

# **BUS STOP ASSESSMENT STUDY: WEST HIGHLAND + SLOAN'S LAKE**

PREPARED FOR:  
CITY AND COUNTY OF DENVER

PLANNING METHODS - URPL 5010.001  
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# Introduction and Context

## A. Project Introduction

The City and County of Denver (CCD) has recently adopted a transit plan known as *Denver Moves: Transit*. In line with that plan, the purpose of this project is to develop a database for the city's bus stops in order to evaluate ridership experience, which will guide the CCD in future planning and implementation. This database will include the existing features and amenities at each bus stop. The goals of this project are 1) to analyze the quality of transit and 2) determine the current success of the transit system. The end goal is to use this database as a tool to improve transit as well as positively impact rider experience.

To build the database, CCD has partnered with Ken Schroepel at the University of Colorado Denver to develop a class project through his Planning Methods course. The team's role, as current Planning Methods students, will be to collaborate with WalkDenver to assist the City's planning team with the goal of an inventory through assessment of the bus stops along the Federal Boulevard corridor.

The class project consists of an assessment of a 9.25-mile section of Federal Boulevard. This section has been broken out into 12 smaller study areas to be evaluated by four-person student teams from the two sections of the Planning Methods course. This study area project team is made up of four students currently in the CU Denver MURP program—Katie Baum, Kim DeJong, Krista Runchey, and Tara Sorrels.

The project consists of several elements to be completed for each study area in order to assist the client. Major tasks include exploring the area's general characteristics, including demographics, urban fabric, transportation, and land use. Methodologies include utilizing American census bureau data, fieldwork in the area of study, and visual features to explain the data we find.

### Tasks for this project include:

*Task A : Project Context*, to explore the study area's general characteristics;

*Task B: Site Assessments*, which includes field investigations; and

*Task C: Findings and Recommendations*, with the team's final analysis.

The team's study area is the West Highlands and Sloan Lake area which is along the western side of the Federal Boulevard corridor, shown in Exhibit 1-1. The boundaries for the area include West 38th Avenue to the north, Federal Boulevard to the east, 19th Avenue to the south, and Perry Street to the west. Exhibit 1-1 presents the study area within a wider geographical context of the city and adjacent neighborhoods. Exhibit 1-2, which follows, provides a more detailed map including streets, key features, and bus stops.



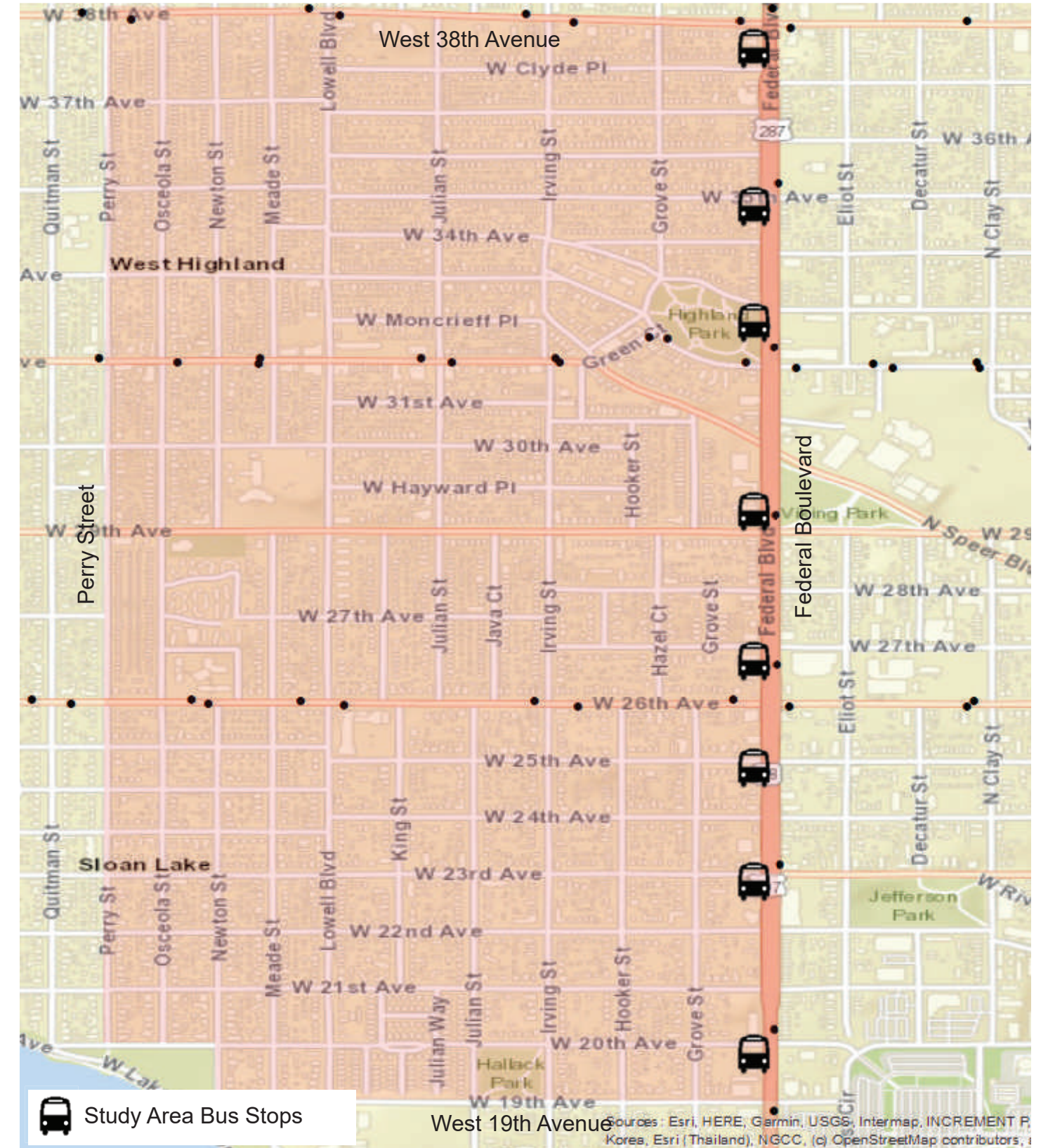


**Exhibit 1-1: West Highland and Sloan Lake Study Area Location Map**



Source: World Imagery. (2019). Esri, DigitalGlobe, Earthstar Geographics, CNES/Airbus DS, GeoEye, USDA FSA, USGS, Aerogrid, IGN, IGP, and the GIS User Community

**Exhibit 1-2: West Highland and Sloan Lake Study Area Detail Map**



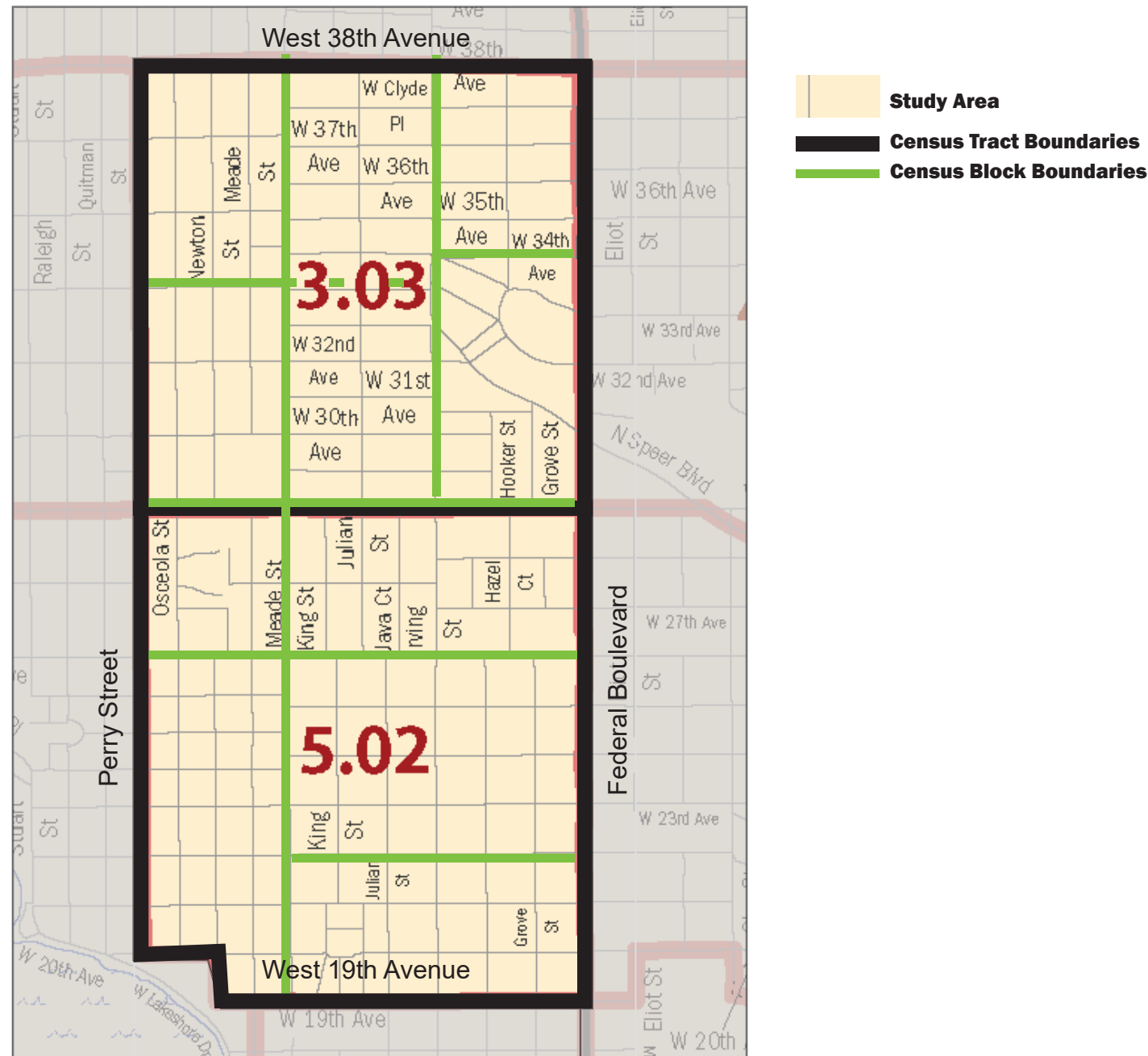
Sources: World Street Map. (2019). Esri, DeLorme, HERE, USGS, Intermap, IPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri(Thailand), MapmyIndia, Tomtom.RTD. (2019). BusStops Active [shape file]. Retrieved from: [http://gis-rtdenver.opendata.arcgis.com/datasets/e0d10c153c1f40f4af45fb81c9a5b905\\_2](http://gis-rtdenver.opendata.arcgis.com/datasets/e0d10c153c1f40f4af45fb81c9a5b905_2)



## B. Demographic Profile

The second part of Task A is an evaluation of demographic attributes to develop a better understanding of the study area. Four datasets were selected to consider and compare to Denver County, as a whole. The attributes include the following: 1) educational attainment; 2) household income; 3) race; and 4) means of transportation to work.

