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Defining the Hudson-Bergen Light Rail Catchment Area

FINAL REPORT
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The objective of this research study was to conduct a comprehensive onboard survey of Hudson Bergen Light Rail (HBLR) weekday riders and use the results of the survey and analysis of secondary data to identify the ridership catchment area of the HBLR system, in the context of its interaction with other transportation modes in the area. Analysis of 3,300 completed surveys found that the vast majority of HBLR riders are frequent users and more than 80 percent of all trips made on the HBLR are for work commute purposes. Most riders live nearby and walk to their boarding station, but a substantial number of riders also drive to stations, use NJ TRANSIT trains, PATH trains, and buses to access stations. Most riders using the HBLR travel to destinations within Hudson County. For HBLR riders who travel to New York, PATH is the predominant egress mode. Approximately two in five HBLR riders frequent area businesses within 1/2-mile of their boarding station. In total, HBLR riders report spending $3.4 million per month and more than $41 million annually in station areas. Evidence from this study suggests that the HBLR plays a dual role in northern New Jersey transportation landscape. Similar to many light rail systems throughout the world, the HBLR serves an important function as a collector/distributer system. In the case of the HBLR, the system facilitates intra-county travel in Hudson County along the waterfront. At the same time the HBLR also connects travelers to the larger regional transportation system facilitating inter-county travel via a variety of multimodal connections. Based on the results of this study, it can be concluded that the HBLR system and many of its stations have both a micro- and a macro-catchment area. The communities served directly by stations and, in particular, the immediate areas around stations make up the system's micro-catchment area which includes a neighborhood market that is within a 1/2-mile linear buffer of stations and a local market area that extends to a 1-mile linear buffer of stations. The micro-catchment area is defined primarily by walking distance. The HBLR macro-catchment area includes both an intermediate market (a 1-5 linear mile buffer) and a regional market (>5-mile buffer). The macro-catchment area is defined by the various transportation modes that connect with the system at key stations. The intermediate market is connected to the HBLR primarily via bus and auto modes, while the regional market is connected via auto, bus, NJ TRANSIT trains and PATH trains.

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A number of staff members and students from the Edward J. Bloustein School of Planning and Public Policy (EJB) contributed to this research. Senior Research Specialist Mark Walzer helped with field supervision of the survey and data cleaning efforts. Project coordinator Stephanie Crozier assisted with administrative work, including the monitoring of surveyors' time allocation, time sheets, payments, and travel re-imbursement. Doctoral students Da Fei and Mirabel Chen assisted with GIS analysis. Da Fei also helped with data weighting, secondary data analysis, and data cleaning. Sonia Szczesna assisted with data entry, geocoding, and data cleaning. Nina Zou assisted with secondary data analysis. Kamalesh Lalwani, Shivang Shelat, and Liam Kennedy helped with data entry. Approximately 40 graduate and undergraduate students from various programs at Rutgers University undertook the difficult task of conducting onboard surveys. Without the contributions of all of the above, the study could not have been successfully completed. The authors are thankful to the entire research team.

The authors are grateful to those Hudson-Bergen Light Rail riders who spent valuable time participating in the focus groups to provide insights. The authors are equally thankful to the riders who completed the onboard survey. Without their sacrifices, this study could not have been completed.

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EXECUTIVE SUMMARY

The Hudson-Bergen Light Rail (HBLR) system, which consists of three service lines, is a major component of northern New Jersey's transportation network. While several service branches travel east-west, the HBLR system primarily provides north-south transit connectivity along the Hudson River waterfront in Hudson County. The area directly served by the HBLR system has experienced significant growth in recent years, much of it along the HBLR right-of-way concentrated at or near HBLR stations. During the first year of service, the system's average weekday ridership was 3,800 daily riders. Today, average weekday ridership often exceeds 50,000 daily riders.

While much is known about overall HBLR ridership and ridership growth over the past 15+ years, there has never been a comprehensive assessment of HBLR ridership in terms of passenger origins and destinations since the system has been fully operational. In addition, no research to date has sought to define the full "catchment area" of the HBLR system in the context of the system's connectivity with other travel modes. Given forecasted population and employment growth in Hudson County and its surrounding areas, it has become increasingly important to more fully understand the catchment and market areas of the HBLR system and its stations.

The research objectives for this study were to:

- Conduct a comprehensive onboard origin and destination survey of HBLR weekday riders.

- Use the results of the survey and analysis of secondary data to identify the ridership catchment area of the HBLR system, in the context of its interaction with other transportation modes in the area.

To achieve these research objectives, the research team employed a mixed methods approach that included a review of available literature, focus groups to collect qualitative impressions of how HBLR riders use the system, primary data collection in the form of a passenger intercept survey and analysis of both primary and secondary data. A summary of the work performed as part of this study are presented in later sections of this report.

Summary of Key Findings from the Survey

- Over the last several decades, significant population and employment growth has occurred within the immediate environs of HBLR stations, generally within a 1/2-mile of Core System stations. These include: Hoboken Terminal, Pavonia/Newport, Harsimus Cove, Harborside, Exchange Place, Essex St, Marin Blvd and Jersey Avenue stations.

- HBLR riders are somewhat younger than Hudson County's population overall. HBLR riders also have higher household incomes and more vehicles available in their household than Hudson County residents.

- A substantially greater proportion of HBLR riders have lived for only a short time at their current residence when compared to how long Hudson County residents overall have resided in their current location.

- Nearly two-thirds of HBLR riders reported that the HBLR was somewhat or very important when they selected their current residence location. This number increases to more than 80 percent of residents living in their current residences for two years or less.

- The vast majority of HBLR riders use the system to commute to work. Approximately 81 percent of all trips made on the HBLR are for work commute purposes.

- The most common means of accessing the HBLR is by walking. Nearly 52 percent of HBLR riders walk to their boarding station. The second most common mode is auto (16.7 percent), followed by NJ TRANSIT train (11.1 percent), PATH train (9.0 percent), and bus (8.9 percent), respectively. The share of the other access modes is relatively small.

- Just short of 39 percent of riders stated that they lived within a1/4-mile of stations and 53 percent of riders stated that they lived within a 1/2-mile of stations. Approximately 80 percent of riders that walk to access their boarding station reported that they live within a ½-mile of their boarding station.

  There is some reason to view these self-reported distances with caution. It appears that riders often specified a distance from origin to boarding station shorter than the network distance calculated using Geographic Information System (GIS) software. For example, as noted above, 53 percent of riders stated that they traveled a 1/2-mile or less from origin to boarding station; however, GIS-calculated network distances would indicate that only about 36 percent of riders had travel distances of a 1/2-mile or less.

- Most riders using the HBLR travel to destinations within Hudson County. Those who travel to boarding station by NJT train, PATH train, and buses are more likely to travel to Hudson County destinations than those traveling to boarding stations by walking or by car. About 27 percent of those who walk to their boarding station travel to New York destinations, 26 percent of those who travel to boarding station by car travel to New York, but a far smaller share of riders traveling to their HBLR boarding station by NJ TRANSIT train, PATH train, and buses travel to New York.

- For HBLR riders who travel to New York, PATH is the predominant egress mode. About 60 percent of alighting HBLR riders use PATH trains to travel to New York.

- The vast majority of HBLR riders are frequent users. Seventy-one percent of riders use the HBLR at least five days a week. In addition, a majority of riders

have been using the system for more than two years. More than one-third have been using the system of five or more years.

- Consistent with the large share of riders using the HBLR for commute purposes, the share of riders purchasing monthly passes is very high. Almost 52 percent of riders purchase monthly passes (with or without parking and ferry passes). Seventy percent of riders purchase their fares from ticket vending machines.

- Many HBLR riders (40.9 percent) frequent area businesses within 1/2-mile of their boarding station. In total, HBLR riders report spending $3.4 million per month and more than $41 million annually.

- HBLR riders are overall satisfied with different attributes of the service and the vast majority of riders (70.4 percent) reported that they use the HBLR because it is the best choice for them to meet their travel needs.

- Compared to 2005, when the previous system-wide survey was conducted, the share of riders older than age 55 increased from about 10 percent in 2005 to more than 18 percent in 2017. The share of Hispanic riders increased from 18 percent to almost 26 percent.

- Between 2005 and 2017, the share of riders with household income more than $200,000 also increased from 5.4 percent to 12.7 percent, but the share of riders with less than $15,000 income also increased, from 6.9 percent to 10.9 percent.

- Hoboken Terminal, Westside Ave, 9th St/Congress St, and Newport Stations experienced the highest increase in boarding riders between 2005 and 2017.

HBLR Catchment Area Definition

Evidence from an analysis of HBLR riders' origins and destinations and access and egress modes suggests that the HBLR plays a dual role in northern New Jersey transportation landscape. The analyses indicate that the HBLR system and many of its stations have both a macro- and a micro- catchment area that includes neighborhood, local, intermediate and regional markets. Similar to many light rail systems throughout the world, the HBLR serves an important function as a collector/distributer system. In the case of the HBLR, the system facilitates intra-county travel in Hudson County along the waterfront. At the same time the HBLR also connects travelers to the larger regional transportation system facilitating inter-county travel via a variety of multimodal connections.

