	5	5
early_1	0:15:48	0:15:48	6	6
early_1	0:18:03	0:18:03	7	7
early_1	0:20:53	0:20:53	8	8
early_1	0:23:14	0:23:14	9	9
early_1	0:26:00	0:26:00	10	10

iv. Frequencies.txt (frequency of recurring trips)

A frequencies table was developed to model the differing headways of the line throughout a day of typical service. The table defines a start and end time for a headway, with each headway associated with a trip ID. The headways are provided in seconds. The trip IDs link the headway times to the individual trips that comprise the route described in the trips.txt file. When frequencies table is used, the stop times file defines a template of stop sequences and travel times between stops, and the frequencies table defines the interval of recurrence for each trip following the stop times template. The frequencies table for project 20-34 is below.

Table 4: Project 20-34 Frequencies Table

trip_id	start_time	end_time	headway_secs
early_1	5:00:00	6:00:00	900
early_2	5:00:00	6:00:00	900
peak_1	6:00:00	9:00:00	600
peak_2	6:00:00	9:00:00	600
mid_1	9:00:00	16:00:00	900
mid_2	9:00:00	16:00:00	900
peak_3	16:00:00	19:00:00	600
peak_4	16:00:00	19:00:00	600
evening_1	19:00:00	24:00:00	900
evening_2	19:00:00	24:00:00	900

Figures 2 and 3 below show the complete multimodal network in the base and build conditions (respectively) for the greater Washington D.C area. The project shown in purple in the second map, clearly demarcating the changes in connectivity resulting from the new GTFS feed described above.