**Exhibit 1-3: West Highland and Sloan Lake Study Area Census Geographies Map**



Source: 2010 Census - Census Tract Reference Map: Denver County, CO

Exhibit 1-3 presents a map showing the study area boundaries within the context of the 11 census block groups, which make up the two census tracts 5.02 and 3.03. These are the tracts that were used to define the geographical parameters within the 2017 ACS 5-year estimates Census data set.

## Attribute #1: Educational Attainment

According to an article in The Chung Report, “educational attainment is an important statistic because it can play into other statistics like literacy, unemployment and average household income. This means cities that perform well in educational attainment often have better outcomes in these other categories.” (Chung, 2017) Table 1-1 presents this attribute for the demographic profile.

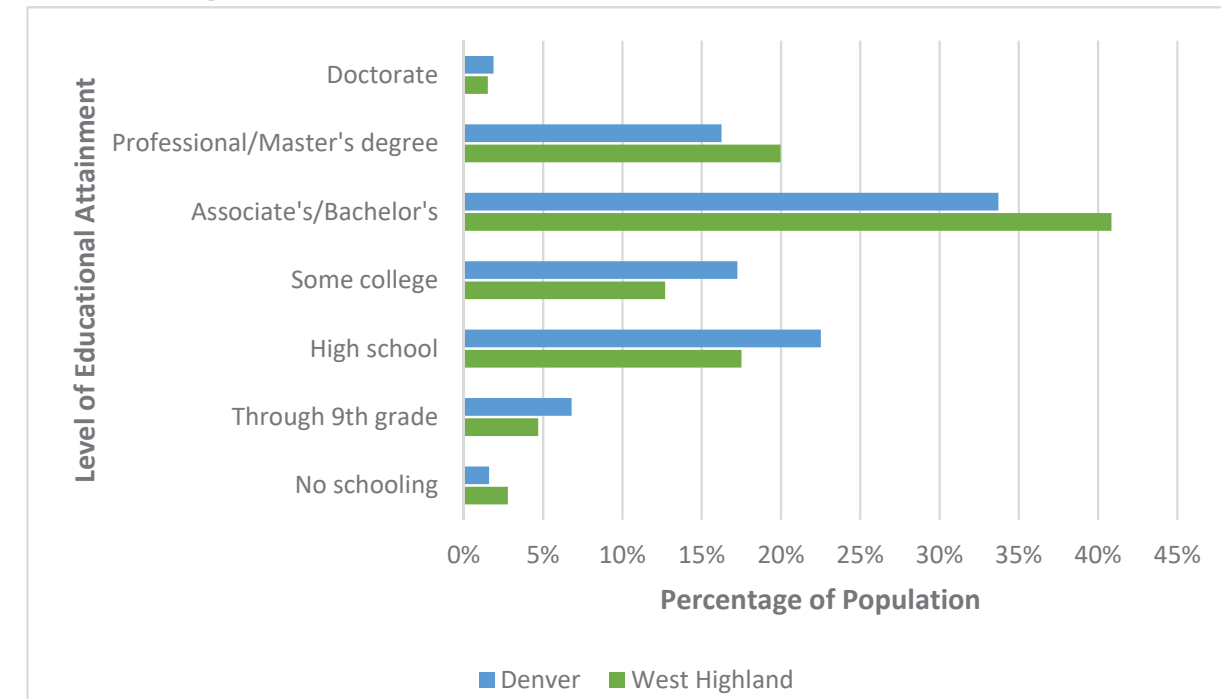
**Table 1-1: Population and Education**

Level of Educational Attainment	West Highland		Denver County	
	Count	Percent	Count	Percent
No schooling	230	3%	7,712	2%
Through 9th grade	388	5%	32,819	7%
High school	1,447	18%	108,773	23%
Some college	1,049	13%	83,391	17%
Associates/bachelor's degree	3,375	41%	162,859	34%
Professional or master's degree	1,650	20%	78,525	16%
Doctorate	125	2%	9,049	2%
<b>Total</b>	<b>8,264</b>	<b>100%</b>	<b>483,128</b>	<b>100%</b>

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates. [https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_17\\_5YR\\_B15002&prodType=table](https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_B15002&prodType=table)

Results from review of the educational attainment data sets (Table 1-1, above) show that the while Denver County, as a whole, has statistically higher percentage of its population of “High school” and “Some college,” the West Highland study area is composed of a greater percentage of higher education degrees overall for its population. Most notable is the difference at the “Associate’s/bachelor’s degree” level varying by seven percentage points higher than the county as a whole. This is visualized in Exhibit 1-4, below.

**Exhibit 1-4: Population and Education**



What does this mean through a planning perspective for mobility? An area with statistically higher levels of educational achievement and household income (discussed in Attribute #2) might indicate an area of growth or change, relative to other parts of Denver.

### Attribute #2: Household Income

Overall, according to the US Census Bureau, West Highland has a higher income than the county of Denver by about \$10K according to the U.S. Census Bureau median incomes by county. This may not seem significant, but after looking at the income distribution, there are notable trends. For example, West Highland has both higher percentage points than Denver county in the highest and lowest income brackets. This is important to study because it shows a severe gap in incomes for residents. In other words, the needs of the population can be drastically different. A higher income could mean that those residents do not need to rely on public transportation, and those with lower incomes most likely depend on adequate public transportation.

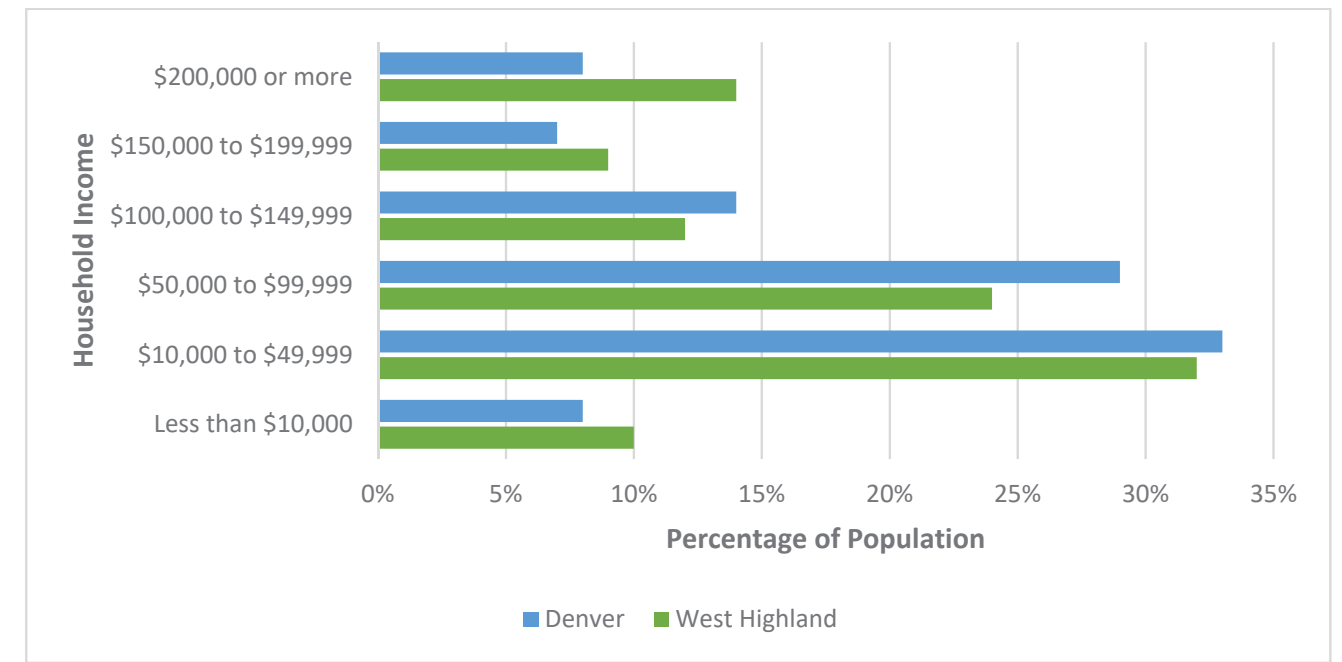
**Table 1-2: Population and Household Income**

Income	West Highland		Denver County	
	Count	Percent	Count	Percent
Less than \$10,000	491	10%	21,768	8%
\$10,000 to \$49,999	1,568	32%	98,854	33%
\$50,000 to \$99,999	11,50	24%	84,194	29%
\$100,000 to \$149,999	594	12%	40,290	14%
\$150,000 to \$199,999	451	9%	18,673	7%
\$200,000 or more	690	14%	23,483	8%
<b>Total</b>	<b>4,944</b>	<b>100%</b>	<b>28,7262</b>	<b>100%</b>

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates. [https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS\\_17\\_5YR\\_B19001&prodType=table](https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_5YR_B19001&prodType=table)

Table 1-2 shows that a higher percentage of West Highland households earn more than \$75,000 than Denver households as a whole. However, when looking at the breakdown, interesting trends come to light. In the highest income bracket of \$200,000 or more, West Highland has significantly higher percentage points than Denver County. In addition, West Highland also has higher percentage points than Denver County in the lowest income brackets. The share of households that earn between \$10,000 and \$50,000 is similar for West Highland and Denver County. This is visualized in Exhibit 1-5 on the following page.

**Exhibit 1-5: Population and Household Income**



### Attribute #3: Racial Composition

Race is an important attribute to consider when thinking about transportation because transit in the United States has always had racial implications, oftentimes intentional. Bernstein et. al. tell the story of racial segregation and inequality in the nation's transit systems and give a specific Denver example. Public transit has historically been viewed by white affluent people to be for non-white and poor people. Bernstein et. al. explain that after the Denver school system lost a lawsuit over segregation in the 1970's, voters passed the amendment that prohibited Denver from expanding its boundaries effectively preserving segregation by facilitating white flight to the suburbs, assisted by the creation of Interstate-70.