The communities served directly by stations and, in particular, the immediate areas around stations make up the system's micro-catchment area which includes a neighborhood market that is within a 1/2-mile linear buffer of stations and a local market area that extends to a 1-mile linear buffer of stations. The micro-catchment area is defined primarily by walking distance. Network walking distances of one mile or less generally fall within a 1/2-mile linear buffer of stations, while network walking distances

of between one and 1.5 miles generally fall within a 1-mile buffer of stations. All of the HBLR stations serve a neighborhood market.

Seven stations (2nd Street, Harborside, Essex Street, Garfield Avenue, Martin Luther King Drive, Richard Street, and Danforth Avenue) serve primarily a neighborhood market. Six stations appear to also serve an extended local market that encompasses the area within a 1-mile linear buffer of stations. These include: Lincoln Harbor, 9th Street /Congress Street, Harsimus Cove, Marin Boulevard, Jersey Avenue, and 8th Street.

The HBLR macro-catchment area includes both an intermediate market (a 1-5 linear mile buffer) and a regional market (>5-mile buffer). The macro-catchment area is defined by the various transportation modes that connect with the system at key stations. The intermediate market is connected to the HBLR primarily via bus and auto modes, while the regional market is connected via auto, bus, NJ TRANSIT trains and PATH trains.

In addition to serving the neighborhood market, five stations (Bergenline Avenue, Port Imperial, Westside Avenue, 45th Street and 22nd Street also serve an intermediate market area. The share of riders accessing intermediate market stations by auto and bus is generally greater than neighborhood and/or local market stations. This is particularly true for Bergenline Avenue and Port Imperial stations which have a bus access mode share 32.1 and 46.2 percent respectively. These stations appear to be extending the reach of the HBLR into southern Bergen County.

Finally, there are six stations (Tonnelle Avenue, Hoboken Terminal, Newport, Exchange Place, Liberty State Park and 34th Street) that serve a regional market area in addition to intermediate, local and neighborhood markets. These stations have a catchment area that extends beyond a 5-mile linear buffer of the stations. The share of riders accessing these station by modes other than walking is substantially higher than other stations and mean network access distances range up to 23.5 miles. For these stations, multimodal connections via bus, NJ TRANSIT trains, PATH trains and park and ride lots extend the reach of the HBLR into Bergen, Essex, Middlesex, Monmouth, Morris, Passaic, Sussex, and Union Counties in New Jersey as well as New York City and Orange and Rockland Counties in New York. Figure ES1 presents a map of the HBLR system that depicts the market area typology of HBLR stations.

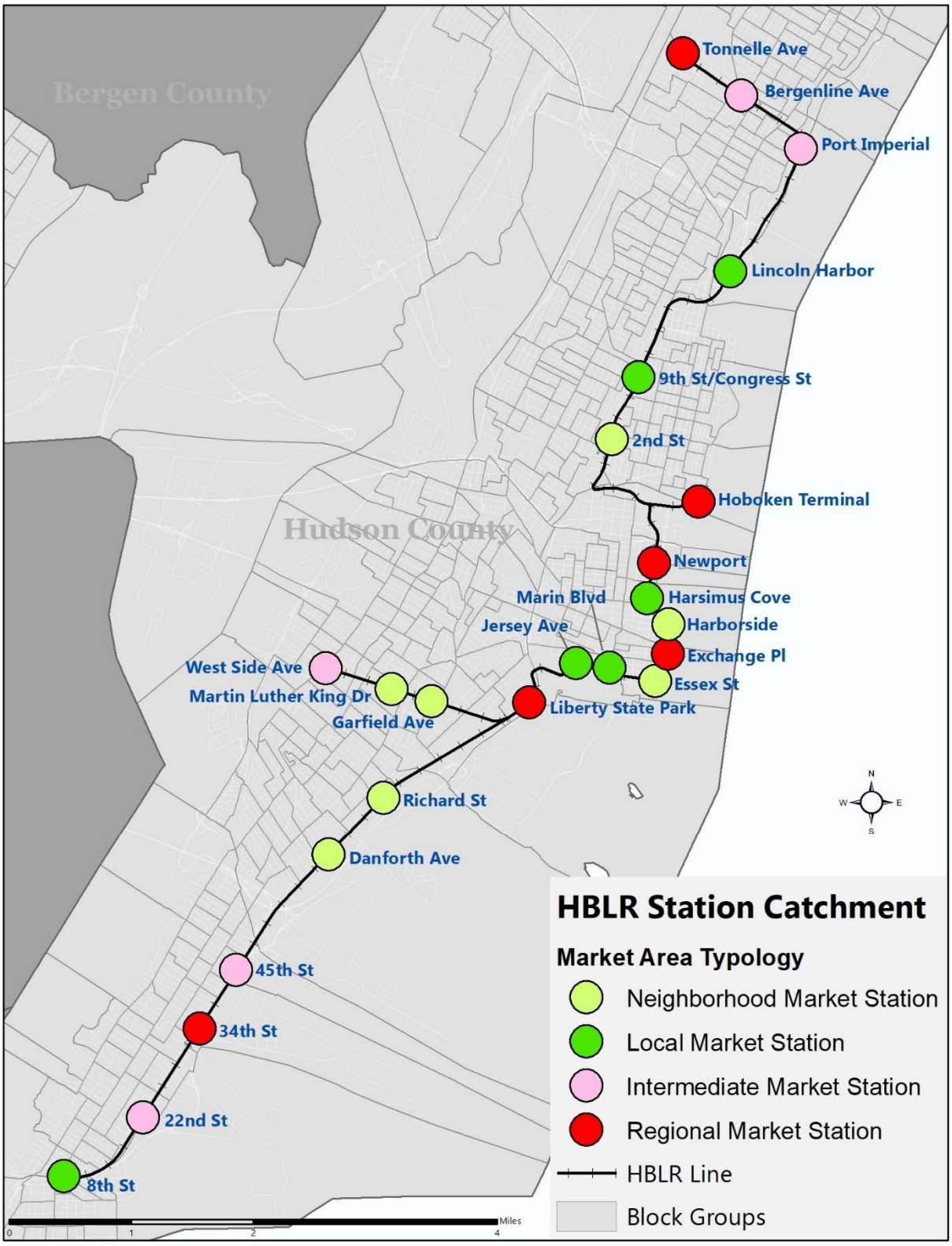

Figure ES1. HBLR Catchment Area Station Market Typology

BACKGROUND

The Hudson-Bergen Light Rail (HBLR) system, which consists of three service lines, is a major component of northern New Jersey's transportation network. While several service branches travel east-west, the HBLR system primarily provides north-south transit connectivity along the Hudson River waterfront in Hudson County. The first phase of the system, which included lines connecting the 34th Street station in Bayonne to the Exchange Place station in Jersey City along the southern branch, and the West Side Avenue station to the Liberty State Park station along the western branch, began operating in April 2000.

Subsequent service extensions included: north to Pavonia/Newport in November 2000; north to Hoboken Terminal in 2002; south to 22nd Street in Bayonne in 2003, north to Lincoln Harbor in 2004; north to Port Imperial on 2005; north to Tonnelle Avenue in North Bergen in 2006; and finally, south to 8th Street Station in Bayonne in 2011. Today the HBLR system is over 17 miles long with 24 stations, providing daily service to seven municipalities along the Hudson River, including Bayonne, Jersey City, Hoboken, Weehawken, Union City, West New York, and North Bergen (See Figure 1).

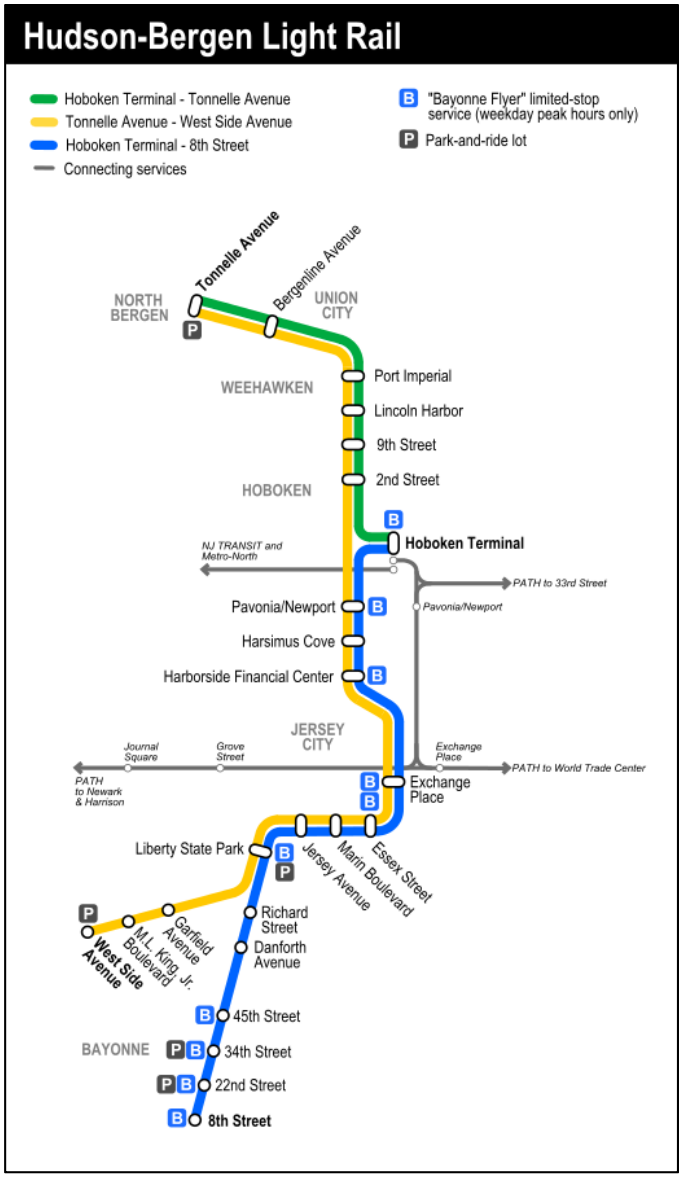

Figure 1. Hudson-Bergen Light Rail service lines
(Source: Port Authority of NY and NJ)

The area directly served by the HBLR system has experienced significant growth in recent years, much of it along the HBLR right-of-way concentrated at or near HBLR stations. During the first year of service, the system's average weekday ridership was 3,800 daily riders. Today, average weekday ridership often exceeds 50,000 daily riders.