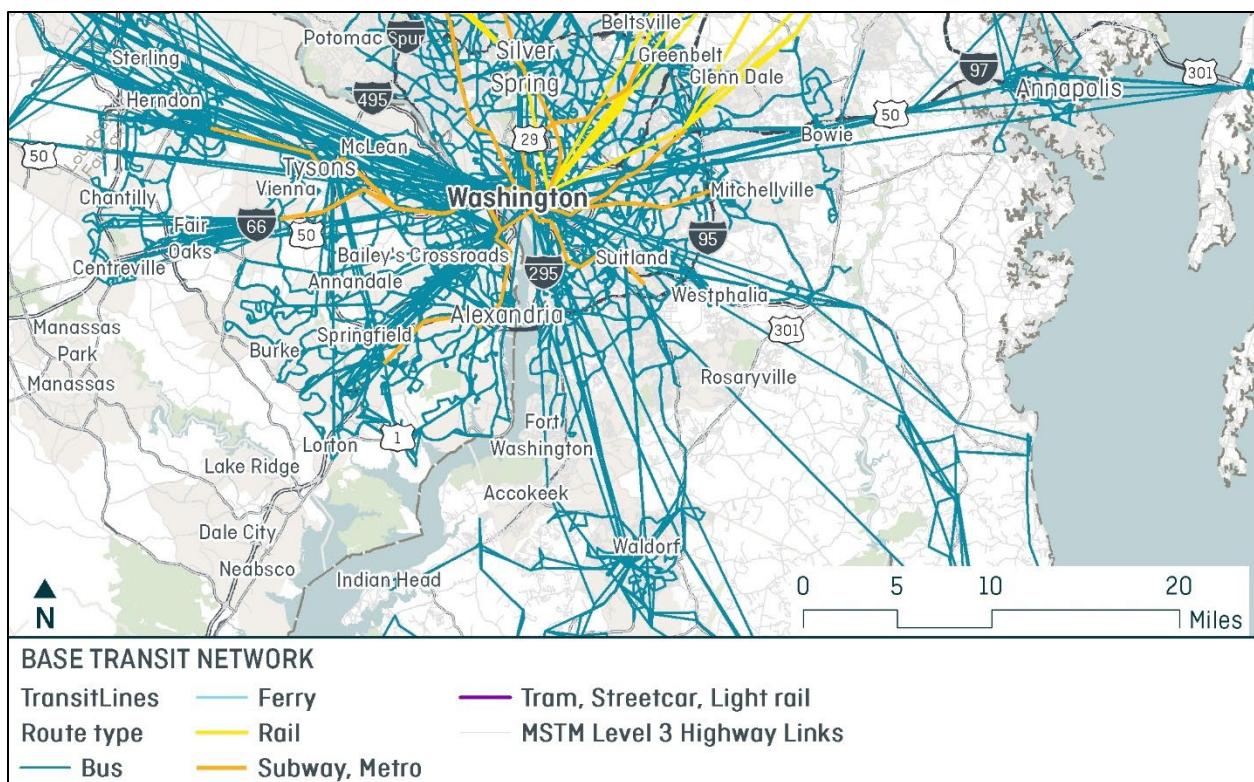


Figure 2: Base Network

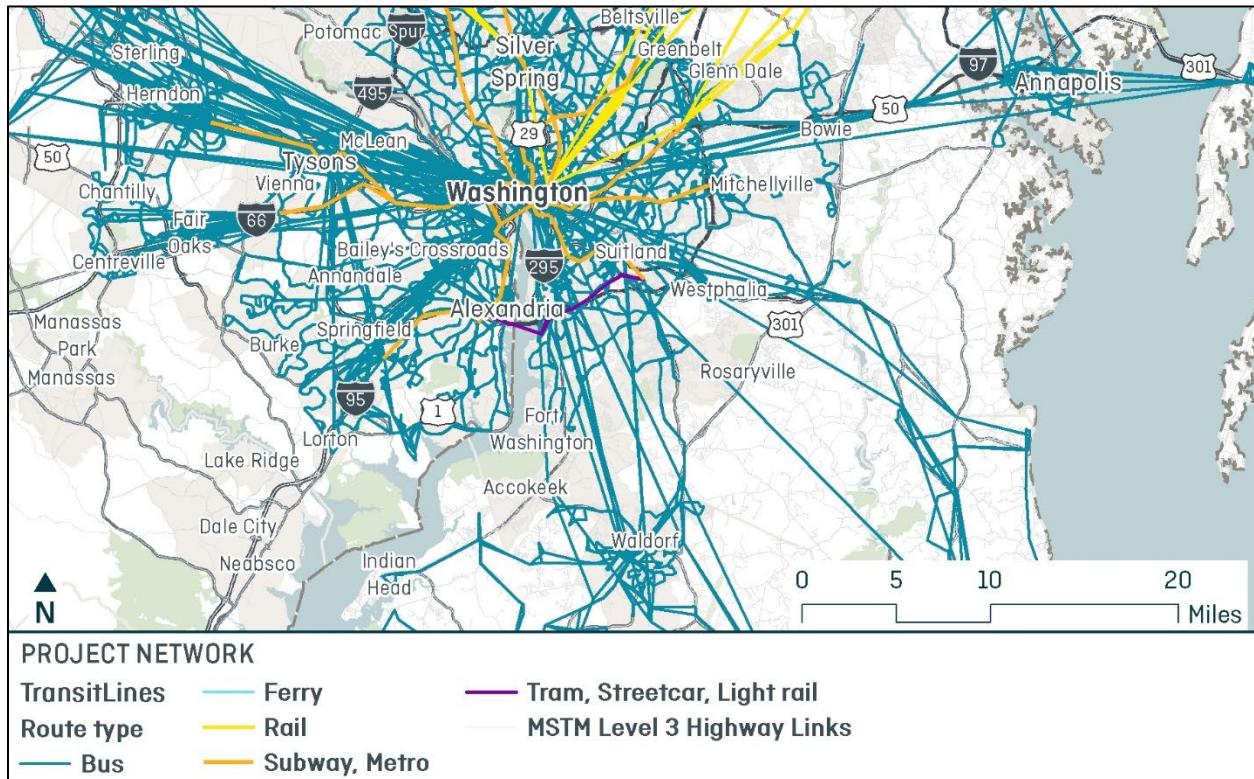


Figure 3: Project Network

2. MODIFICATIONS OF EXISTING GTFS FEEDS

Analyzing Project 20-34 did not require modifying existing GTFS feeds.

CHAPTER III. NETWORK REVIEW RESULTS

1. NETWORK DATASET CONFIGURATION REVIEW

The multi-modal network is composed of five features classes:

- “TransitLines” represents vehicle trips between transit stops;
- “Stops” represents transit stops served by transit vehicles;
- “L3_HWY” represents the local street network for access to/egress from transit stops;
- “Stops_Snapped2Street” represents each transit stop as a location “snapped” to the L3_HWY features;
- “Connectors_Stops2Street” represents the connections from the L3_HWY features to the transit Stop locations via the Stops_Snapped2Street junctions.

These features are grouped into three “connectivity groups” that enforce appropriate routing for transit network problems. Modeled paths must begin on the streets (L3_HWY) network (column 1) and can proceed to the transit lines (column 3) via the Connectors_Stops2Streets features (column 2). The network edge features are connected through the Stops (column 2-column 3) and the Stops_Snapped2Streets (column 1-column 2) node features. Figure 4 below shows the connectivity topological rules applied to the development of the Project 20-34 multimodal network.

Connectivity Groups:				
Source	Connectivity Policy	1	2	3
Connectors_Stops2Streets	End Point	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
L3_HWY	End Point	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TransitLines	End Point	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stops	Honor	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Stops_Snapped2Streets	Override	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Group Columns:

Figure 4: Connectivity Policy

Travel times between zones are computed using a travel time evaluator, setup for the Project 20-34 multimodal network in Network Analyst as shown in Figure 5. A 3 mph (264 feet per minute) walk speed

is assumed and the transit evaluator computes time-of-departure-specific transit travel times using the GTFS schedule.