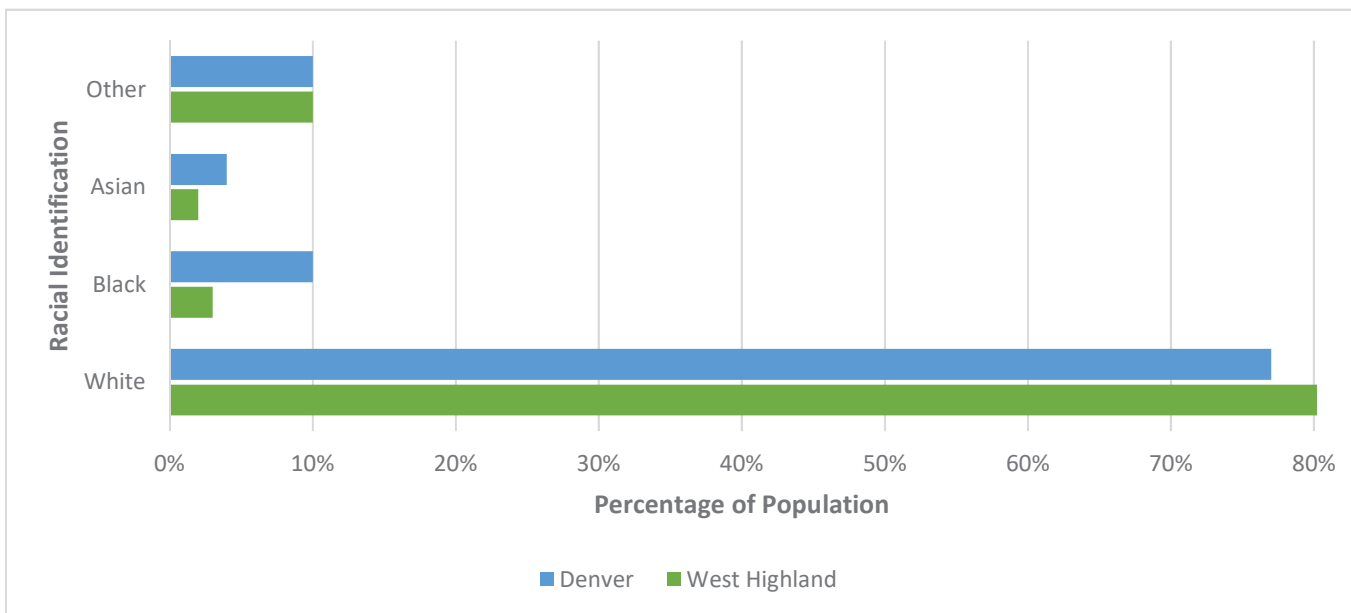
Transportation in all forms have historically been less accessible to non-white individuals. This notion is still true today as white and affluent people have fled back into cities along with investment and improvements in public transportation. If one lives in a US city, it is likely that one knows a highway or two that cuts through a historically black or brown neighborhood to lead one to the white suburbs. The long-standing stigma around riding the bus, and the lack of investment in public transportation until it was serving white people is also telling of the racial inequity that has been perpetuated through transit. Transit has been one of the many tools to separate and ostracize non-white people from opportunity and freedom.

**Table 1-3: Racial Composition of the West Highland Study Area versus Denver County**

Race	West Highland		Denver County	
	Count	Percent	Count	Percent
White	8,730	84%	521,481	77%
Black	338	3%	64,466	10%
Asian	207	2%	24,433	4%
Other	1,067	10%	68,087	10%
<b>Total</b>	<b>10,342</b>	<b>100%</b>	<b>678,467</b>	<b>100%</b>

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates. [https://factfinder.census.gov/faces/table-services/jsf/pages/productview.xhtml?pid=ACS\\_17\\_5YR\\_B02001&prodType=table](https://factfinder.census.gov/faces/table-services/jsf/pages/productview.xhtml?pid=ACS_17_5YR_B02001&prodType=table)

**Exhibit 1-6: Racial Composition of the West Highland Study Area versus Denver County**



The counts and percentages presented in Table 1-3 and visualized in Exhibit 1-6, show that the West Highland study area is composed of mostly white residents and has a higher percentage of white residents than the county as a whole. Compared to Denver County, this area specifically is less diverse. Jarrett Walker talks about race on his Human Transit blog, an extension from the book required for this course. Walker suggests that while there may often be a stigma around taking public transit for elite (and white) individuals, there is no reason to assume white affluent people would be reluctant to use public transit if it were useful (Walker, 2014).

The means of transportation data for the West Highlands study area may illustrate Walker’s point since a higher percentage of people in the West Highlands area take transit than that of the whole county, even though the population is mostly white with higher levels of education and incomes. As the team continues to study this area, the frequency and consistency of the buses should help tell the rest of the story.

**Attribute #4: Means of Transportation to Work**

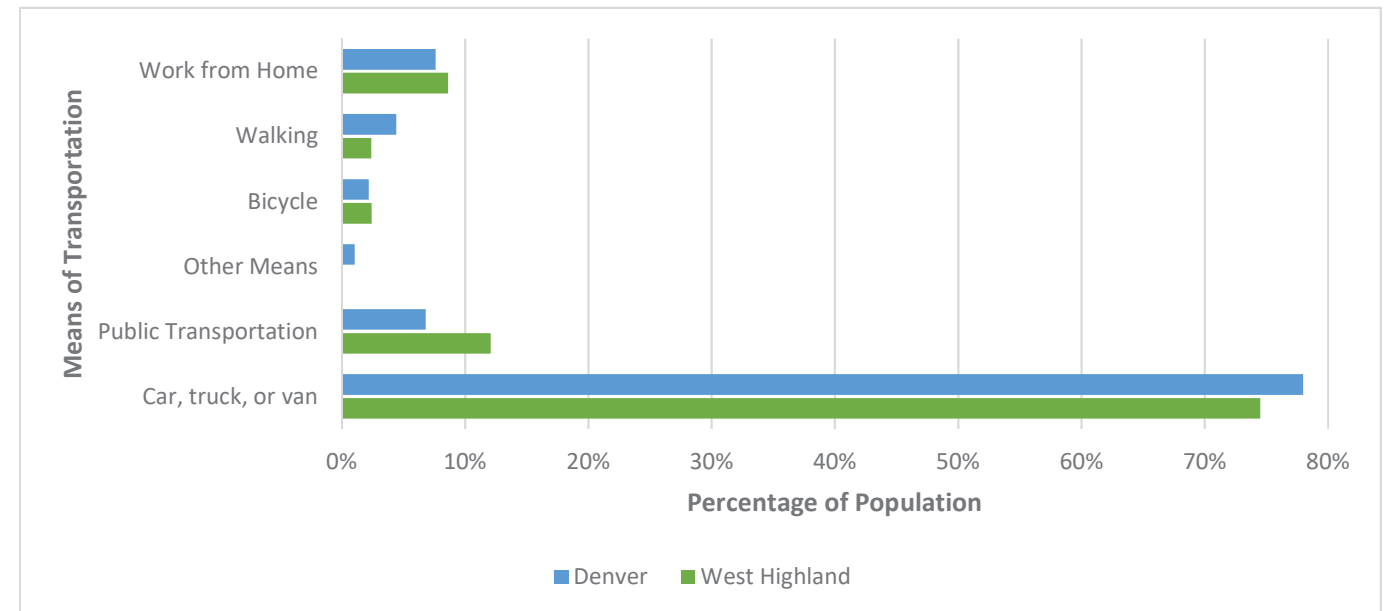
Review of the means of transportation to work data set (Table 1-4, below) shows that while the West Highlands has a higher percentage of white residents, slightly greater income and a greater percentage of residents with higher education degrees, the area still maintains similar commuting transportation mode trends when compared with Denver County. The largest discrepancy is in public transit use. West Highlands residents utilize public transportation as their means of commuting at a higher rate (five percentage points higher) than the rest of Denver County, as visualized in Exhibit 1-7.

**Table 1-4: Means of Transportation to Work**

Means of Transportation	West Highland		Denver County	
	Count	Percent	Count	Percent
Car, truck, or van	4,522	75%	286,512	78%
Public Transportation	733	12%	24,960	7%
Other Means	-	0%	3,865	1%
Bicycle	146	2%	8,081	2%
Walking	144	2%	16,133	4%
Work from Home	523	9%	27869	8%
<b>Total</b>	<b>6,068</b>	<b>100%</b>	<b>367,420</b>	<b>100%</b>

Source: U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates. [https://factfinder.census.gov/faces/table-services/jsf/pages/productview.xhtml?pid=ACS\\_17\\_5YR\\_B08301&prodType=table](https://factfinder.census.gov/faces/table-services/jsf/pages/productview.xhtml?pid=ACS_17_5YR_B08301&prodType=table)

**Exhibit 1-7: Means of Transportation to Work**





## C. Land Use, Transportation, and Urban Fabric

Next for consideration is the context of land use, transportation, and urban fabric. Visualizations for each of the contexts outlined will help formulate the analysis.

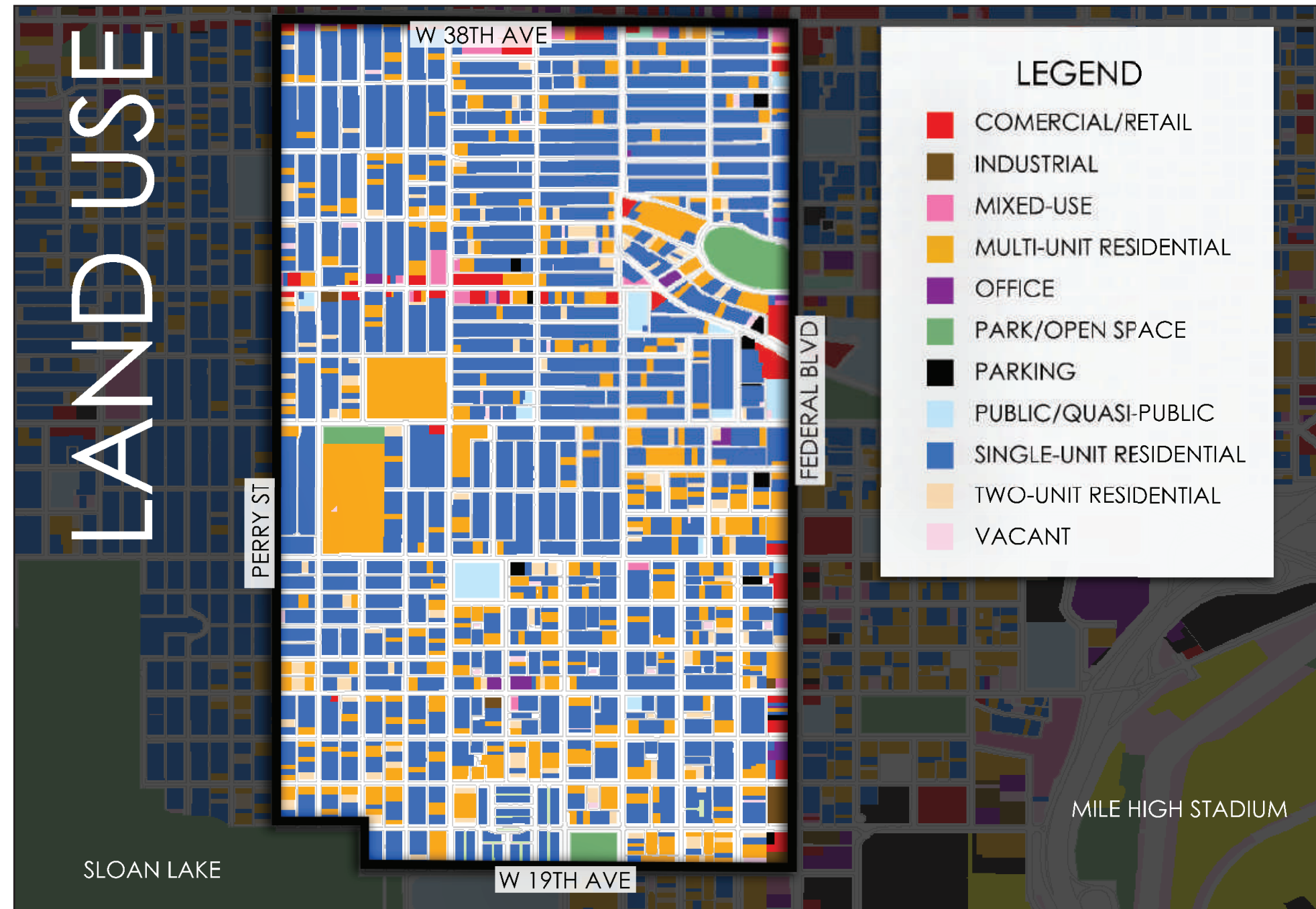
### Land Use

The land use for the study area site, as presented in Exhibit 1-8, consists primarily of residential; these are heavily single-unit residential uses, multi-unit residential, and some two-unit uses. There are parks/open space uses in and around the site. Concentrations of commercial uses appear along West 32nd Avenue and Federal Boulevard, near Speer Boulevard and south of West 26th Avenue. The commercial land use along West 32nd Avenue consists mostly small businesses--boutique style retail and non-chain type restaurants. This district serves those who live in the neighborhood but is also considered a shopping and dining destination for tourists as well as Denver locals that live outside the area. The commercial land use along the southern section Federal Boulevard is completely different than that along West 32nd--more along the lines of automotive services, indicating the volume of traffic and commuters. The north end of Federal Boulevard within the study area, consisting mostly of residential use, indicates a high concentration of families and potentially youths commuting to and from school.