While much is known about overall HBLR ridership and ridership growth over the past

15+ years, there has never been a comprehensive assessment of HBLR ridership in terms of passenger origins and destinations since the system has been fully operational. In addition, no research to date has sought to define the full "catchment area" of the HBLR system in the context of the system's connectivity with other travel modes. Given forecasted population and employment growth in Hudson County and its surrounding areas, it has become increasingly important to more fully understand the association between the HBLR system catchment area and potential new developments within the system's area of influence.

Growth in the HBLR Corridor

Hudson County's population growth has far exceeded the growth in other New Jersey counties in recent years. According to the US Census Bureau, Hudson County's population increased by nine percent in the seven years between 2010 and 2017, when New Jersey's population increased by only 2.4 percent. Between 1990 and 2017, the county's population increased by 25 percent, from around 553,100 to 691,600. Most of the population growth in Hudson County has been concentrated along the HBLR corridor, especially in the HBLR's Core System station areas.

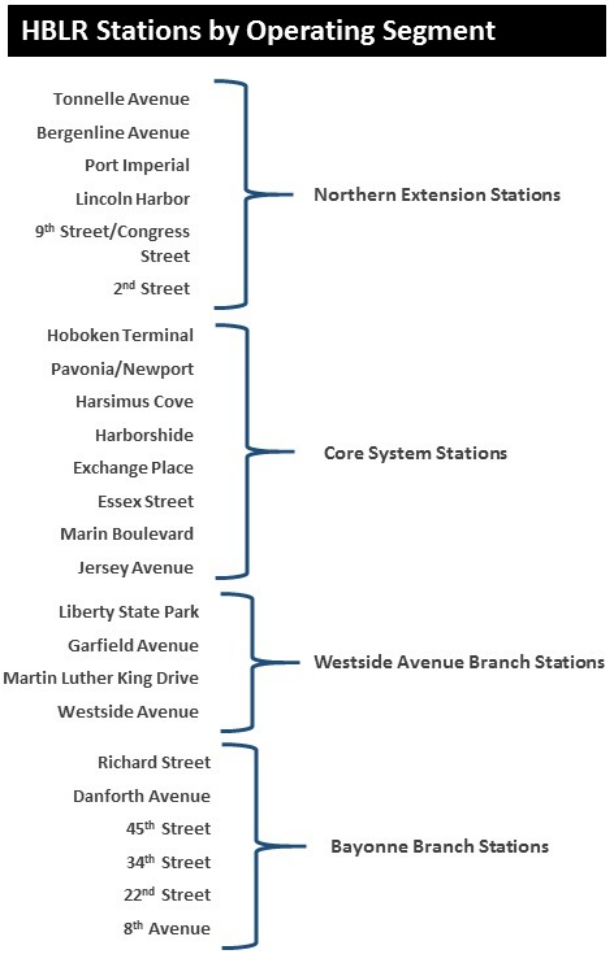

Figure 2. HBLR stations by operating segment

Figure 2 lists each HBLR station by operating segment. Figure 3 shows the change in mean population of census tracts located within a 1/2 mile of the HBLR stations between 1990 and 2013. Although population increased in all station areas during this period, growth was more significant in the areas surrounding Core System stations between Hoboken Terminal and Jersey Ave Station in Jersey City. This is likely due to many factors. For example, these Core System station areas were generally less populated in 1990 than the Northern Extension, Westside Ave Branch and Bayonne Branch station areas. In addition, the area between Hoboken Terminal and Jersey Ave station has been the focus of intense redevelopment activity over the past thirty years. In that time, many

large scale residential and mixed use development projects have been completed in this area over the past three decades.

Figure 4 shows the construction of residential units within 1/2 mile of HBLR stations between 1997 and 2016. The figure shows that Core System station areas, experienced the most growth in residential units. This makes sense given the fact that population growth around the same stations over a similar time period. Hoboken Terminal is the only station around which a substantial population growth took place despite not having similarly substantial new residential development. It can also be observed from Figure 4 that residential development has been higher in the Northern Extension station areas than in the Westside Avenue Branch and Bayonne Branch station areas.

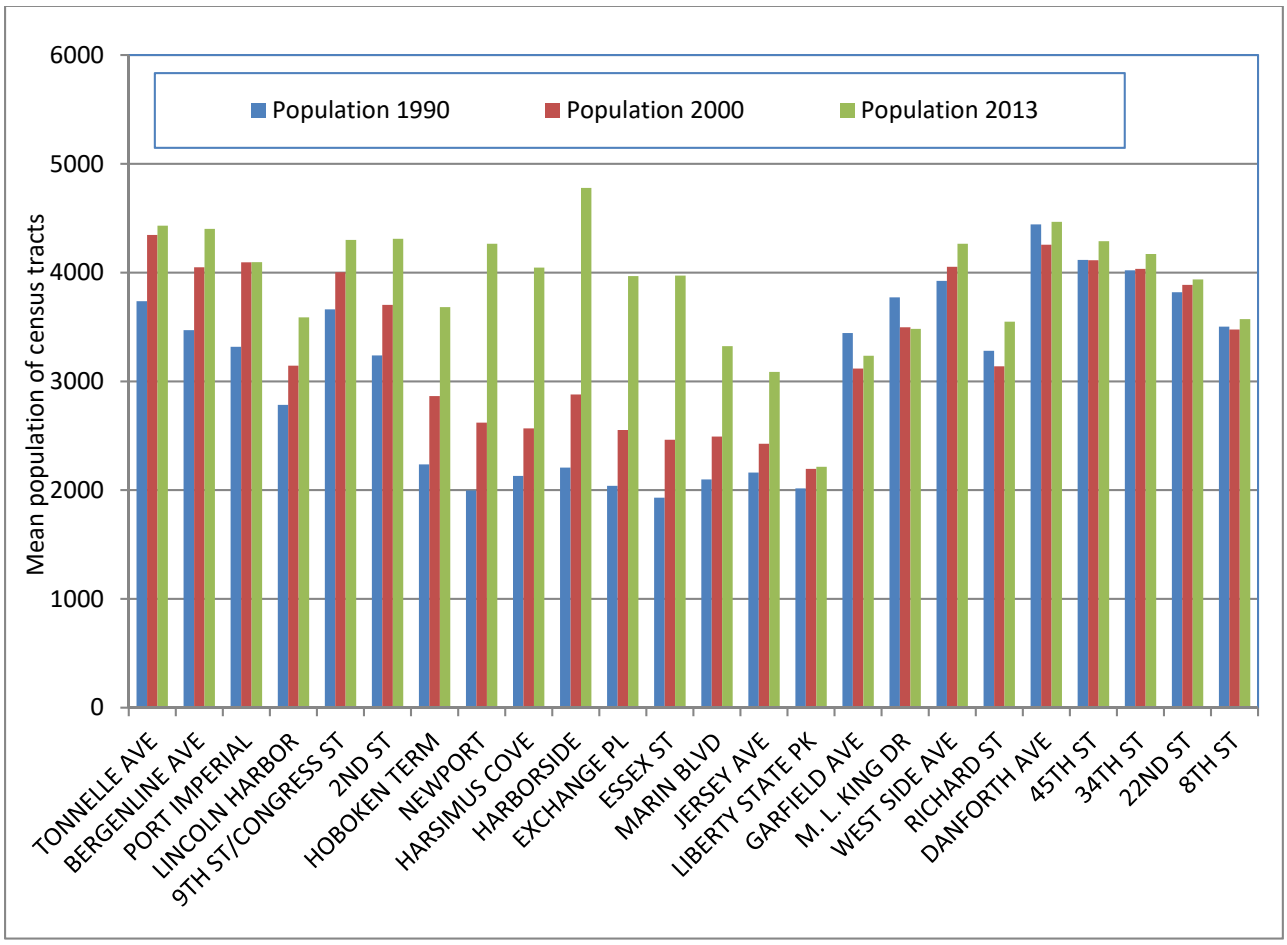

Figure 3. Mean population of census tracts within 1/2 mile of HBLR stations
(Source: Geolytics and American Community Survey)