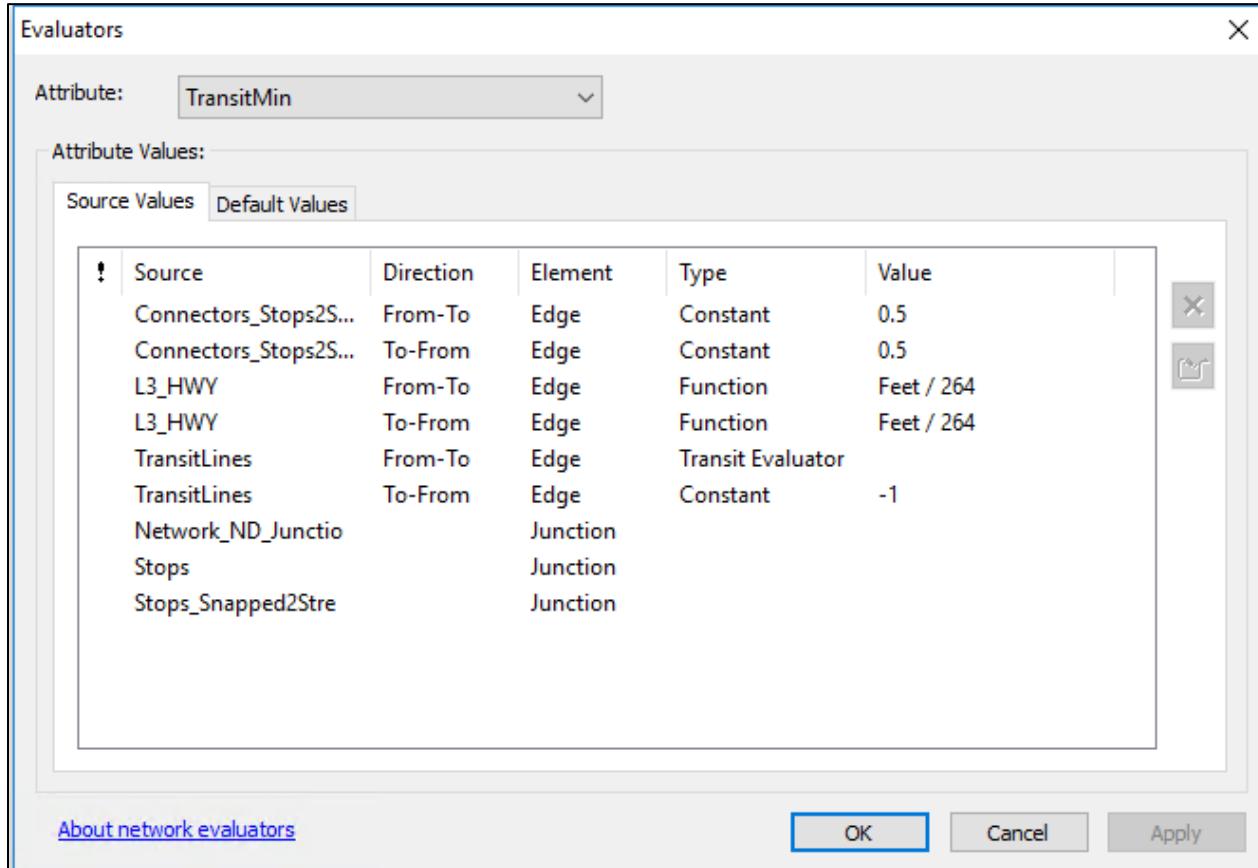


Figure 5: Minutes Evaluators

2. CONNECTIVITY TESTS

There are several steps required to create a multi-modal network, presenting opportunities for user error or technical anomalies to mis-represent network connectivity. To test the connectivity and usability of the Project 20-34 multimodal network, two quality control tests were performed: Service area analysis and routing analysis. These tests are described below. All test cases are based on an assumed departure time of 8:00 AM on a typical Wednesday.

Figures 6 and 7 compare travel time isochrones for a single location within the project study area. A simple check that the isochrones expand as the project provides additional service and that the expansion is intuitive given the nature of the project is sufficient to confirm that the project is appropriately integrated into the base multimodal network.

A comparison between Figure 6 and 7 shows a clear expansion of service area from the location used in the test, Eisenhower Ave. at Stovall St. in Alexandria, Va. The addition of the Project 20-34 line expands the service area isochrones eastward, reflecting the addition of line's eastern terminus at the Branch Avenue Metro Station. The isochrone patterns also show shortened service times in areas northeast of the proposed line. These changes confirm that Project 20-34 is appropriately integrated into the base multimodal network.