Source: Kim DeJong

Exhibit 1-8: Land Use Map



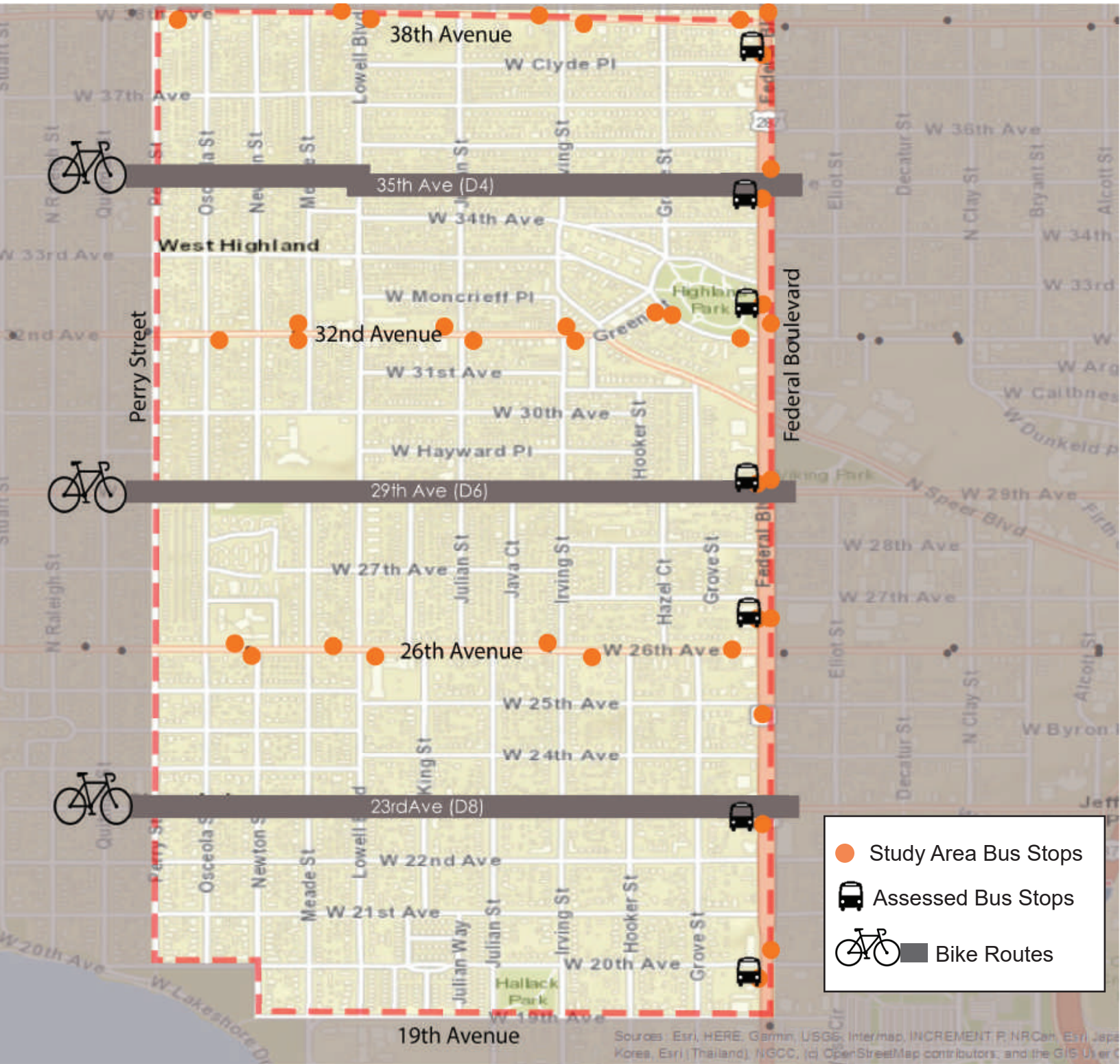
Source: City and County of Denver. Existing Landuse 2018 [shapefile]. Open Data Catalog. Retrieved from: <https://www.denvergov.org/opendata/dataset/city-and-county-of-denver-existing-landuse-2018> City and County of Denver. Edge of Pavement Linear [shapefile]. (2018). Retrieved from: <https://www.denvergov.org/opendata/dataset/city-and-county-of-denver-edge-of-pavement-linear-2016>



## Transportation

The transportation context for the study area site, as presented in Exhibit 1-9 consists of mostly quiet residential streets with a grid layout.

**Exhibit 1-9: Land Use Map**



Source: World Street Map. (2019). Esri, DeLorme, HERE, USGS, Intermap, iPC, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, Tomtom.RTD. (2019). BusStops Active [shape file]. Retrieved from: [http://gis-rt-d-denver.opendata.arcgis.com/datasets/e0d10c153c1f40f4af45fb81c9a5b905\\_2](http://gis-rt-d-denver.opendata.arcgis.com/datasets/e0d10c153c1f40f4af45fb81c9a5b905_2)

## Major Streets

There are no major interstate highways through the area, however, our primary road of interest, Federal Boulevard is part of U.S. 287. Highest traffic streets include Federal Boulevard as a major Denver corridor, with West 38th, 32nd, 26th, and 29th Avenues carrying the bulk of the traffic going east/west.

## Bike Lanes

Established bike lanes are mapped along east/west routes, including West 35th Avenue (D4), West 29th Avenue (D6), and West 23rd Avenue (D8). These bike routes are shown in Exhibit 9 as thick gray lines.

## Sidewalks

As an older, well-established Denver residential neighborhood, it is very pedestrian-friendly. Nearly every block has buffered sidewalks, many residential streets between the major avenues are lined with tree-shaded sidewalks on both sides.

## Bus Routes

Bus stops, as indicated by orange dots in Exhibit 9, run the east/west routes along West 38th, West 32nd, and West 26th Avenues. The only north/south bus access is along the Federal Boulevard corridor.







### Urban Fabric

As visualized in Exhibit 1-10: Snapshots of Urban Fabric, the West Highlands and Sloan Lake study area is composed of predominantly single-unit and multi-unit residential and one- and two- story homes, the majority of which were built in 1939 or earlier. Maintaining a quiet, suburban feel close to downtown, the study area—as with most of Denver—has seen a resurgence of Millennial investment and residential redevelopment. Residential setbacks and almost universal sidewalks enhance the area’s walkability with regularly used bike lanes running along West 23rd and West 29th Avenue connecting Sheridan Boulevard to Federal Boulevard.

Public green space is limited to three parks: Highland Park, Osceola and West 29th Avenue Park, and Hallack Park. Almost uniformly residential zoning leaves little room for commercial spaces, yet Highland Square (West 32nd Avenue and Lowell Street) is home to a popular collection of unique restaurants, retail shops and in the summer, the weekly Highlands Farmers Market.

### Transit Usage and Walkability

Overall, the West Highland and Sloan Lake study area is an area experiencing great growth and change. Regarding demographics, West Highland has a higher income and educational attainment when compared to Denver County. West Highland also utilizes public transportation slightly more than Denver County. Due to this, this study is incredibly important to both ensure that the county can utilize public transit effectively as well as increase ridership. West Highland is unique in that it is primarily residential, so Federal Boulevard may be the primary avenue that residents use to commute to where they need to go.



### Exhibit 1-10: Snapshots of Urban Fabric



West Montcleif and Irving Place



West 22nd Avenue and Lowell Street



West 23rd Avenue and Newton Street



Osceola Street and West 29th Avenue Park



West Highland Residential Street



West Highland Neighborhood Sidewalk

Photo credits: Katie Baum, Kim DeJong



## Chapter 2:

# Site Assessments

The City and County of Denver (CCD) is working to develop a database of bus stops in order to track the quality and to positively impact the rider experience. In Part A of this project (presented as Chapter 1), Team West Highland and Sloan Lake researched the study area's characteristics, including demographics, urban fabric, transportation and land use. The team found that when comparing West Highland and Sloan Lake to Denver County, the study area has a higher household income, higher educational attainment, is not racially diverse, and largely commutes with an automobile (however, West Highland does have a larger percentage of those using public transportation).

With this demographic information in hand, the team then set out to conduct field investigations. To start, the team conducted windshield/walking surveys to have a good understanding of the area as a whole. A windshield/walking survey is when the team drives and/or walks around the observation field, taking notes and photos, to begin preparing for the interviewing process. Next, the team developed an Execution and Safety Plan to guide the bus stop assessments and interviews prior to going out into the field. This step is essential in order to maintain team safety and utilize time in the most effective manner. Finally, the team conducted bus stop assessments and intercept interviews. This was the main portion of this task as it develops the answers for CCD's questions regarding both the quality of bus stops as well as the transit user's opinions on the impacts these bus stops have on their ridership experience.

After completing the initial steps and surveys, the team was successfully able to complete all bus stop assessments and gather 22 intercept interviews from transit users at the stops. With this data, the team is ready to complete the next steps involving final analysis and recommendations for the CCD.