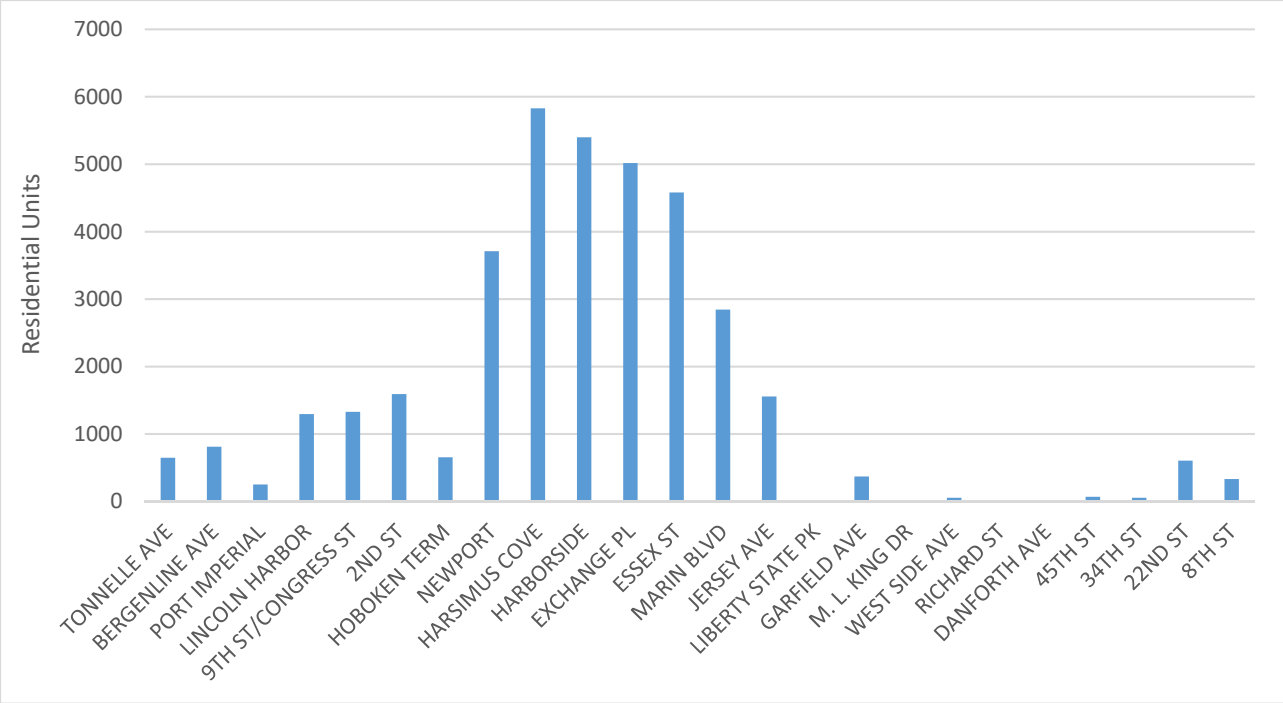

Figure 4. Residential units constructed within 1/2 mile of HBLR stations between 1997 and 2016
(Source: VTC HBLR Development Study)

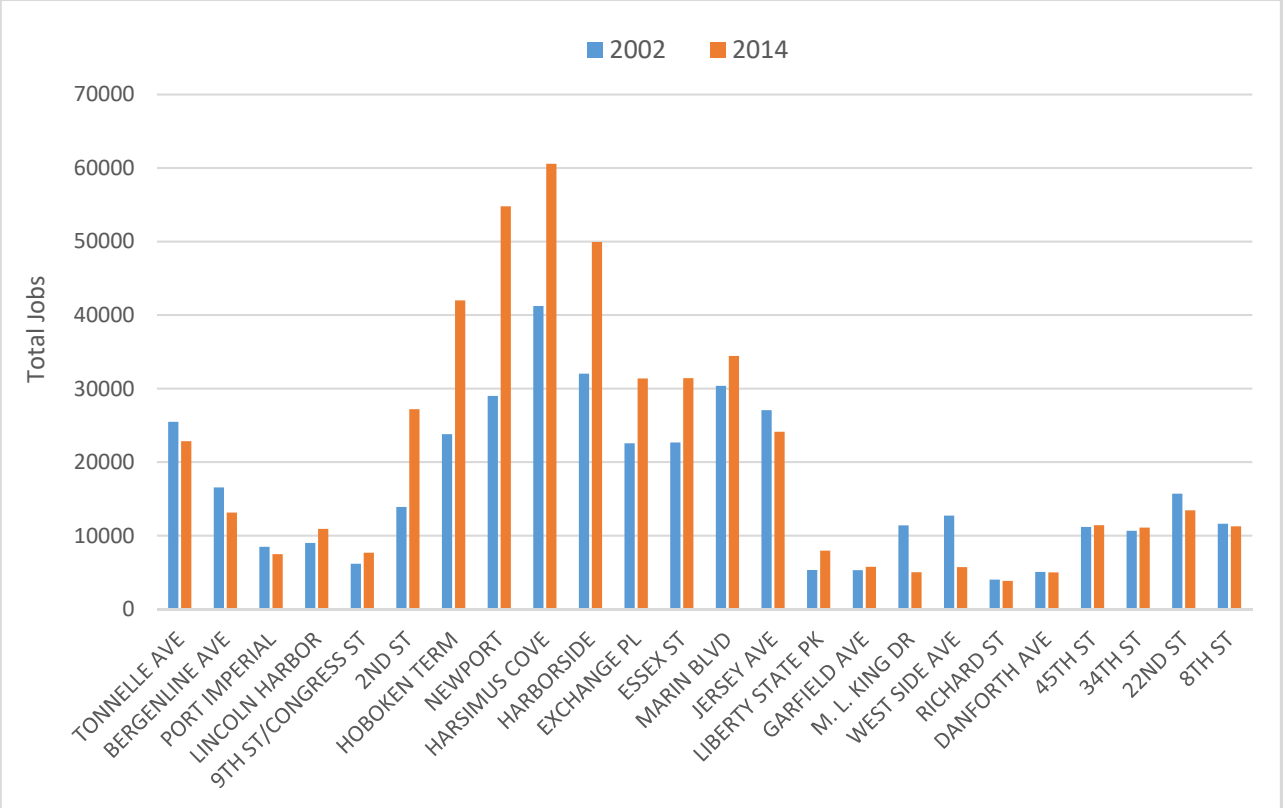

Figure 5. Growth of total jobs within 1/2 mile of HBLR stations between 2002 and 2014
(Source: Longitudinal Employer-Household Dynamics)

Figure 5 shows growth of jobs in all sectors within a 1/2 mile of HBLR stations between 2002 and 2014. As shown in the figure, job growth was strongest in the Core System station areas and in the 2nd Avenue and Tonnelle Avenue station areas along the Northern Extension. A number of the remaining outlying station areas lost jobs between 2002 and 2014. A reason for this pattern may be that the economic recovery from the Great Recession was slower in these station areas. Another possibility is that some jobs relocated to other locations, some potentially closer to other stations.

Characteristics of People and Places Near Stations

Five-year summary data from the 2016 American Community Survey (ACS) was analyzed to examine various demographic and socioeconomic characteristics of individuals living within a 1/2-mile buffer of the 24 HBLR stations. As shown in Table 1, the share of older adults (age 65+) is generally lower in Core System station areas and with a few exceptions, generally higher in the Northern Extension, Westside Avenue Branch and Bayonne Branch station areas. One reason for this pattern could be that the residential neighborhoods along the outlying operating segments are more established and contain older housing stock, typically in smaller scale residential buildings; whereas, the neighborhoods surrounding the Core System are newer. Housing in most of the Core System station areas includes newer high-rise, luxury apartment buildings.

Table 1 – Persons age 65+, race, ethnicity, education, and annual household income of residents within 1/2 mile of stations

Station	% Age 65+	% Non-White	% Hispanic	% Bachelor Degree+	Median HH Income
Tonnelle Ave	8.6	27.7	84.0	17.9	55,495
Bergenline Ave	12.3	35.6	86.2	16.7	42,997
Port Imperial	13.3	34.1	68.4	34.0	65,386
Lincoln Harbor	12.4	26.9	47.1	43.8	64,989
9th St/Congress St	7.6	28.9	36.5	59.9	87,755
2nd St	7.8	33.6	31.9	60.0	90,161
Hoboken Terminal	4.7	33.1	11.2	81.2	126,018
Newport	4.9	66.9	13.4	79.8	125,317
Harsimus Cove	7.5	55.1	16.9	76.1	128,227
Harborside	5.6	49.7	13.0	81.2	147,289
Exchange Pl	4.9	48.7	11.2	84.1	154,351
Essex St	6.5	44.1	13.3	81.6	141,093
Marin Blvd	8.0	42.2	19.0	74.8	110,107
Jersey Ave	6.8	38.9	19.4	75.5	106,120
Liberty State Park	6.5	63.2	33.8	53.8	88,961
Garfield Ave	9.1	85.9	25.0	18.6	35,785
Martin Luther King Dr	9.3	87.9	23.6	19.8	35,385
West Side Ave	11.2	76.5	23.7	32.2	48,963
Richard St	11.4	90.0	23.8	14.3	35,292
Danforth Ave	12.0	82.2	30.7	14.2	38,222
45th St	14.2	36.9	24.4	33.8	59,507
34th St	17.1	24.1	23.3	33.5	57,510
22nd St	9.7	33.3	30.4	26.0	46,460
8th St	12.4	29.6	26.2	27.5	68,355

The share of non-White persons and Hispanic persons varies considerably along the various HBLR operating segments. In many station areas the share of non-White persons is low, while the share of Hispanic persons is high. The data also shows that compared to other station areas, the share of both non-White persons and Hispanic persons is lower in the station areas located along the Bayonne Branch. This indicates that these station areas have a higher share of non-Hispanic White residents.