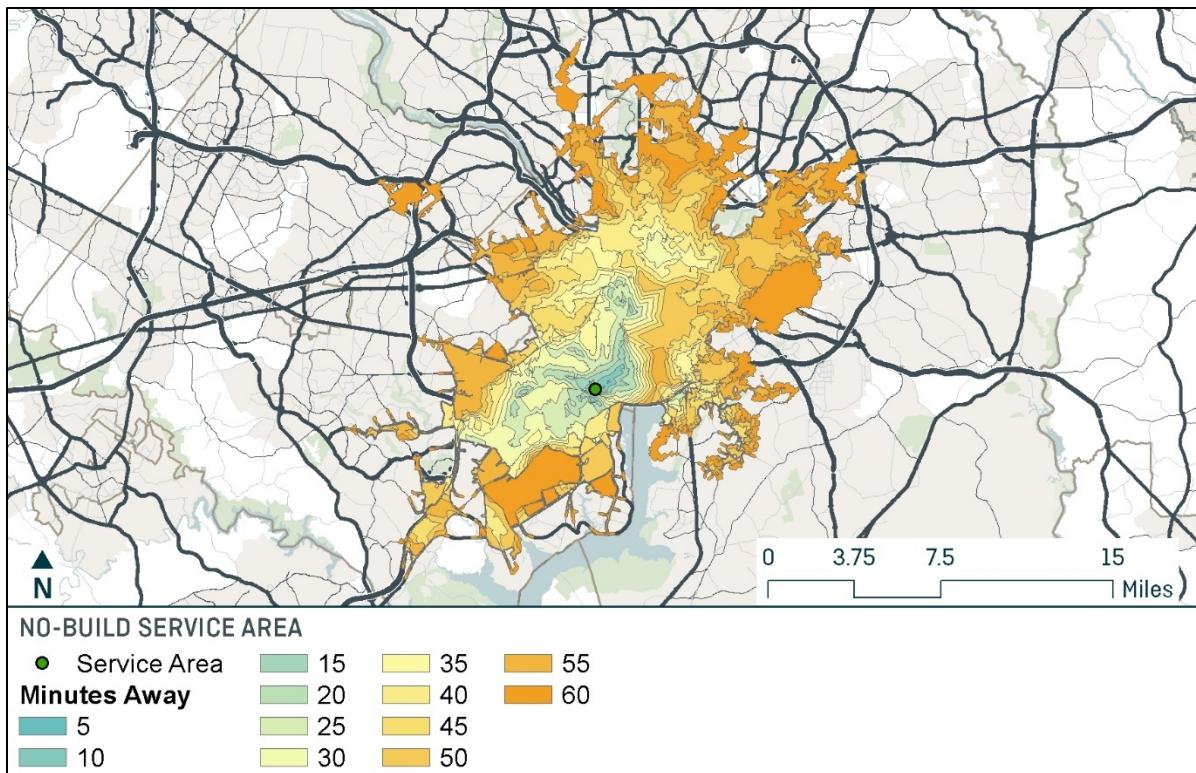


Figure 6: No-Build Service Area from Eisenhower Ave. at Stovall St. at 8:00 am

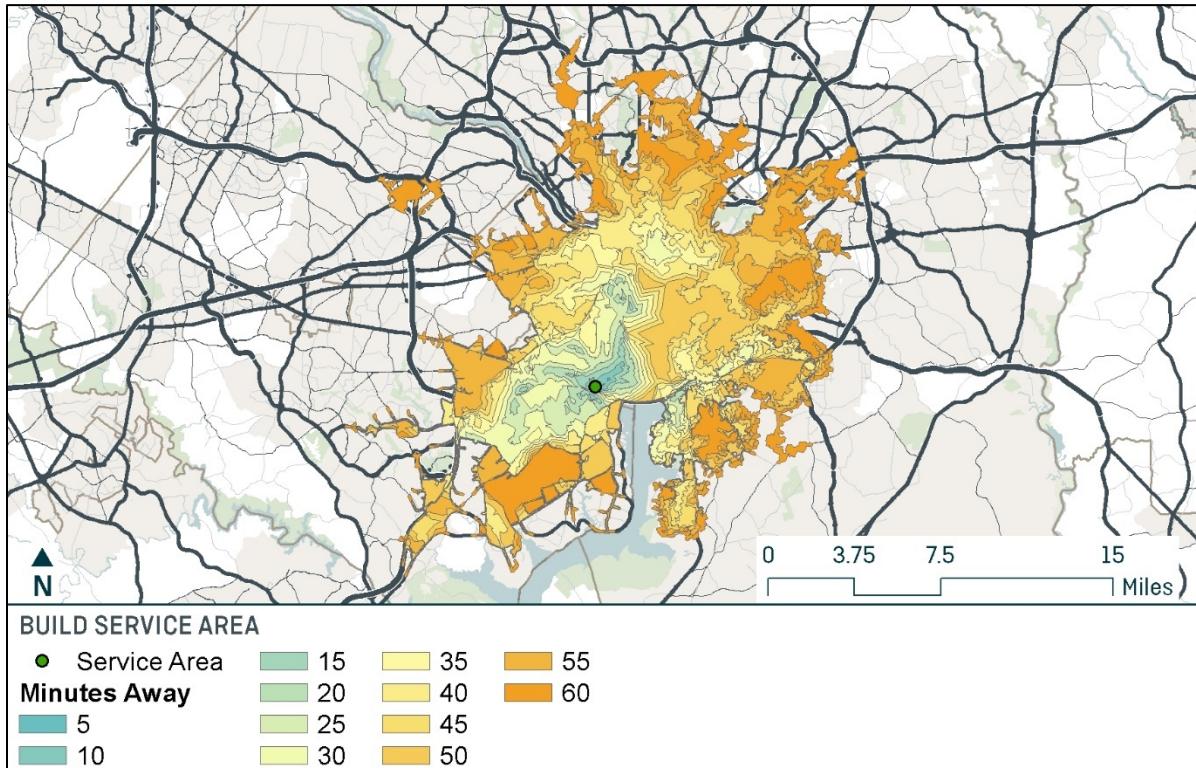


Figure 7: Build Service Area from Eisenhower Ave. at Stovall St. at 8:00 am

3. SHORTEST PATH

Figures 8 and 9 compare the shortest path between two points that would utilize the proposed light rail line. In Figure 8, the shortest path should use the existing transit network. In Figure 9, the shortest path should use the proposed light-rail line and reflect a shorter travel time.

The test confirms the network is utilizing the route made available by the proposed line. The no-build route requires approximately one hour to travel a 5.6-mile path between the points. Twenty-four minutes of the trip require walking. The build route, which follows the alignment of Project 20-34 across the Potomac River, shows a reduced travel time of 37.5 minutes to traverse a 6.4-mile path. The reduced travel time represents a 38-percent decrease over the no-build travel time.

This test further confirmed Project 20-34 was appropriately integrated into the base multimodal network.



Figure 8: No-Build Route Eisenhower Avenue at Stovall Street to Alexandria Drive at Balmorai Drive West



**Figure 9: Build Route Eisenhower Avenue at Stovall Street to
Alexandria Drive at Balmorai Drive West**

CHAPTER IV. REASONABILITY OF RESULTS

1. EXTENT OF STUDY AREA

The project study area is based on travel time from the zones in which the project is implemented – any zones within 45 minutes by transit (in the project build scenario) are part of the study area as are any zones within 15 minutes by driving (based on MSTM highway skims).