# A. Study Area Windshield/Walking Survey

## Historical Context

The neighborhood roots date back to 1858, when Denver was founded. Wealthy railroad founders bought land, platting out the grid pattern. Highland Park, however, would be laid out with curving streets, following topographical features. (Barnhouse, 2012, p. 7) This area of northwest Denver is considered a legacy of early rail transportation—originally accessed by horsecar, followed by cable car which preceded the electric cable car or trolley. (p. 9)



Source: Barnhouse, M.A., *Images of America: Northwest Denver*. Arcadia Publishing, 2012. p. 17

Within the study area, major streets: West 38th Avenue, West 32nd Avenue and West 29th Avenue, were previously serviced by the streetcar system. By 1950, these streets would be converted to bus routes. (Barnhouse, inside cover)

Situated uphill from Denver, Highlands was one of the original suburbs for residents to escape the smelter and factory smoke of the city below. Highlands incorporated in 1875, only to be annexed by Denver in 1896. This side of the city is sometimes referred to as the “Brooklyn of Denver” due to its geographic and cultural diversity—historically, home to immigrant communities and a variety of religious faiths, and like Brooklyn, struggles with gentrification. (Barnhouse, p. 7)

## Historic Highlights

Historic highlights for this study includes **Highland Park** at West 32nd Avenue and Federal Boulevard. The park was originally the site of the Highland Park Hotel in 1875, which burned down. The land became a nursery (planting many of the trees that are there today) and in 1899, was sold to the City for \$18,000 (Barnhouse, p. 90). It is now a seven-acre multi-use park.

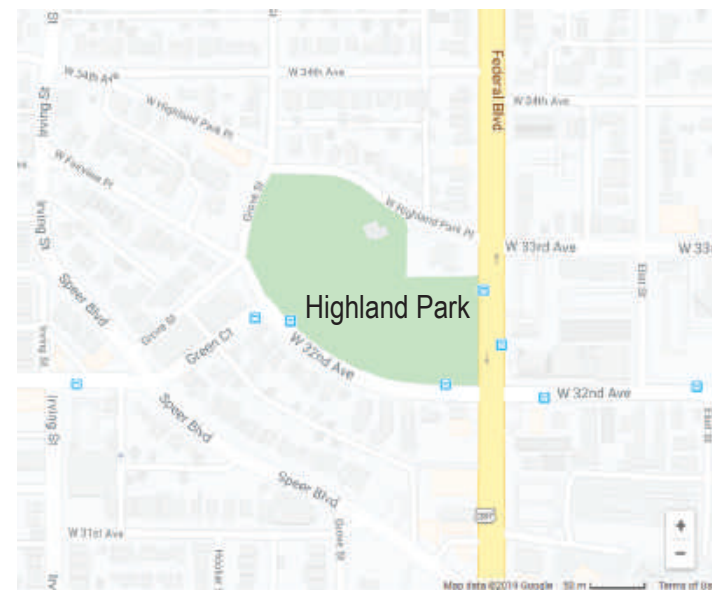


Photo credit: Kim DeJong; Map source: google maps

Built in 1913, the **Woodbury Library**, located at West 33rd Avenue and Federal Boulevard, in Highland Park. The building is Italian Renaissance style architecture, funded by steel magnate, Andrew Carnegie. (Barnhouse, p. 66)



Photo credit: Kim DeJong

The **Bosler House**, at 3209 West Fairview Place, built in 1875, was designated a Denver Historic Landmark in 1984 and listed on the National Register of Historic Places in 1995. (Landmark, 2016)



Photo credit: Kim DeJong

## Family Services

The residential nature of the West Highland and Sloan Lake neighborhood, make it a good location for organizations that offer family services.

The Denver Children’s Advocacy Center, at 2149 Federal Boulevard, seeks to prevent child abuse and provide services that keep children safe, support victims, and help families recover (Denver Children’s Advocacy Center website).



Photo credit: www.google.com/streetview/

At 2741 Federal Boulevard, the Lambuth Family Center provides housing for families experiencing homelessness and also provides financial independence services (The Salvation Army).



Photo credit: www.google.com/streetview/



## Commercial District

Highlands Square branches off from the historic West 32nd Avenue and Lowell Street intersection, offering a destination for dining and shopping.



Photo credits: Kim DeJong



## Walkable Neighborhoods

Nearly all of the residential streets have fairly well-maintained sidewalks, with a majority of them buffered from traffic and many of them shaded by trees.



Photo credits: Kim DeJong



Overall, the study area has continuous sidewalks, green space, and decent tree cover. For these reasons, the area is, for the most part, pedestrian-friendly aside from the heavy traffic volumes along Federal Boulevard as a major corridor. Federal Boulevard has bus stops which provide access to the services along the street such as the Woodbury Library, Denver Children's Advocacy Center, and Lambuth Family Center. This historic neighborhood struggles with gentrification however, which may drive those who need these services further away.

## B. Execution and Safety Plan

After completing the Study Area Windshield/Walking Survey and prior to starting field work, the team prepared an Execution and Safety Plan. This provided a guide to plan the execution of both the bus stop assessments and the intercept interviews.

- 1) The team first prepared a simplified map to identify each of the bus stop locations, according to ID numbers, as a reference.
- 2) Next, a schedule was drafted based on team members' availability to meet-up in pairs or as a team, based on two-hour increments. Follow-up visits were a consideration for incomplete assessments, remaining interviews, or re-take of photos.
- 3) The team decided on mode of transportation as meet-up logistics were developed—driving or biking to a mutually agreed-upon site within proximity to study area bus stops.
- 4) Method of observation:
  - a. For the bus stop assessments, the method of observation was in-person, visual analysis, and recording through use of the mobile assessment website ([bit.ly/ratemystop](http://bit.ly/ratemystop)). Team members took pictures as reference and made notes of bus stop conditions. The team did the first “trial run” assessment as a team to have consensus on ratings. Remaining assessments were completed in pairs, no team members worked alone.
  - b. For the intercept interviews, the method of observation was in-person, one-on-one interviews using the WalkDenver questionnaire.
- 5) The team identified potential methodology problems for the assessments could include scheduling (inclement weather, schedule conflicts, illness), inconsistent recording of data, or inconsistent interpretation of data. The team agreed to work together to resolve these potential issues. For the interviews, three primary potential problems were identified with corresponding potential solutions:
  - a. lack of transit users; try different locations and aim for peak time
  - b. transit users unwilling to participate; try adjusting the approach, don't take it personally, be patient
  - c. non-English speaking language barriers; have the translated questions readily available



6) Lastly, the team completed a personal safety issues/hazards study along with an approach to ensure the safety of the team. Table 2-1, below, presents the guide created for the Execution and Safety Plan.

**Table 2-1: Summary of Personal Safety for Field Activities**

Issue/Hazard	Approach
a. Inclement weather (high winds, icy conditions, lightning, heavy rain, hail, snow, extreme heat, extreme cold, etc.)	Good weather is ideal for the assessments and interviews. If the team decides to proceed, use best judgement and dress appropriately for inclement weather conditions. In case of extreme weather, reschedule.
b. Walking busy streets	Extreme caution. Be aware of traffic, avoid distractions. Absolutely no texting, calls, or listening to headphones while walking.
c. Walking areas that appear unsafe	Be aware of surroundings, stay with a partner or team
d. Encountering unfriendly people	Avoid conflict, do not engage. Stay calm. Stay with a partner or team. Walk away.
e. Walking rough terrain/icy sidewalks	Wear appropriate footwear. Pay attention to avoid slips, trips and falls
f. Other hazards (may include insect bites/bee stings, hypodermic needles)	Awareness of any team member's allergies. Communicate if bit or stung. Communicate to team members if any needles are seen, avoid any contact with needles.

## C. Bus Stop Assessments Site Investigation

The team's field investigation began with the Bus Stop Assessments. These were scheduled concurrently with the Intercept Interviews for efficiency, to make the best use of the team's time.

### Data Attributes

Data attributes that were collected for the assessments included the following:

- Overall condition
- Safety
- Amenities
- Physical condition
- Cleanliness
- Accessibility
- Connectivity
- Crosswalks
- Public art

The team's collection methodology involved in-person, visual analyses, and use of the mobile assessment website ([bit.ly/ratemystop](http://bit.ly/ratemystop)). Team members also took pictures as reference to record bus stop conditions. Remaining assessments were completed in pairs.

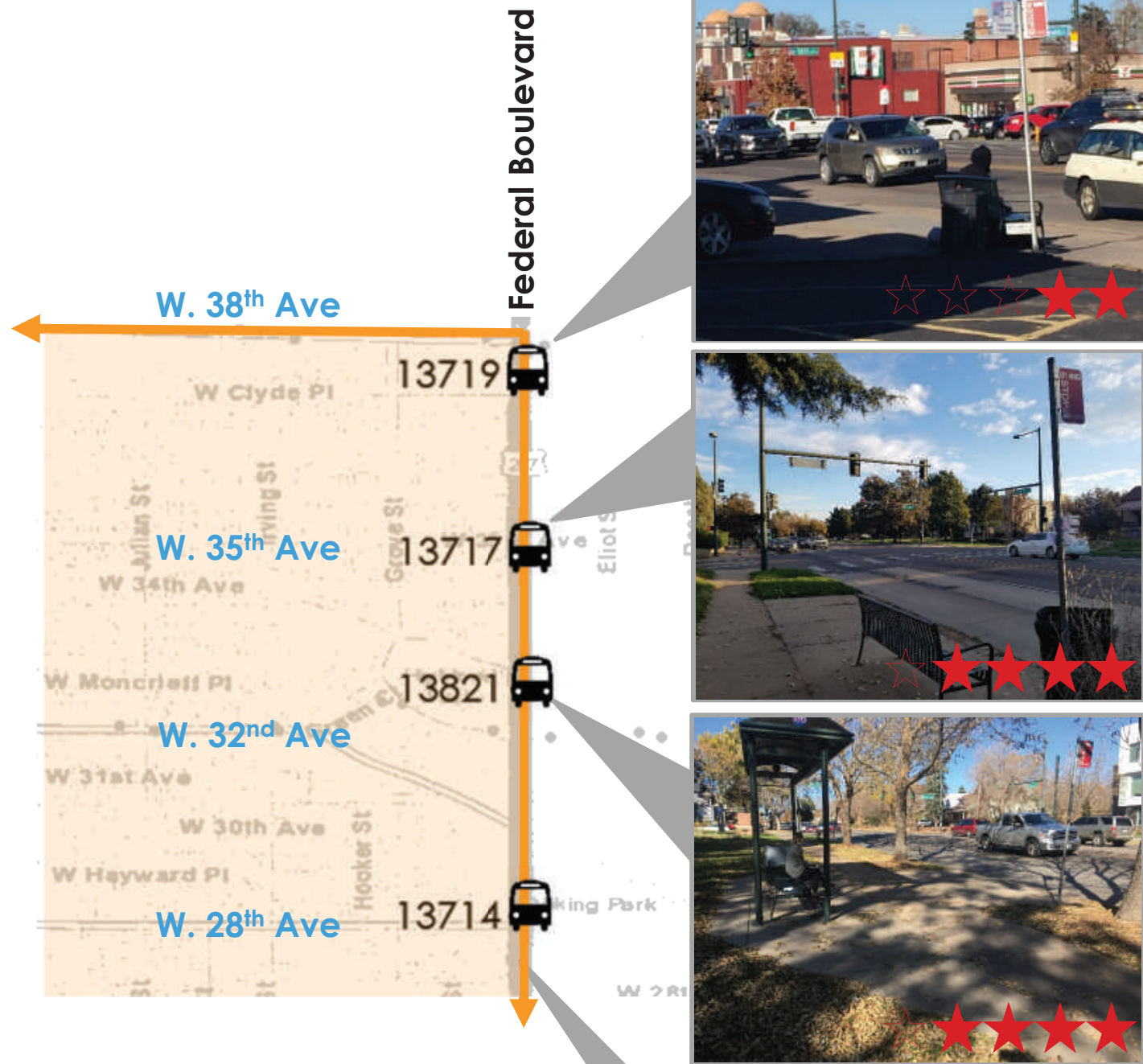
### Summary of Characteristics and Conditions

#### Overall Condition

The overall condition rating (from one to five) took into account all the data attributes that were assessed by the team. The study area's stops averaged a 3.4 rating for overall condition. The following Exhibit 2-1, on the following pages, presents the locations of the study area bus stops, each labeled with its Bus Stop ID number, representative photo and the overall condition.