The share of Hispanic persons is highest in the Northern Extension station areas, whereas the share of non-White persons is generally higher along Bayonne Branch and Westside Avenue Branch, especially in the Garfield Ave, Martin Luther King Dr, Danforth Ave, and Richard St station areas. Educational attainment is significantly higher in Core System station areas. Consistent with the high level of education, the median household income is also significantly higher in Core System station areas than station areas in the other three operating segments.

Table 2 shows the share of workers commuting by public transit (all modes), median age of structures, share of households with 50 more units in structure, median home value, and median monthly rent within 1/2 mile of HBLR stations. Some valuable insights about the areas near stations can be gleaned from these data.

Table 2 – Transit use, age of structures, share of structures with 50+ units, median home value, and median gross monthly rent within 1/2 mile of stations

Station	Share of Transit Commuters (%)	Median Age of Structures	Share of 50+ Units in Structure (%)	Median Home Value ($)	Median Monthly Rent ($)
Tonnelle Ave	36.5	54	3.2	273,776	1,354
Bergenline Ave	43.0	65	10.3	278,323	1,116
Port Imperial	46.0	57	27.1	369,133	1,357
Lincoln Harbor	46.6	65	19.3	369,138	1,288
9th St/Congress St	50.4	59	21.9	439,611	1,608
2nd St	51.3	54	19.3	374,870	1,633
Hoboken Terminal	68.2	45	53.3	570,546	2,109
Newport	71.0	35	66.9	405,059	2,218
Harsimus Cove	66.1	35	64.6	531,781	2,098
Harborside	61.8	24	79.8	595,090	2,445
Exchange Pl	61.4	24	81.1	643,577	2,514
Essex St	59.9	29	73.9	620,123	2,338
Marin Blvd	62.0	52	45.4	557,931	1,817
Jersey Ave	62.2	57	34.6	577,321	1,826
Liberty State Park	46.3	37	44.2	405,831	1,653
Garfield Ave	40.6	66	2.4	272,847	1,125
Martin Luther King Dr	43.3	62	3.0	291,081	1,099
West Side Ave	38.6	60	2.1	305,570	1,118
Richard St	28.9	63	2.2	245,770	1,102
Danforth Ave	33.9	65	8.5	244,836	1,054
45th St	25.5	75	2.7	315,456	1,252
34th St	24.2	77	0.3	324,047	1,209
22nd St	23.1	67	3.2	307,217	1,107
8th St	20.7	72	1.4	293,712	1,242

Transit commutation rates in Hudson County far exceeds the rate in New Jersey as a whole. In New Jersey, only 11.2 percent workers commute by transit, whereas in Hudson County, 41.3 percent do so. Transit mode share for work trips in 15 of the 24 HBLR station areas exceeds the Hudson County rate. The transit commutation rate among residents living in HBLR Core System station areas averages 64.1 percent, significantly higher than that of residents in living in station areas along the other three operating segments. It is worth noting that several of the Core System stations provide direct connections to PATH and NJ TRANSIT commuter rail services. This may encourage higher rates of transit use. Transit commutation rates are lowest in the Bayonne Branch station areas.

The median age of housing stock in most of the Core System station areas (Hoboken, Newport, Harsimus Cove, Harborside, Exchange Place and Essex Street) and in the Liberty State Park station area is notably less than the other HBLR station areas. The median age of housing stock in these station areas is 45 years and under, which indicates that a substantial portion of the housing in these areas has been constructed since 1980. The newest housing stock exists in the Harborside, Essex Street and Exchange Place station areas, where the median age of housing is 24-29 years old. Also notable is the fact that nearly three-fourths of the housing units in the Newport, Harsimus Cove, Harborside, Exchange Place and Essex Street station areas is situated in large-scale multifamily buildings.

Median home value and rents are also highest in Core System station areas. The Exchange Place station area, which also includes a PATH station, has the highest median home value and rents. With a few minor exceptions, median home values and rents decrease with distance from the Core System stations.

In summary, it is clear from the data that the Core System Station areas are different in important ways from the remaining station areas. Residential buildings in Core System station areas are newer and include a greater proportion of large multi-family buildings. People living in in Core System station areas have higher rates of educational attainment, have higher incomes, and pay more for housing. A separate analysis (not reported here) that compared occupations across station areas found that more than 50 percent of workers living in Core System station areas are engaged in managerial or technology-oriented occupations, whereas the share of such workers varied between 7.4 percent and 45.3 percent for the remaining station areas.

RESEARCH OBJECTIVES AND APPROACH

The research objectives for this study are to:

- Conduct a comprehensive onboard origin and destination survey of HBLR weekday riders.

- Use the results of the survey and analysis of secondary data to identify the ridership catchment area of the HBLR system, in the context of its interaction with other transportation modes in the area.

To achieve these research objectives, the research team employed a mixed methods approach that included a review of available literature, focus groups to collect qualitative impressions of how HBLR riders use the system, primary data collection in the form of a passenger intercept survey and analysis of both primary and secondary data. A summary of the work performed as part of this study are presented in the sections that follow.

LITERATURE REVIEW

The term catchment area originated in the field of geography to define areas from which cities (e.g., New York City), services (e.g., transit services) or institutions (e.g., universities) draw populations, customers, students, et cetera. In urban and regional planning, the term has been used for almost a century to describe the service areas of settlements. In transportation, the term has historically been used for defining the markets of industries and areas served by regional transportation systems. In recent times the term's usage has increased and it has often been used in the context of public transportation, especially regarding transit-oriented developments (TODs). However, catchment areas have many other applications in transit planning, including ridership forecasting, economic development assessment, and network connectivity assessment.

An important task of this study is to define the catchment area of the HBLR system and each of its stations from various perspectives. Toward this end, the research team conducted a review of available literature and past studies on this topic. The reviewed literature was identified through Google Scholar and the Rutgers University Library system. The literature was searched using various relevant keywords. The search was conducted keeping in mind the study's objective of establishing one or more catchment areas for the HBLR system. A total of approximately 100 articles and reports were reviewed. The results of the literature review are summarized below.

HBLR-specific Studies

Only a handful of studies specifically focused on the HBLR and its riders. Two of these studies looked at change in transit ridership and concluded that the HBLR promotes transit ridership in Hudson County. [1,2] In addition, a number of planning studies conducted by various local planning agencies have confirmed the positive influence of the HBLR in promoting public transit usage in Hudson County. (See references *3,4,5,6 and,7.)* In a similar vein, Hudson County identified the HBLR as a catalyst for investment and redevelopment in Hudson County. [8] Academic studies have also shown the importance of the HBLR in raising property value near the system. [9]

Studies on Rail Station Catchment Area

Studies related to rail transit catchment area can be broadly classified into four groups: (a) property value studies; (b) transit-oriented development (TOD) studies; (c) land use, population, and employment impact studies; and (d) gentrification studies. The property value studies in the first category are the most abundant and their primary objective is to examine the impact of transit proximity on the value of properties, including vacant land,

single-family homes, multi-family homes, retail space, and office space. The second category of studies deals with TODs, which sometimes also include discussions on property value. The TOD catchment studies mostly deal with walkable distance from stations and the impact of density on transit. The third category of studies deals with land use, population, and employment changes near transit stations. The last category also focuses on changes near stations, but they use the term gentrification to describe changes in population characteristics, property value, median household income, educational attainment of people, vacancy rate, etc.

The literature review revealed that station catchment areas have been defined in different ways in different studies. In most cases, studies have used a distinct boundary around stations, such as a ¼-mile, ½-mile, or one-mile, as a buffer. [10,11,12] The advantage of such an approach is that it allows comparison of changes in variables (e.g., property value or population growth) within the buffer with changes in the control areas outside the buffer. Some studies have used an outer boundary as well as an inner boundary around stations. [13,14] The inner boundary is often used by studies to account for potential "nuisance effect" of transit. [14]

In comparison to the studies that use a constant distance, other studies have used linear or continuous distance from stations, but some of these studies also set an outer perimeter to exclude areas that are not likely to be affected by transit. [15] For example, a study might set an outer boundary of two miles from stations and then look at property value at different distances within the two-mile radius. Finally, a few studies used continuous distance to create interaction variables, meaning that distance was multiplied to other variables instead of using distance as a separate variable. [16] It is also worth noting that some studies that used continuous distance from stations transformed the distance variable (for example, by assuming a logarithmic or quadratic form) based on the study's assumptions. [17,18]

Most studies using distinct pre-determined catchment area distances adhered to either a 1/2-mile or 1/4-mile buffer around stations, but some used one-mile buffers also. The reasoning in most studies in using a 1/2-mile buffer has been that it is the typical walking distance for most people. However, studies that have truly examined what people's walking distances are have pointed out that walking distances can vary due to the land use characteristics and street networks around stations. [19,20] One study also found that people value one-seat rides, [18] indicating that people may walk longer to the stations that provide one-seat rides to destinations compared to stations that do not provide one-seat rides. Thus, in addition to mere distance from stations, one should also look at walking time to stations, the land uses around stations, the characteristics of the street network around stations, and the quality of transit service itself, including frequency of trains and the possibility of getting one-seat rides to major destinations.