The study area comprises 221 square miles that includes a portion of Washington, D.C., Alexandria, Va., and suburbs in Prince George's County, MD. It extends about 9 miles north and 10 miles south of the proposed light rail route. The study area extends west about 8 miles from the light rail's western terminus at the King Street-Old Town Station and about 7 miles from its eastern terminus at the Branch Avenue Station.

2. TRAVEL TIME CONTOURS TO PROJECT

The service area analysis above showed that the project brings more of the study area within a one-hour travel time by transit. As described in the service area tests, the drop off in transit travel time follows the light-rail line eastward/westward. Portions of the study area in Prince George's County northeast of the I-495 and I-295 junction and south along Indian Head Highway show the most obvious gains. These areas would otherwise take more than 60 minutes to reach the service point at Eisenhower Ave. at Stovall St. but begin to fall within an hour of travel with the addition of Project 20-34.

3. MMA RESULTS

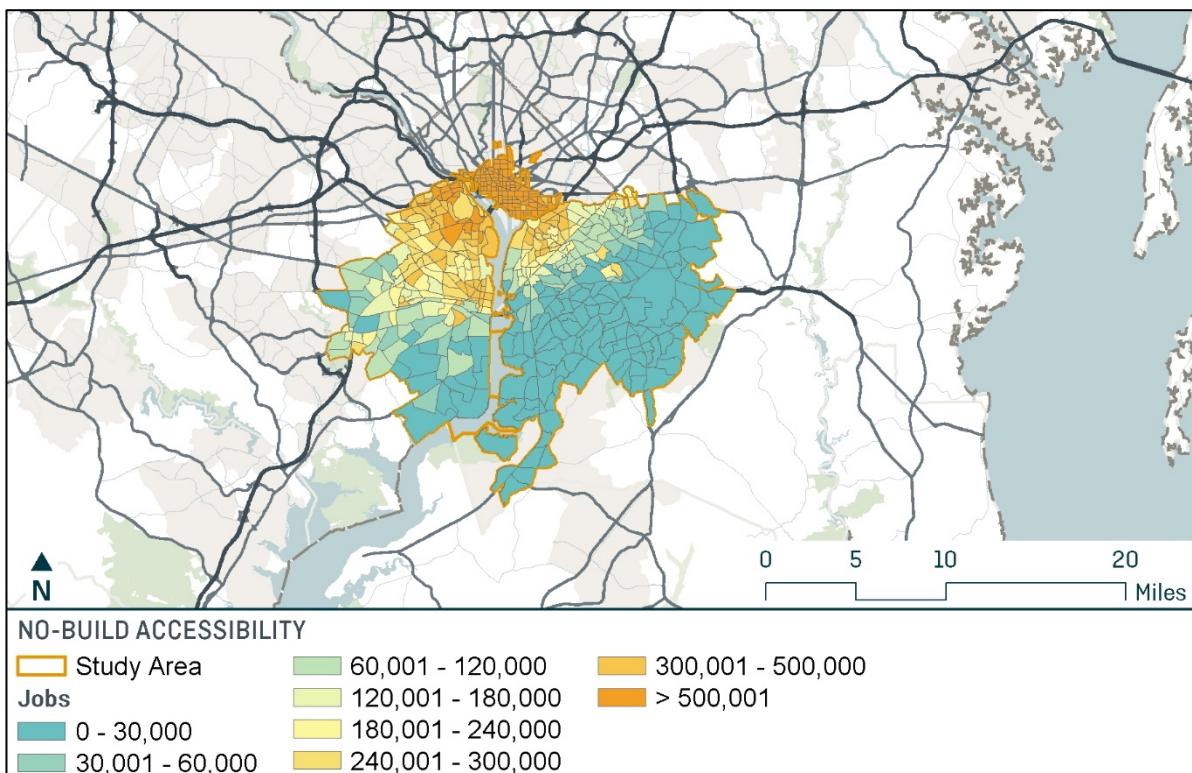


Figure 10: No-Build Jobs Accessibility in the Study Area

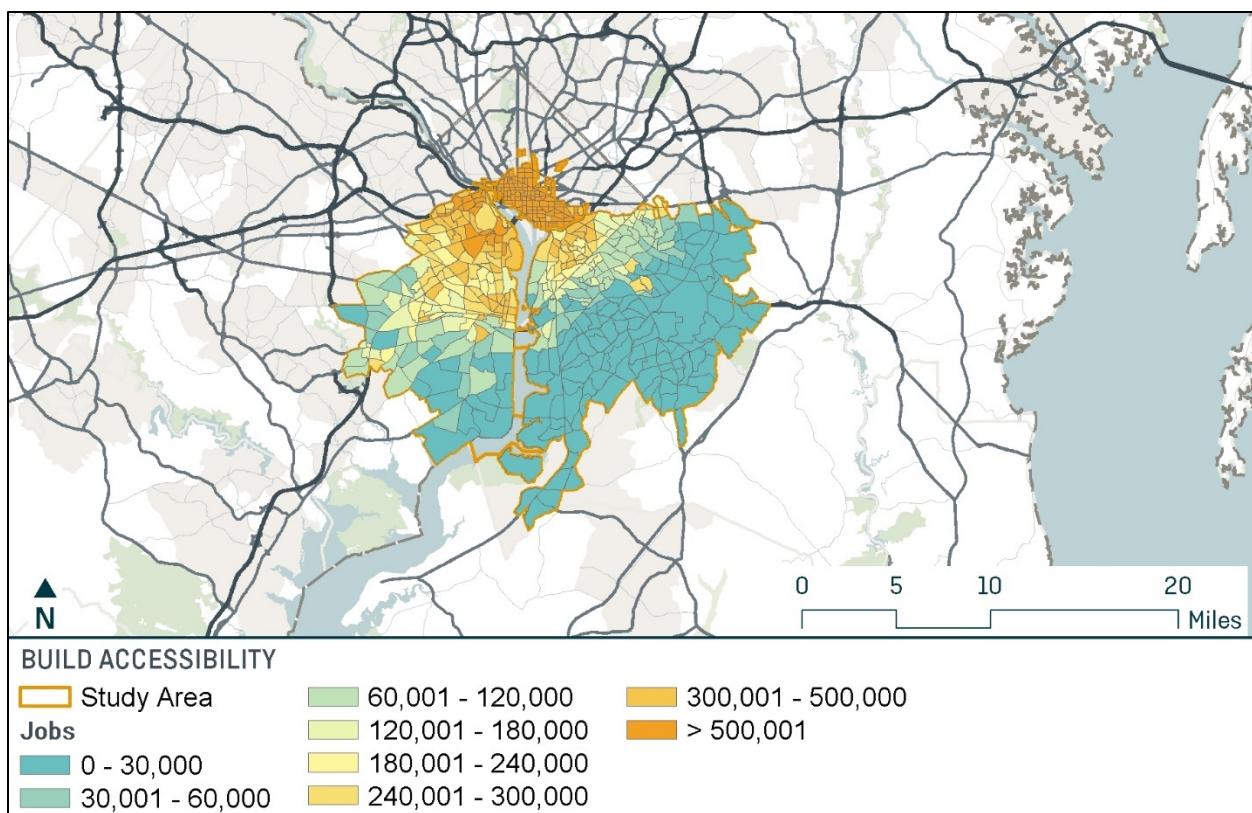