Exhibit 2-1: Bus Stop Assessment Summary



- Study area (partial)
- Study area boundary (partial)
- Major Street**
- Bus stop
- Bus ID #**
- Overall rating (1-5)

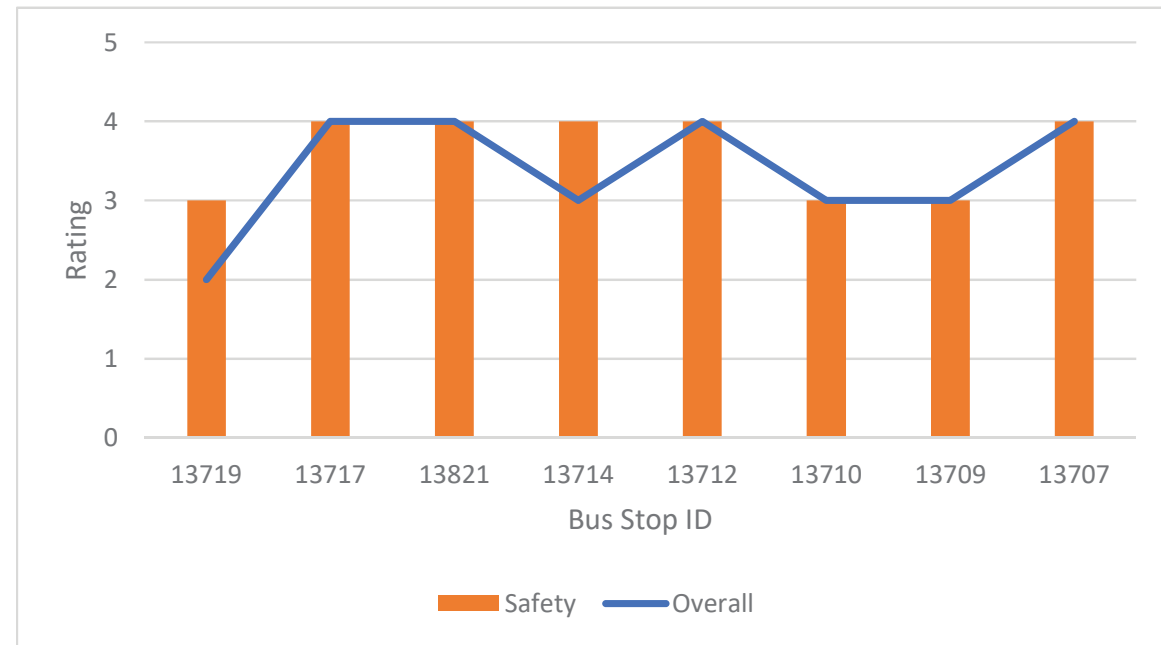




## Safety

For safety, the assessment used a 1-5 rating, but there was an additional question to clarify the rating: "What, if anything, makes the stop feel unsafe?" Two answers, traffic and lighting, were prominent for the stops. Three of the stops felt too close to the street, and without any buffer from traffic, were loud and felt unsafe with proximity to the traffic. Lack of lighting showed up on seven of the eight stops. Chart 2-1, below, represents how the safety ratings generally correlated to the overall ratings.

**Chart 2-1: Ratings for Bus Stop Safety**



Source: [https://docs.google.com/spreadsheets/d/1dHdUuxrhd\\_aJEIhQI9zdhFryV4F-Q8jhwgs02menyw/edit#gid=2054854252](https://docs.google.com/spreadsheets/d/1dHdUuxrhd_aJEIhQI9zdhFryV4F-Q8jhwgs02menyw/edit#gid=2054854252)

## Amenities, Physical Condition, and Cleanliness

Assessment of the amenities took into account the layout of the stops and any existing shelters, benches, trash cans, shade trees, system maps, and schedules. All the stops were located on concrete pads, a few with dirt and grass nearby. The physical condition and cleanliness of the stops was rated (one to five) with the average ratings of 3.5 and 3.4 respectively. Exhibit 2-2, on the next page, provides a summary of amenities, with highlights of condition and cleanliness of the stops.

**Exhibit 2-2: Summary of Bus Stop Amenities with Highlighted Attributes**

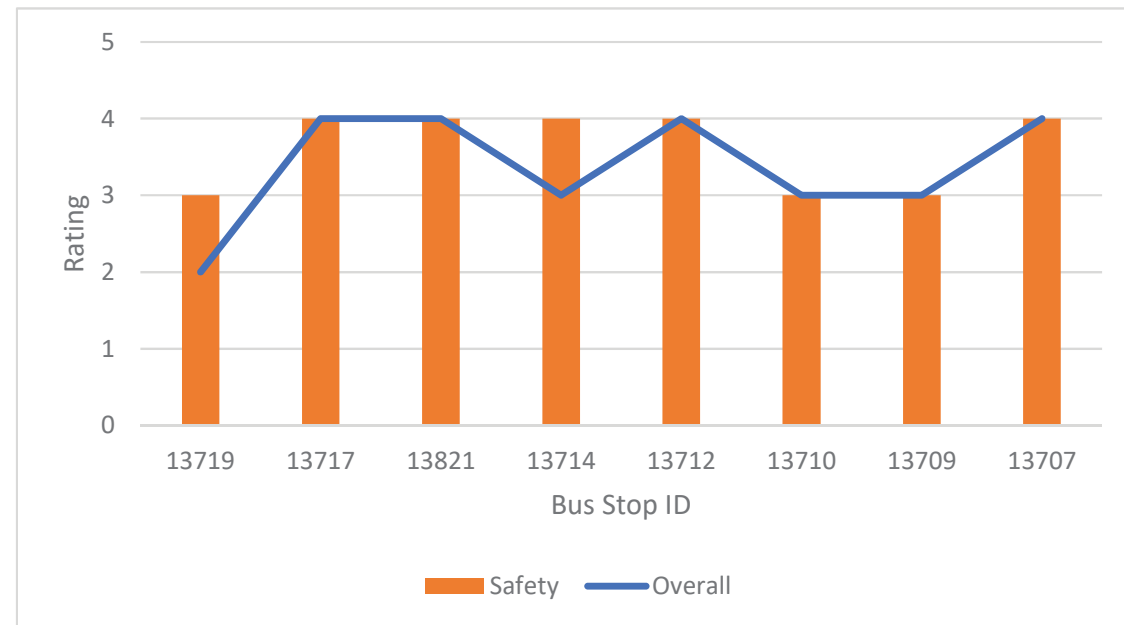
Bus Stop ID	Amenities	Site Highlights for Cleanliness and Condition
13719		No shelter or vegetation, surrounded by asphalt
13717		Good condition
13821		Shade trees, near park
13714		Overflowing garbage
13712		Nice shelter, but small benches, and dirty 
13710		Bench looking shabby, no trash can
13709		Good condition
13707		Double bench – good Trashed trash can - bad

**Legend** Bench Trash Shelter Shade Map/Schedule



Chart 2-2, below, presents the ratings for condition and cleanliness of the stops which correlated strongly with the overall rating.

**Chart 2-2: Ratings for Physical Condition of Amenities and Cleanliness of Bus Stop**

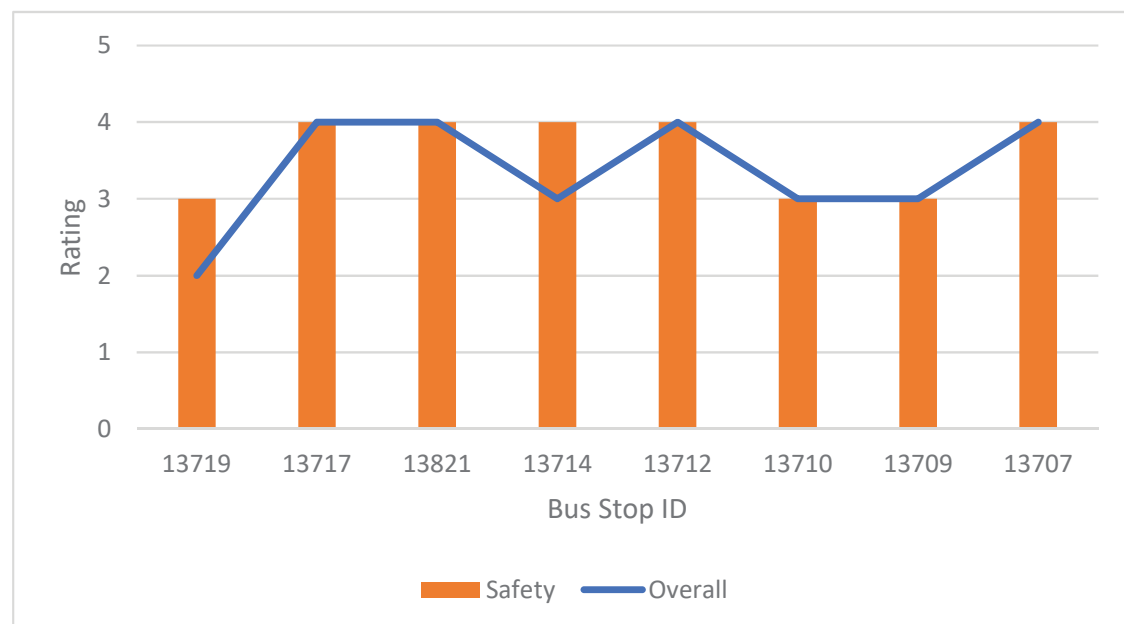


Source: [https://docs.google.com/spreadsheets/d/1dHdUuxrhd\\_aJEIhQI9zdFryV4F-Q8jbhwgs02menyw/edit#gid=2054854252](https://docs.google.com/spreadsheets/d/1dHdUuxrhd_aJEIhQI9zdFryV4F-Q8jbhwgs02menyw/edit#gid=2054854252)

**Accessibility, Connectivity, and Crosswalks**

The bus stop assessment results show that this study area’s “accessibility for people with disabilities” and “pedestrian connectivity (sidewalks)” were rated relatively high, as presented in Chart 2-3, below. At all the stops, the accessibility and connectivity were at least as high as, and higher than the overall rating for each stop. With the exception of one stop, all were rated at a “5” for connectivity. Most of the stops had crosswalks nearby, in sight of the stop.