The literature review revealed that studies have often used a smaller buffer (e.g., 1/4-mile buffer) around stations when dealing with retail commercial activities or employment activities, whereas they used larger buffer (e.g., 1/2-mile or one-mile buffer) when dealing with residential properties. [10,21,22] One study that actually examined the consequences of different sizes of catchment areas concluded that a 1/4-

mile buffer is more appropriate for employment-related land uses and a 1/2-mile buffer is more appropriate for residential land uses. (23)

It is also worth noting that studies have used different buffer sizes for different types of areas. For example, one study used a 1/4-mile buffer for areas within a central business district (CBD), but a 1/2-mile buffer outside of CBD. (24) It may be reasonable to use smaller buffer sizes in CBD areas because of the complexity of such areas. Because of the complex land use patterns and transportation networks within CBDs, it may be difficult to discern changes in areas beyond a quarter mile from stations. In such cases, it may not be appropriate to attribute any changes to transit. Furthermore, a larger buffer size in such areas also increases the possibility of overlapping buffers between stations located in close proximity to each other.

The studies that use a linear distance from stations instead of using a pre-determined discrete buffer size such as 1/2-mile buffers could be useful to identify true buffers around stations in that such studies could potentially indicate at what distance there is a change in the variable observed. For example, such studies could potentially show whether people's propensity to walk to stations drops off at ¼-mile, ½-mile or one-mile from stations. However, the studies that used continuous distance from stations mostly dealt with property value instead of walking distance. Since property value and walking distance are not the same, observations from property value studies cannot be used to make inferences about walkability. Furthermore, even among the property value studies that used continuous distance from stations, differences in results can be found. The assumed functional form (i.e., whether linear, negative exponential, quadratic, etc.) can also affect the distance at which property value drops off. For example, the assumption of a negative exponential function may make property value drop off faster with distance than a simple linear form. Thus, even property value studies do not allow generalizations about buffer size or catchment area.

Finally, it is evident from the literature review that almost all studies considered catchment areas of stations as the same even though each study included data from areas near a number of stations. Thus the studies are concerned about average catchment area of stations rather than unique catchment area of each station. From the assertions in some studies that the land uses and street characteristics of the areas near stations as well as the quality of transit service all affect ridership, one can argue that the catchment areas of stations for the same rail line could be different and therefore generalizations should not be made about transit stations as a whole.

Issues Pertinent to the Current Study

The objective of the literature review was to examine whether there is there is a clear understanding from past studies regarding what catchment area should be used when studying rail services such as the HBLR. The review showed that there is no one-size-fits-all catchment area definition. However, it helped to identify issues that should be considered when attempting to define the catchment area of the HBLR system and its stations. These issues include the following:

- Discrete catchment area vs. continuous distance. When a discrete or distinct catchment area is chosen, that catchment area is usually arbitrary, and therefore it may or may not reflect the actual or true catchment area of stations. For example, if the catchment area is set at 1/2-mile buffer with the assumption it is people's typical walking distance, it will be accurate only if a very large proportion of people walk to the stations from around a ½-mile of stations. The problem with this method is that one does not know whether most people residing within the 1/2-mile buffer walk to HBLR stations. An advantage of this method is that it allows comparison of (a) buffer areas with areas beyond buffers, and (b) the buffer of one station with buffers of other stations.

  In contrast, the treatment of distance as a continuous variable has an advantage in that one can avoid having to select an arbitrary catchment area and instead let the data speak for itself. If actual observed data (say, from a survey) shows that there is a natural break in walking distance (say, at 1/2-mile or 3/4-mile), then that distance can be used to define the catchment area. However, this approach is also not free from limitations. For example, it is difficult to define a control area with this method without a certain degree of arbitrariness since there will still have to exist an outer boundary to the area. For example, even if the data shows that 3/4-mile is the distance that most people walk, in order to have a control area, one will still have to set an arbitrary outer boundary such as one or two miles.

- Large area vs. small area. Studies have opted for buffers of different sizes when dealing with different types of activities and different types of locations. For jobs, studies have often preferred smaller buffers, such as 1/4-mile buffers, whereas for residential units or resident population, studies have used larger buffers. Studies for downtown locations also have opted for smaller buffers, whereas studies for less dense locations have opted for larger buffers. Although the areas around a few HBLR stations, such as Hoboken Terminal and Exchange Place, have a fair amount of jobs, the areas around most stations have few jobs. This suggests that if a generic catchment area buffer is set for all HBLR stations, it should probably be set at a1/2-mile distances instead of a 1/4-mile.

- One catchment area for all stations vs. different catchment areas for different stations. Almost all reviewed studies considered catchment areas around stations as average for all stations of the rail systems being studied. For a rail system like the HBLR with stations that vary widely in terms of number of boardings, connection to other modes of transit, parking, and surrounding land uses, it can be argued that the catchment area of stations should be different depending on the unique characteristics of each station. Although different catchment areas for different stations can make analyses complex, it may be worthwhile to let the data show whether the catchment areas of individual HBLR stations should be the same or different.

To conclude, the literature review showed that station catchment areas can be pre-determined, such as a 1/4-mile, 1/2-mile, or one-mile buffer, or the size of the

catchment area can be determined based on distance traveled by riders from station or change in property value with distance from stations. Most studies considered relatively small catchment areas and focused on walking or property value. No study was found that considered the role of other transit modes in affecting ridership or catchment areas of a given system. A reason may be that the effect of other transit modes or routes on a given transit line is usually considered to be minimal. Another reason may be that identifying large catchment areas of a transit line based on its interaction with other transit modes or lines (e.g., transfers) is more complex than identifying the catchment area of a specific mode or system.

CUSTOMER FOCUS GROUPS

The research team worked with NJ TRANSIT staff to organize and conduct two HBLR customer focus groups. The primary purpose of the focus groups was to help NJ TRANSIT and the research team better understand the rationales and thought processes riders use to select the HBLR as their travel mode of choice. The focus groups also provided an opportunity to pre-test the draft questionnaire to be used to conduct an onboard customer survey.

Both focus groups were conducted at Hoboken Terminal on January 18, 2017. The first took place from 5:30 to 7:00 PM. The second took place from 7:30 to 9:00 PM. Twenty-two customers participated in the two sessions. Focus group participants were recruited via email using contact information exported from the NJ TRANSIT Customer Scorecard database. Each focus group participant received a cash incentive of $100, provided by NJ TRANSIT. Research team members facilitated the focus groups whereas NJ TRANSIT staff attended as observers.

Prior to conducting the focus groups, a topic guide was prepared in coordination with NJ TRANSIT. It included the questions and topics to be discussed in the focus groups. Approval of the Institutional Review Board of Rutgers University was sought and received on the topic guide before the focus groups were convened. A copy of the focus group topic guide and summary report of focus group findings is attached as Appendix 1. Key observations and themes gleaned from the focus groups are summarized in the sections that follow.

General Impressions of the HBLR

At the beginning of the focus groups, participants were asked to provide their general impression of the HBLR service and their experiences using the system: The following are observations from that discussion:

- Participants use the HBLR on most weekdays. Only one participant used the HBLR fewer than three times per week. Most used the HBLR Monday through Friday.

- Most participants use the HBLR for commuting to work. Running errands, appointments, and social gatherings were other reasons people use the HBLR, but commuting to work was the primary reason for most participants.

- The majority of participants primarily used the HBLR during the AM and PM commute periods. Only a few participants said they ride the HBLR in off-peak hours.

- When asked what they like most about traveling on the HBLR, participants said it was convenient, comfortable, and affordable. Several participants said driving was frustrating, time-consuming, and unreliable.

- Crowded trains, especially during the AM and PM peak periods, was what most participants considered their least favorite aspect of using the HBLR system. More signage, more comfortable shelters, and better ticket enforcement on the trains were other areas suggested for improvement. Participants also would like to see an etiquette campaign for riders, improved security, and better real time information. Additionally, several participants noted that the elevators at the 9th Street/Congress Street and Bergenline Avenue stations are often out of service.

- The following concerns were mentioned less frequently by participants:
    - The warning system for closing doors does not provide ample time or warning. This is particularly challenging for riders bringing strollers on board.
    - The ticket vending machine is confusing. One participant accidently bought a monthly pass instead of an all-day pass.
    - The Essex Street station does not have a shelter.
    - A station at 1st Street in Bayonne is needed.