Figure 11: Build Jobs Accessibility in the Study Area

CHAPTER V. MAPPING AND FINDINGS

1. NETWORK

i. Project Links and Stops

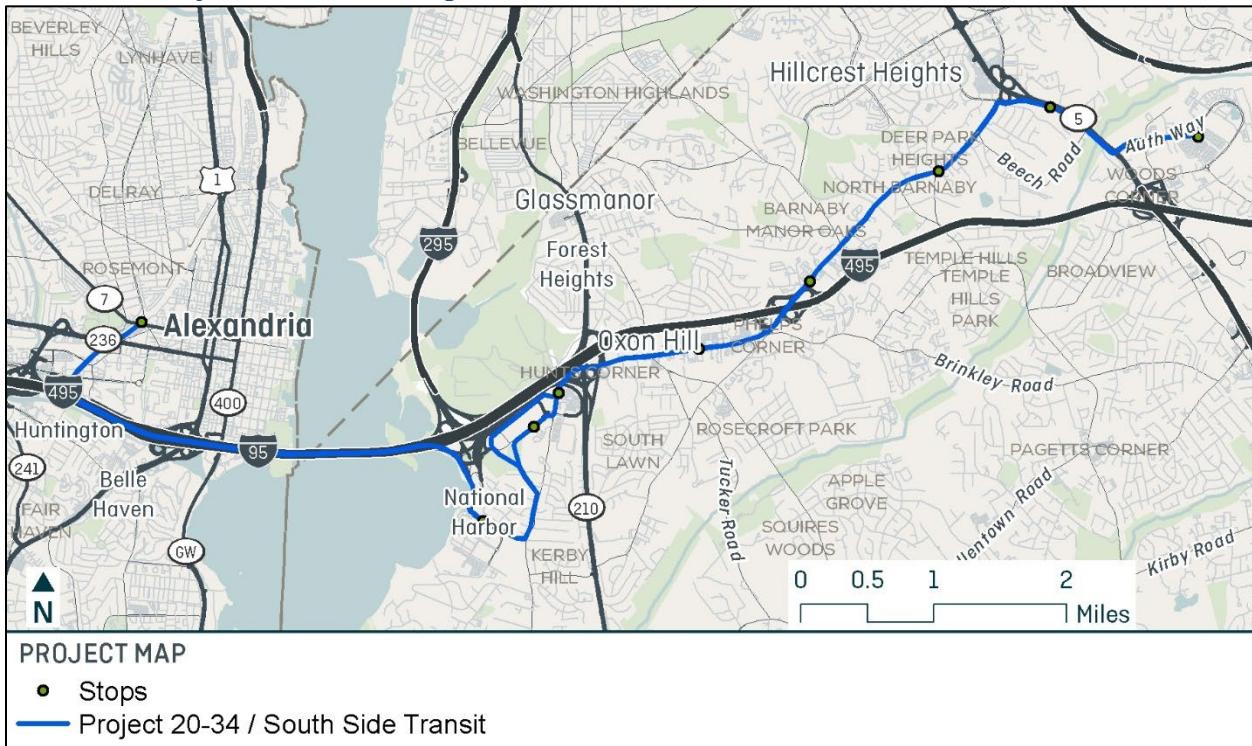


Figure 12: Project Links and Stops

2. BUILD vs NO BUILD

i. Average travel time changes

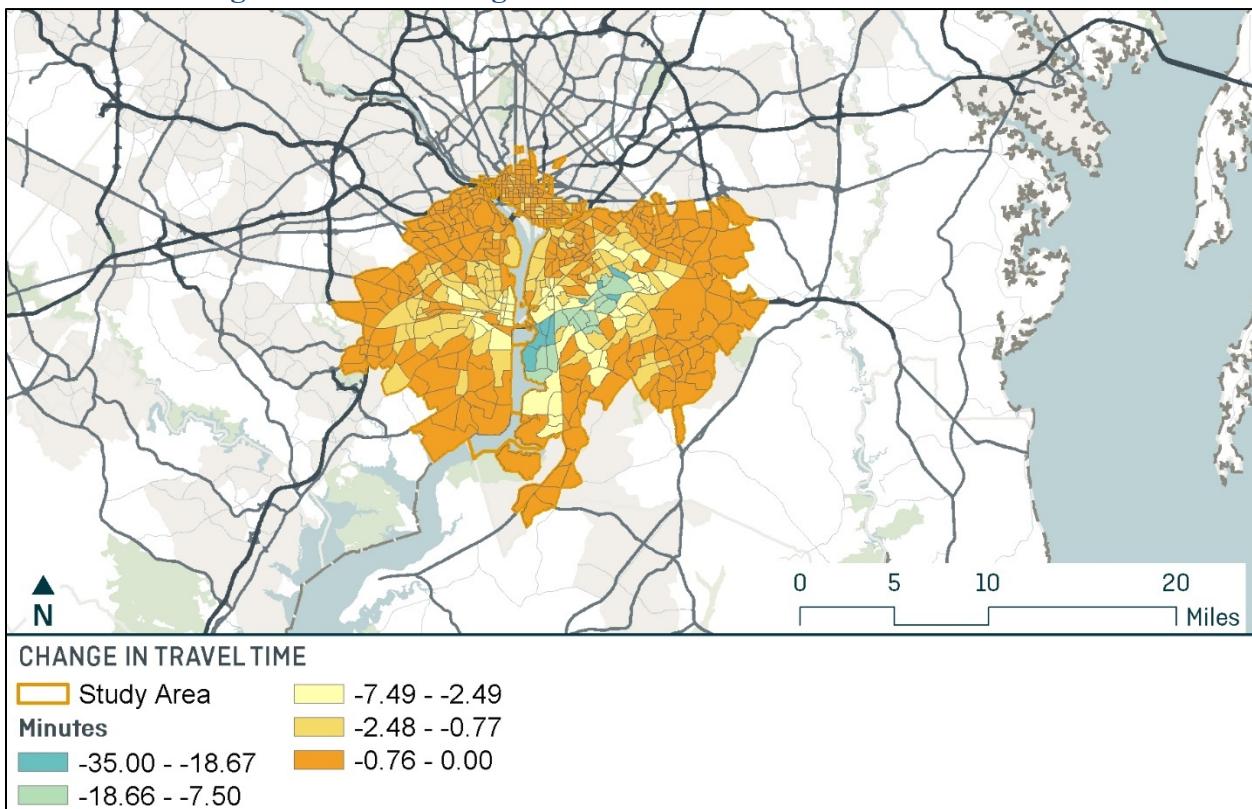


Figure 13: Average change in travel time at 8:00 AM

3. TAZ

The MMA results show an increase in the number of jobs accessible by transit when compared to the no-build option. A majority of the study area sees an increase of at least 1 to 1,000 jobs. TAZs along the path of Project 20-34 show increases upwards of 10,000.