**Chart 2-3: Ratings for Bus Stop Accessibility and Connectivity**



Source: [https://docs.google.com/spreadsheets/d/1dHdUuxrhd\\_aJEIhQI9zdFryV4F-Q8jbhwgs02menyw/edit#gid=2054854252](https://docs.google.com/spreadsheets/d/1dHdUuxrhd_aJEIhQI9zdFryV4F-Q8jbhwgs02menyw/edit#gid=2054854252)

**Public Art**

There was not any public art present at any of the study area bus stops, with the possible exception of a large mural on the side of a nearby business in proximity to the study area’s southernmost stop, near the gas station at Federal Boulevard and West 20th Avenue (Stop ID 13707).



Photo credit: Kim DeJong

**D. Intercept Interviews**

On October 18th and October 25th, the West Highland team interviewed public transit users and their initial reactions regarding the eight bus stops within the team’s study area.

Approximately 60 percent of the respondents were under the age of 40, and due to the study area’s proximity to North High School, almost forty percent of the respondents were under the age of 20. The majority of respondents identified as either Hispanic/Latino (42 percent) or White (42 percent), and one-third of the respondents identified as female with the remaining two-thirds identifying as male. Across all respondents, lack of car access was the impetus for public transit utilization as 80 percent did not own a vehicle and 60 percent identified this specifically as the reason for taking transit.



Photo credit: Kim DeJong



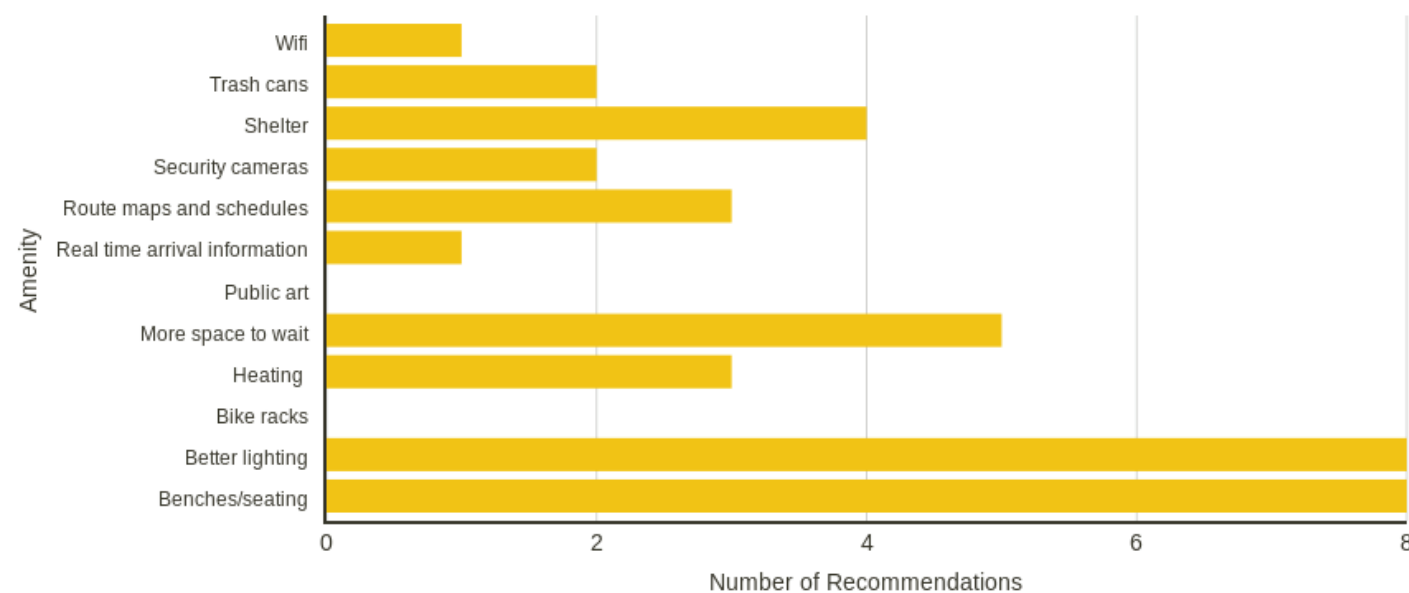
For the most part, amenities provided at the bus stops were deemed satisfactory, particularly at Stop ID 13712 and Stop ID 13821 where the majority of interviews took place. In a few interviews and also identified in the team's bus stop assessments, the proximity to Federal Boulevard and its quick moving traffic was unsettling and to some respondents, made the bus stops feel unsafe. Overall, 76 percent of respondents deemed the bus stops average or better. The top four recommended improvements were more seating, better lighting, shelter and more space to wait. Exhibit 2-3 provides a visual summary.

Chart 2-4, below presents respondent recommendations. From this chart, it can be seen that the majority of respondents were concerned with the lack of lighting and adequate seating. Additionally, shelters and more waiting spaces were other areas that riders felt were lacking. Overall, public art, bike racks and arrival information were not priority bus stop improvements.

**Exhibit 2-3: West Highland Bus Stop Interviews**



**Chart 2-4: West Highland Bus Stop Recommendations via Intercept Interviews**



## E. Methodology Critique

Overall, the team felt that the plan was laid out efficiently. The bus stop investigations were completed through a cell phone application that was user friendly and easy to complete while at the bus stops. One critique of this method could be the fact that individuals may have different opinions on rankings. As a team, we tried to develop similar rankings in order to maintain consistency. However, the team felt that not having a universal system among all teams could be a setback to the project. If every team has a different ranking, then results could be skewed.

Regarding the intercept interviews, many of the questions were useful, but the team did conclude that some questions could have been phrased differently. For example, Question 9 was not received well by the interviewees; often, the team had to rephrase the question in order for it to be understood by the interviewees. In addition, Question 8 was almost too open ended. Often when asking this question, interviewees could not think of any qualities right away. After giving some examples and prompting, they would find items they agreed with. However, this may just be because the team member was giving them the choices. The question may have worked better if it compared a few amenities or if the team member was instructed to let the interviewee read the list. In addition, for this question some of the amenities did not need to be included; for example, heating is a resource that will likely not be present at any of the bus stops, so it does not seem necessary to have on the list.

The team also found that the two-hour time allocation was rather unrealistic. The team went out on two separate occasions to complete all the interviews. The first meeting took about three hours and the team gathered about 75 percent of all interviews; however, the first hour, the team did not have great luck gathering interviews. After going out a second time in the afternoon, the team was able to gather all interviews in about an hour.

Overall, the team had great success in the fieldwork part of the investigation. If done a second time, meeting times may have been different; the team found that the afternoon was more lively than the morning for gathering intercept interviews.

The team learned the importance of conducting site investigations and interviews in planning. It was eye opening to see how much work goes into simply preparing for these investigations, and it is arguably the most important part of data collection. Had the team not conducted previous windshield and walking surveys, it would have been difficult to plan out routes and locate all the bus stops in a timely manner. In addition, the windshield surveys also gave insight into which bus stops may be the most successful in regards to popularity for gathering interviews.

Finally, the team also learned the importance of going into the field and learning the opinions of bus riders. These opinions are invaluable for the planning process, and often transit users are wary of planning entities. However, after gaining trust, the interviewees truly opened up and gave thoughtful insights on ways that these bus stops can be improved. Without these opinions, public entities are merely guessing about which amenities are important and which issues mean the most to the city's transit users.



## Chapter 3:

# Gaps and Recommendations

This chapter concludes the Bus Stop Assessment Study. The first section, Transit/Pedestrian Infrastructure Gaps discusses the key issues that the team identified through the assessments and interview process. Following the identified gaps, the team makes recommendations based on these findings in Transit/Pedestrian Recommendations.

## A. Transit/Pedestrian Infrastructure Gaps

### Existing Transit/Pedestrian Infrastructure Gaps

The team identified gaps relating to the existing elements of transit and pedestrian infrastructure at or near the bus stops in the study area. These gaps largely included space at each of the stops. For example, some of the most popular bus stops did not appear to have adequate space to accommodate all of the users. This leads to an unpleasant experience as users felt crowded and there was not enough benches or space to sit while waiting for a bus. Additionally, another gap relating to space included the lack of a buffer between the stop and automobile traffic on Federal Boulevard. On Federal Boulevard, the speed limit is 40 mph, and often traffic may be moving even faster than that. Many bus stops were no more than a few feet away from the curb. This contributes to a general feeling of lack of safety and may lead to users not using those bus stops without an adequate buffer.



Photo credit: Kim DeJong







Photo credit: Tara Sorrels

### Missing Transit/Pedestrian Infrastructure Gaps

The team identified a handful of transit and pedestrian infrastructure elements at or near the bus stops in the study area that were missing to some degree. These included missing bus stop elements such as shelters, and supporting pedestrian elements like signaled crosswalks, and signs. In summary:

- 1) Lack of shelters: only two of eight stops had shelters
- 2) Poorly designed crosswalk: curb cut through median for crosswalk, but no signs, lights, or paint to indicate safe crossing
- 3) Lack of route and schedule information: only one of eight had information



Photo credit: Kim DeJong

### Transit-Rider/Pedestrian Experience Gaps

The team also identified transit-rider/pedestrian experience gaps, reflecting broader environmental issues that diminish a transit-rider's or pedestrian's experience. These included poor maintenance (litter, cracked sidewalks), safety issues (speeding cars, complete lack of lighting, and crime concerns), environmental issues (lack of shade, air pollution, noise) as well as poor aesthetics. In summary:

- 1) Poor maintenance: litter, overflowing trash cans
- 2) Safety: speeding cars, lack of lighting
- 3) Environmental: lack of shade, air pollution, noise

## B. Transit/ Pedestrian Infrastructure Recommendations

### Big Picture

In macro terms, the existing and missing transit/pedestrian infrastructure gaps as well as the transit-rider/pedestrian experience gaps are addressed in the plans that apply to the study area, particularly *Denver Moves: Transit Plan*. Other plans include the *Comprehensive Plan 2040*, *Blueprint Denver*, *West Highland Neighborhood Plan*, and *Federal Boulevard Corridor Plan*. Although the *West Highland Neighborhood Plan*, written in 1986, includes the need for more bus stop shelters, this analysis will focus on newer plans such as *Denver Moves: Transit* which includes a more robust assessment of bus stop infrastructure.

Because Federal Boulevard is identified as a “High-Capacity Transit Corridor” within the transit plan (*Denver Moves: Transit Plan*, p. 3-10) this lays out an implementation for the infrastructure needed to address the gaps. By creating a bus-only, dedicated transit lane, such as in the conceptual graphic of a high-capacity transit corridor pictured below-- would act as a buffer between the traffic and pedestrians waiting at or travelling to and from the bus stops.

### Exhibit 3-1: Conceptual Graphic of a High-Capacity Transit Corridor in Denver





Another one of the macro, big picture ideas would be to add protected bike lanes to increase access to the bus transit on Federal Boulevard. There are currently no bike lanes on Federal Boulevard and adding them would require protection of a median or trees to avoid bicyclists being exposed to the high volumes of traffic on this street. This could be done in conjunction with the high-capacity transit corridor development.