How Participants Use HBLR

After providing their general impressions and experience, participants were asked a series of questions about the last trip they took on the HBLR. The following is a summary of participant responses and discussion:

- Participants named the following origin-destination pairs:
    - 22nd Street to Exchange Place
    - 45th Street to Hoboken Terminal
    - Danforth Avenue to Hoboken Terminal
    - Garfield Avenue to Exchange Place
    - Newport to Tonnelle Avenue
    - Bergenline Avenue to Harborside
    - 9th Street to Exchange Place
    - Tonnelle Avenue to Harborside
    - Bergenline Avenue to Hoboken Terminal
    - 8th Street to Newport
    - 9th Street to Newport

- Most participants walk to their stop. Participants who started their last trip at Tonnelle Avenue drove. Those who drove to Tonnelle Avenue said they buy the monthly parking pass.

- All participants said they walk to their final destination.

- Monthly passes are the most common way participants paid for their trip. Four participants buy individual tickets or a ten pack.

- Two participants use the HBLR on a part of their trip to New York City. These participants transfer to the PATH to reach Wall Street and Bryant Park.

Station Spending Patterns

Participants were asked to describe their spending habits in HBLR station areas.

- Most participants visited an eating establishment, convenience store, or coffee shop on their way to the HBLR station. Coffee or snack food purchases are the most common purchases.

- The frequency of participants' visits to coffee shops and eating establishments varied greatly. Whereas some said they visit a business almost every day, others said they go once a week or less often.

- Participants reporting spending between $5 and $200 per month at businesses in the immediate vicinity of HBLR stations. Some individuals said they spend more than $200 on groceries and lottery tickets at locations near HBLR stations.

Relationships between HBLR and Participant Residence Location

Participants were asked a series of questions regarding where they live in relation to the HBLR and how important the HBLR is/was in terms of residential location decisions.

- Although five participants have lived at their address for two years or less, the remainder have lived at their address for 5 to 15 years.

- Most participants live 2 to 10 blocks from a HBLR station. A handful of participants who drive to Tonnelle Avenue live 10 miles or more away from the station.

- Most participants who walk to the closest HBLR station spend about 10 minutes or less walking. One individual walks twenty minutes. Another participant noted that she sometimes walks 40 minutes to work instead of taking the HBLR.

- Only two participants said HBLR service was an important factor in choosing where they currently live. The remainder of participants said HBLR did not factor into their decision. Several participants noted that they would rather live near a PATH station.

- Participants suggested that if they had to move today, transit would be an important factor for them. The HBLR in particular is not important. Participants reiterated their desire to live closer to a PATH station or other transit options.

PASSENGER INTERCEPT SURVEY

As part of this study, the research team conducted an on-board intercept survey of HBLR riders. The survey questionnaire used to collect information from riders was developed in consultation with NJ TRANSIT and informed by input received at two HBLR customer focus groups. The survey questionnaire included 42 questions designed to elicit responses related to trip origin and destination, trip purpose, access and egress modes, transfer patterns, consumer spending at stations, customer satisfaction, and range of other variables including demographic and socioeconomic characteristics. A copy of the survey questionnaire is included as Appendix 2.

The survey was distributed on-board trains and at select high-volume stations in paper format with a self-addressed postage-paid return envelope. HBLR customers were given three options for completing and returning the survey. Option one was to complete the survey and return it to an onboard survey agent. Option two was to complete the survey and return it by mail; and option three was to complete the survey on-line. The online survey was administered utilizing Qualtrics, an Internet-based survey software program approved by Rutgers University. English and Spanish language versions of the survey questionnaire were available in both the hard-copy, paper version and the Internet version of the survey. Each survey and return envelope was assigned a unique serial ID, which was used to track survey responses. The serial ID was required to be entered when completing the survey on-line.

Summary of Field Operations

As noted above, the HBLR operates on three service lines: 1) Hoboken Terminal to Tonnelle Avenue in North Bergen; 2) Hoboken Terminal to 8th Street in Bayonne; and 3) Tonnelle Avenue to Westside Avenue in Jersey City. Surveys were distributed on all three service lines on every train departing between the hours of 6 AM and 11 PM. The first round of survey field operations took place over nine weeks, between March 21, 2017 and May 18, 2017. During these weeks, there were several days/weeks that field operations were suspended for either anticipated or unplanned reasons. These were as follows:

Suspension Dates:	Reason:
April 4-6	Train derailment at NY Penn Station caused significant system-wide delays
April 11	Jewish Holiday
April 18-20	Jersey City and Hoboken Public Schools closed for Spring Break

During all other weeks, surveys were distributed on Tuesdays, Wednesdays, and Thursdays only. A second round of survey operations was conducted over a four-week period from November 14, 2017 to December 7, 2017. The purpose of the second round of surveying was to increase the number of completed survey responses from HBLR customers using the Tonnelle Avenue to Westside Avenue service line. Survey operations were suspended the week of November 21-24 because of the Thanksgiving holiday. During all other weeks, surveys were distributed on Tuesdays, Wednesdays, and Thursdays only following the same protocol used during round one of survey operations.

As shown in Table 3, surveys were distributed on a total of 492 unique train departures, 416 during Round 1, with an additional 76 unique train departures during Round 2. Each departure comprised a one-direction trip from origin station to ending station.

Table 3 – HBLR train trips surveyed (April-May 2017)

Direction of travel/Service Line	**Unique Trip Departures (6 AM-11 PM)**	**Car Split of Trains**	
		2-car Trains	1-car Trains
Northbound Weekday			
8th Street to Hoboken Terminal (April-May 2017)	83	81	2
Westside Avenue to Tonnelle Avenue (April-May 2017)	66	55	11
Westside Avenue to Tonnelle Avenue (Nov-Dec 2017)	39	35	4
Hoboken Terminal to Tonnelle Avenue	57	0	57
TOTAL	245		
Southbound Weekday			
Hoboken Terminal to 8th Street	86	83	3
Tonnelle Avenue to Westside Avenue (April-May 2017)	67	59	8
Westside Avenue to Tonnelle Avenue (Nov-Dec 2017)	37	35	2
Tonnelle Avenue to Hoboken Terminal	57	0	57
TOTAL	247		

Survey agents worked in teams of two, with at least one survey team assigned to each train car. On-board survey agents took positions in the light rail cars and distributed paper surveys to passengers when boarding and in between stops. As requested, survey agents also handed out pencils for customers that wished to fill out the surveys on-board. Agents recorded the serial IDs and number of surveys successfully distributed on assignment sheets that were created for each unique train departure. Ridership estimates for each train departure were provided by NJ TRANSIT and recorded on the assignment sheets. Therefore, agents were not required to count the total number of passengers boarding and alighting at each station.

Figure 6. Survey agents in the field

In addition to on-board survey agents, platform survey agents were also deployed during the weeks of March 28 through April 27, 2017. Platform agents were assigned to distribute surveys at one of four high-volume stations (Hoboken Terminal, Newport, Harborside, and Exchange Place) from 7-9 AM and 4:30-6:30 PM. The agents distributed surveys to passengers waiting for trains on the platform as well as those leaving trains who may not have received surveys on board. They also accepted completed surveys, which were stored in boxes provided by NJ TRANSIT. There were no platform agents deployed during the second round of survey operations.

Survey Distribution and Response Rates

Survey agents distributed 14,419 surveys as part of round one field operations and an additional 3,005 surveys during round two. Of those, 3,350 surveys were completed by HBLR customers and returned onboard or by mail (2,883) or online (467). This represents a survey return rate of approximately 19.2 percent. Completed paper surveys returned onboard and the surveys received by mail were cleaned to address missing data, flipped trips, origin and destination data that did not make sense, and other issues as needed. The survey data were manually entered into Qualtrics online survey software and the paper surveys were scanned and cross checked for quality control purposes. The manually entered dataset was then merged with the dataset from surveys completed online. Not all the completed surveys contained enough data to be used for analysis purposes. Twenty-nine surveys were only partially complete and did

not contain enough information to be used. The elimination of these surveys resulted in a useable dataset of 3,321 records.

Survey Returns by Service Line

As noted above, surveys were distributed both onboard trains and on station platforms. Those surveys distributed onboard trains are analyzed in Tables 4 through 6, which summarize survey returns by HBLR survey line. Table 7 shows survey returns by station and time of day for those surveys distributed on station platforms.

The following are observations from the analysis of survey returns:

- The survey effort yielded 3,321 completed surveys, which represents 6.8 percent of the estimated 48,208 weekday riders boarding and alighting trains during the hours of 6 AM and 11 PM.

- Two thousand seven hundred ninety-eight (2,798) returned surveys came from surveys that were originally distributed onboard an HBLR train. This represents 84.2 percent of all the returned surveys. Of those, 36 percent were distributed on the Hoboken Terminal to 8th Avenue line. Fifty-three percent were distributed on the Tonnelle Avenue to Westside Avenue line. The remaining 11 percent were distributed on the Tonnelle Avenue to Hoboken line. See Table 4.
    - Returns from the Tonnelle Avenue to Westside Avenue line were overrepresented when compared to ridership share across the three lines–53 percent vs. 45 percent of overall ridership.
    - Returns from the Hoboken to 8th Avenue line were underrepresented when compared to overall ridership during the hours of survey operations–36 percent of returns vs. 47 percent of ridership.
    - Returns from the Tonnelle Avenue to Hoboken line were also slightly overrepresented in the pool of returned surveys–11 percent vs. 8 percent of overall ridership.