i. Project Study Area

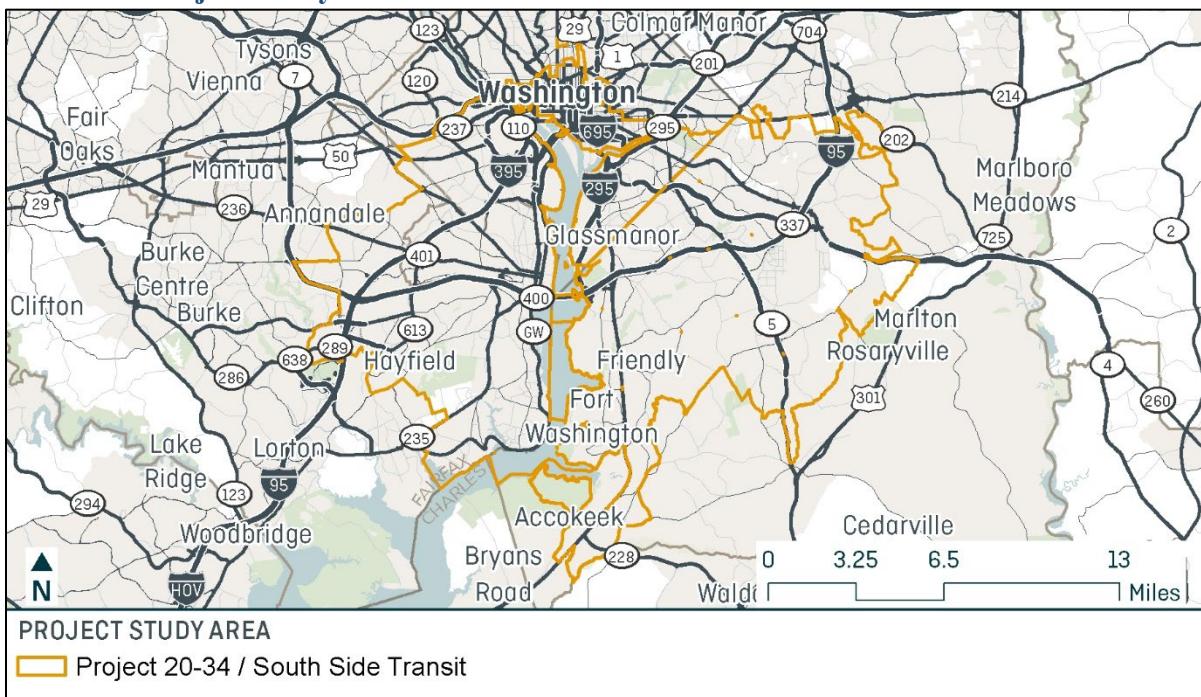


Figure 14: Project Study Area

ii. Accessibility Changes

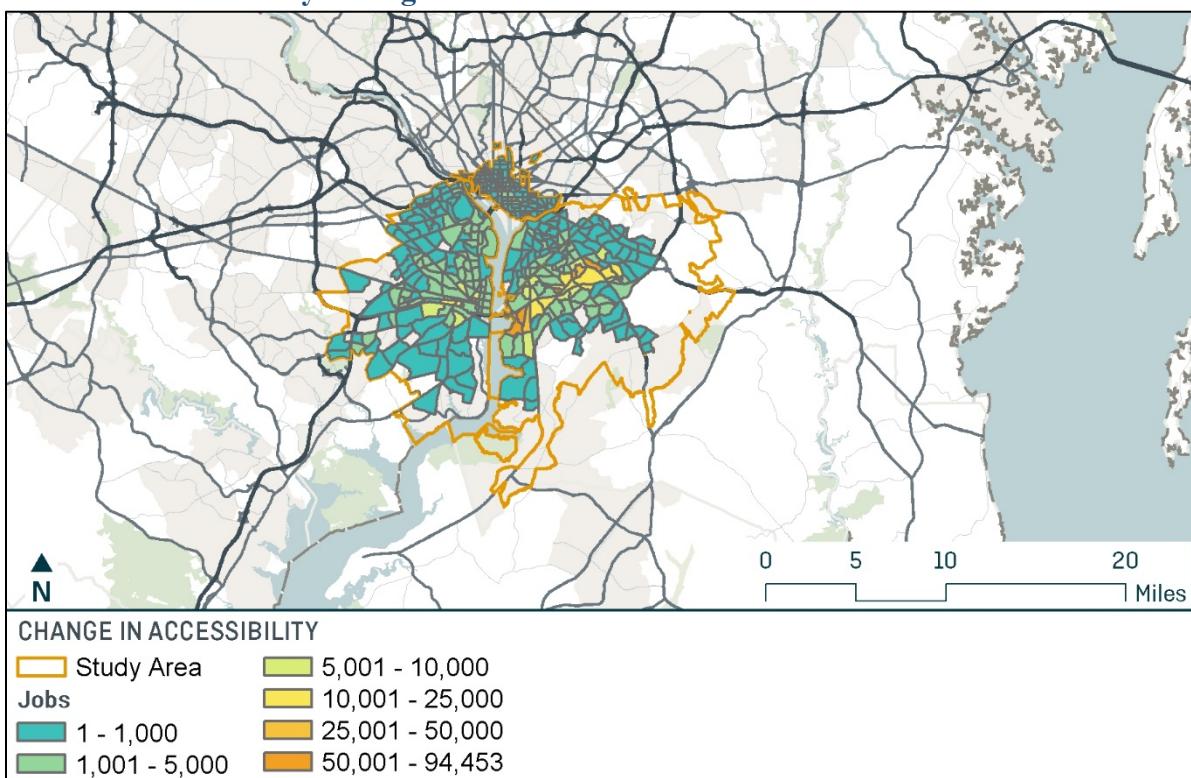


Figure 15: Change in Accessibility between No-Build and Project in Study Area

4. PROJECT FINDINGS

As shown in Figure 15, the largest increases in job access occur in the TAZs in closest proximity to Project 20-34's alignment. The following table summarizes the change in job accessibility for the general and disadvantaged populations in the study area. The addition of Project 20-34 increased the number of accessible jobs for the general population by less than 1 percent and by 10 percent for the disadvantaged population.

Table 5: Project Findings

Measure:	Value
Access to Jobs in Base (<i>general population</i>)	270,472
Access to Jobs in Build (<i>general population</i>)	272,050
Change in Access to Jobs (<i>general population</i>)	1,578
Access to Jobs in Base (<i>disadvantaged population</i>)	42,359
Access to Jobs in Build (<i>disadvantaged population</i>)	46,641
Change in Access to Jobs (<i>disadvantaged population</i>)	4,282
Change in Average Travel Time Per Trip	-1.24 (mins)
Estimated Ridership	28,900
Estimated Existing Ridership (<i>Estimated Ridership * 80%</i>)	23,120
Total Estimated Travel Time Savings for Existing Transit Riders (<i>Change in Average Travel Time Per Trip * Estimated Existing Ridership</i>)	-28,669 (mins)

Note travel time change/savings reported in minutes (mins) – negative values indicate reduced average travel times/time saved.