Since *Denver Moves: Transit* has been adopted by the City and County of Denver, its success now relies on implementation. Within Chapter 3: Denver's Big Moves, includes the "Implement High-Quality and Reliable Transit" implementation plan. The actions listed in the plan include improving transit stops through design (*Denver Moves: Transit Plan*, p. 3-21), such as amenities including shelters, benches, trash receptacles, and rider information (print and real-time). This alone, would go a long way to directly address many the gaps found in the study area.

### Specific Solutions

In micro terms, there are specific changes that could be made to some of the stops in the West Highland/Sloan Lake study area that would improve the safety and experience for transit-riders and pedestrians. The following analysis provides a recommendation for each gap category based on the *Denver Moves: Transit Plan*.

#### Proximity to Traffic

The most concerning existing transit/pedestrian infrastructure gap was that the benches and platforms for transit riders to wait for the bus were extremely close to the street and traffic with no buffer whatsoever. Bus Stop ID 13719 was one where the bench looked like it was in the middle of traffic as seen in the photo shown to the right. If a car lost control or if there was a crash, there is nothing buffering the pedestrians on that bench from the dangers of the heavily trafficked street. To improve this stop, the team recommends at the very least, to move it back from the street and create a buffer around the stop so the cars pulling in and out of the parking lot cannot get as close as the car in the photo below. The buffer could include a structure for the bus stop so that it is at least more visible for people operating vehicles around it.



Photo credit: Krista Runchey

#### Lack of Shelters

The most common missing transit/pedestrian infrastructure gap, was that of missing bus stop shelters. Six of the eight stops assessed were missing any kind of shelter from the elements. Based on the team assessment and interviews, the consensus was that shelters should be a standard design element for a basic bus stop, in line with the *Denver Moves: Transit Plan*.



Photo credit: Tara Sorrels

#### Unmarked Crosswalks

Even more concerning than the lack of shelters was the poorly designed crosswalk near Bus Stop ID 13710. To improve this stop, there will need to be a visible cross walk with signage and technology that lets people know when they can cross safely. The crosswalk needs to be more visible to vehicles as well. This would include painting the crosswalk lines in the street and putting up pedestrian crossing signs.



Photo credit: Kim DeJong

#### Lack of Maintenance

Some of the Transit-Rider/Pedestrian Experience gaps found during this study were the lack of lighting, cleanliness, and route information. Bus Stop ID 13714 was adopted by the St. Dominic Parish church behind it, but it was covered in trash.

The recommendation for Bus Stop ID 13714 would be to review the responsibilities of those entities that adopt bus stops and enforce those responsibilities to ensure upkeep. Additionally, the same stop lacked lighting and route information. These shortcomings were common among most stops in the study area.



Photo credit: Tara Sorrels

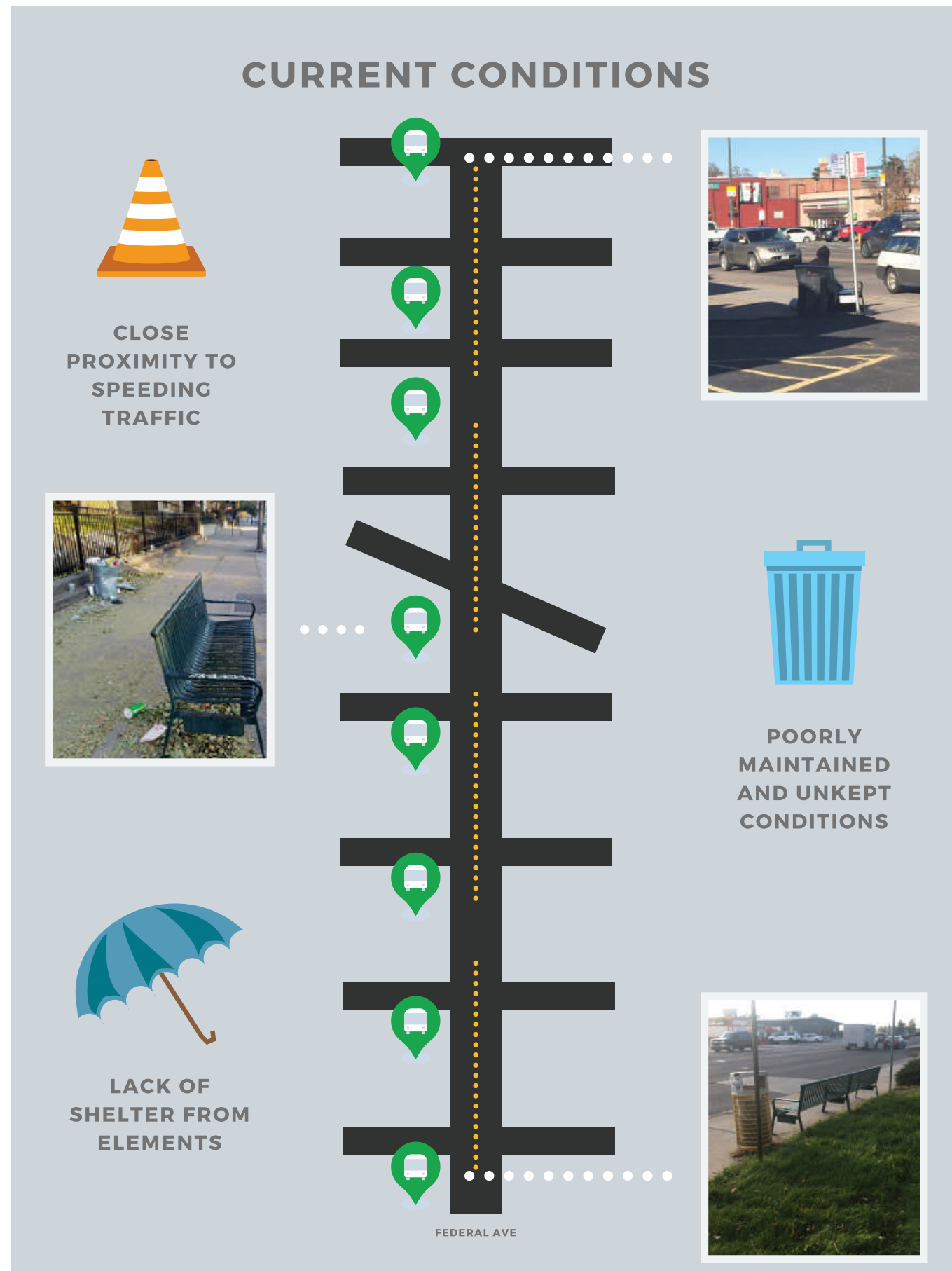
### RECOMMENDATIONS SUMMARY

Exhibits 3-2 and 3-2 on the following pages visualize the gaps and recommendations. The following summary of recommendations to increase transit-rider/pedestrian experience apply to all Federal Boulevard bus stops within this study area.

- 1) Create a buffer from traffic, for safety and comfort.
- 2) Add shelters, for safety and protection from elements.
- 3) Make crosswalks that accsss stops visible to drivers, for safety.
- 4) Provide trash cans, for cleanliness and comfort (keep them maintained).
- 5) Add lighting, for safety.
- 6) Add route information, for ease of transit use (large font and easy to read in both English and Spanish).
- 7) Add tree coverage, for shade, and to buffer traffic noise and pollution

Both macro and micro recommendations would actively implement *Denver Moves: Transit*, *Blueprint Denver 2019*, and *Vision Zero* strategies. Creating a corridor that is safe and pleasant for pedestrians and effective for frequent transit routes requires all these recommendations be implemented.







## WORKS CITED

### Chapter 1

- Bernstein, A., Solomon, N., Yuen, L., & Miner, C. "Back of the Bus: Mass Transit, Race, and Inequality. Transportation Nation. N.d. Retrieved from: <https://project.wnyc.org/backofthebus/>
- Denver Bike Map. 2019 Edition. Denvergov.org. Retrieved from <https://www.denvergov.org/content/denvergov/en/bicycling-in-denver/resources/bike-maps.html>
- Denver County Census Tract Map. Retrieved from [https://www2.census.gov/geo/maps/dc10map/tract/st08\\_co/c08031\\_denver/DC10CT\\_C08031\\_002.pdf](https://www2.census.gov/geo/maps/dc10map/tract/st08_co/c08031_denver/DC10CT_C08031_002.pdf)
- DeJong, Kim. General neighborhood stock photography
- Education and the human capital challenge. The Chung Report. Published Apr 19, 2017. Retrieved from <https://thechungreport.com/educational-attainment-explained/>
- U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates. Census.gov
- Walker, Jarrett. "Race, Racism, and Transit Planning. Human Transit. 25 June, 2014. <https://humantransit.org/2014/06/race-racism-and-transit-planning.html>

### Chapter 2

- Barnhouse, M.A., Images of America: Northwest Denver. Arcadia Publishing. 2012.
- DeJong, Kimberly. Photographs for Windshield/Walking Survey, Assessments, general neighborhood stock photography.
- Landmark Bosler House is Sold. March 22, 2016. Denver.gov. Retrieved from <https://www.denvergov.org/content/denvergov/en/community-planning-and-development/news/2016/bosler-house-is-sold.html>
- Denver Children's Advocacy Center. (n.d.) What We Do. Retrieved from <https://www.denvercac.org/what-we-do>
- Runchey, Krista. Photographs for Assessments.
- The Salvation Army. (n.d.) About Lambuth. Retrieved from [https://lambuthfamilycenter.salvationarmy.org/lambuth\\_family\\_center/about-lambuth](https://lambuthfamilycenter.salvationarmy.org/lambuth_family_center/about-lambuth)
- Sorrels, Tara. Photographs for Assessments.

### Chapter 3

- City and County of Denver. (2019). Denver Moves: Transit. Retrieved from <https://www.denvergov.org/content/denvergov/en/denveright/transit.html>
- City and County of Denver. (2019). Comprehensive Plan. Retrieved from [https://www.denvergov.org/content/dam/denvergov/Portals/Denveright/documents/comp-plan/Denver\\_Comprehensive\\_Plan\\_2040.pdf](https://www.denvergov.org/content/dam/denvergov/Portals/Denveright/documents/comp-plan/Denver_Comprehensive_Plan_2040.pdf)
- City and County of Denver. (1986). Highland Neighborhood Plan. Retrieved from [https://www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/Plans/Highland\\_Neighborhood\\_Plan.pdf](https://www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/Plans/Highland_Neighborhood_Plan.pdf)
- City and County of Denver. (1995). Federal Boulevard Corridor Plan. Retrieved from [https://www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/Plans/Federal\\_Bldv\\_Corridor\\_Plan.pdf](https://www.denvergov.org/content/dam/denvergov/Portals/646/documents/planning/Plans/Federal_Bldv_Corridor_Plan.pdf)
- City and County of Denver. What is Vision Zero. Retrieved from <https://www.denvergov.org/content/denvergov/en/vision-zero/what-is-vision-zero.html>