- Although patterns varied somewhat by line, the vast majority of returned surveys (75 percent) were distributed on either Tuesday (42 percent) or Thursday (33 percent). The remaining 25 percent were distributed on Wednesdays. See Table 5.
    - Two reasons likely explain this distribution. First, the first day of surveying on each line was either Tuesday or Thursday. Riders were more likely to encounter a survey agent for the first time on each line on either a Tuesday or Thursday. Riders were more likely to accept a survey on the first day of surveying. Second, due to scheduling constraints, fewer survey agents were deployed on Wednesdays throughout the survey field period.

Table 4 – Trip direction by service line distribution (n=2,798)

Direction of Trip	Tonnelle Ave.-Hoboken		Hoboken-8th St.		Tonnelle Ave,-Westside Ave.		Total	
	N	%	N	%	N	%	N	%
Northbound	165	51.7	532	52.6	780	53.1	1,477	52.8
Southbound	154	48.3	479	47.4	688	46.9	1,321	47.2
Total	319	100.0	1,011	100.0	1,468	100.0	2,798	100.0
Percent of Total Returns	11%		36%		53%		100%	
Ridership (6 AM to 11 PM)	3,885		22,765		21,558		48,208	
Percent of Total Ridership	8%		47%		45%		100%	

Note: Ridership estimates are based on HBLR On/Off passenger count data provided by NJ TRANSIT for the period March-April 2017.

Table 5 – Day of trip by service line distribution (n=2,798)

Day of Trip	Tonnelle Ave.-Hoboken		Hoboken-8th St.		Tonnelle Ave.-Westside Ave.		Total	
	N	%	N	%	N	%	N	%
Tuesday	168	52.7	448	44.3	544	37.1	1,160	41.5
Wednesday	69	21.6	216	21.4	439	29.9	724	25.9
Thursday	82	25.7	347	34.3	485	33.0	914	32.7
Total	319	100	1,011	100	1,468	100	2,798	100

Table 6 – Time of trip by service line distribution (n=2.798)

Time of Trip Start	Tonnelle Ave.-Hoboken		Hoboken-8th St.		Tonnelle Ave.-Westside		Total	
	N	%	N	%	N	%	N	%
Morning Peak (6 AM-10 AM)	136	42.6	533	52.7	684	46.6	1,353	48.4
Midday (10 AM-4 PM)	79	24.8	231	22.8	347	23.6	657	23.5
Evening Peak (4 PM-8 PM)	86	27.0	225	22.3	411	28.0	722	25.8
Evening (8 PM-11 PM)	18	5.6	22	2.2	26	1.8	66	2.4
Total	319	100.0	1,011	100.0	1,468	100.0	2,798	100.0

Table 7 – Returned platform survey by station and time of shift (n=523)

Time of Platform Shift	Hoboken Terminal		Newport		Harborside		Exchange Place		Total	
	N	%	N	%	N	%			N	%
AM Peak Period (7 AM-9 AM)	99	67.8	54	53.5	71	73.2	71	39.7	295	56.4
PM Peak Period (4:30 PM-6:30 PM)	47	32.2	47	46.5	26	26.8	108	60.3	228	43.6
TOTAL	146	100.0	101	100.0	97	100.0	179	100.0	523	100.0
Percent of Total	28%		19%		19%		34%		100%	

- Approximately half of returned surveys (48 percent) were distributed during the AM Peak period. Twenty-four percent were distributed midday between the hours of 10 AM and 4 PM and 26 percent were distributed during the evening peak period. The remaining two percent of returned surveys were distributed between 8 PM and 11PM. These results were largely consistent across all three service lines. See Table 6.
    - One likely reason for this result is that many riders use the HBLR to travel to and from work locations during traditional commuting hours. So, a rider traveling to work in the morning likely first encountered a survey agent during the morning peak period. That same rider would be unlikely to accept another survey on their return trip or if they utilized the HBLR at another time during the day.

- Twenty-three percent of returned surveys (523) were distributed by survey agents located on one of four heavily used station platforms. As shown in Table 7, more than half were distributed at either Hoboken Terminal (28 percent) or Exchange Place (34 percent). The remaining 38 percent were distributed at Newport (19 percent) and Harborside (19 percent).
    - The majority of surveys distributed on station platforms (56 percent) were distributed in the AM Peak Period.

Survey Returns by Station

Finally, to examine survey return rates by boarding and alighting station, the research team compiled ridership estimates by station utilizing passenger on/off counts conducted by NJ TRANSIT during the months of March and April 2017. These data were compared to the start and end station frequencies reported in the returned survey data. See Table 8.

- Boarding customer response rates varied from a high of 50 percent at Tonnelle Avenue station to a low of four percent at Harsimus Cove, when compared to the estimated number of riders using each station.
    - The highest response rates for boarding customers were observed at Tonnelle Avenue (50 percent), Westside Avenue (32 percent), and 8th Street (23 percent)–all three are terminal stations.
    - The lowest response rates for boarding customers were observed at: Harsimus Cove, Newport, Harborside, and Jersey Avenue stations. In all cases response rates were six percent or less.
    - Alighting customer response rates by station varied from a low of four percent to a high of 26 percent when compared to the total number of riders estimated to be using each station.
    - The highest response rates for alighting customers were observed at Harborside (26 percent) and Lincoln Harbor (24 percent).

- The lowest response rates for alighting customers were observed at: Richard Street, 22nd Street, Liberty State Park, and MLK Boulevard stations. In all cases response rates for these stations were six percent or less of customers using these stations.

Table 8 – Response rate estimates by station

Station Name	Ridership (6 AM to 11 PM)		Response Rate Estimates					
	Total Riders Getting On	Total Riders Getting Off	# of Returned Surveys with Start Station	Est. Unique Boarding Cust.	**Boarding Cust. Resp. Rate**	# of Returned Surveys with End Station	Est. Unique Alighting Cust.	**Alighting Cust. Resp. Rate**
Tonnelle Ave	1,254	1,342	313	627	**50%**	73	671	**11%**
Bergenline Ave	2,989	3,039	242	1,495	**16%**	130	1,520	**9%**
Port Imperial	1,240	978	119	620	**19%**	60	489	**12%**
Lincoln Harbor	861	857	56	431	**13%**	105	429	**24%**
9th St/Congress St	2,491	2,107	167	1,246	**13%**	113	1,054	**11%**
2nd Street	1,223	1,050	68	612	**11%**	50	525	**10%**
Hoboken	5,177	4,904	469	2,589	**18%**	339	2,452	**14%**
Newport	5,696	6,374	164	2,848	**6%**	565	3,187	**18%**
Harsimus Cove	1,159	1,195	25	580	**4%**	58	598	**10%**
Harborside	2,122	2,247	60	1,061	**6%**	290	1,124	**26%**
Exchange Place	5,069	6,176	169	2,535	**7%**	714	3,088	**23%**
Essex Street	1,417	1,534	54	709	**8%**	126	767	**16%**
Marin Boulevard	860	967	29	430	**7%**	57	484	**12%**
Jersey Avenue	1,085	1,164	34	543	**6%**	79	582	**14%**
Liberty State Park	2,844	2,850	172	1,422	**12%**	76	1,425	**5%**
Garfield Ave	835	727	67	418	**16%**	24	364	**7%**
MLK Drive	1,458	1,441	124	729	**17%**	40	721	**6%**
West Side Ave	1,895	1,741	301	948	**32%**	127	871	**15%**
Richard Street	760	680	34	380	**9%**	12	340	**4%**
Danforth Ave	1,013	827	56	507	**11%**	23	414	**6%**
45th Street	1,236	983	99	618	**16%**	32	492	**7%**
34th Street	1,838	1,706	141	919	**15%**	48	853	**6%**
22nd Street	1,966	1,819	149	983	**15%**	34	910	**4%**
8th Street	1,720	1,500	194	860	**23%**	55	750	**7%**
TOTAL	**48,208**	**48,208**	**3,306**	**24,104**	**14%**	**3,230**	**24,104**	**13%**

NOTES: 1) Estimated Unique Boarding (or Alighting) Customers were assumed to be half of the number of Total Riders Getting On (or Off) because it was assumed that each unique rider would ride the train twice each day. For example, they would ride once in the morning to travel to work and then ride again to return home from work. So each unique person has two boardings and two alightings. 2) 15 survey responses included missing data for boarding station and 91 survey responses included missing data for alighting station.

Entering, Cleaning, and Geocoding the Data

Although about 14 percent of the riders completed the survey online, the other 86 percent of completed surveys were returned by mail. Mailed back surveyed had to be entered manually using the Qualtrics on-line survey questionnaire. The entered data was then reviewed and cleaned. In many cases, riders' stated origins and destinations were corrected and/or expanded so that they could be properly geocoded by ArcGIS software. Distances from trip origin to boarding station and alighting station to destination were estimated by the ArcGIS Network Analyst.

RESULTS OF WEIGHTED DATA ANALYSIS

In consultation with NJ TRANSIT, the research team explored different methods for weighting the survey data. Three weight variables were considered:

- Method #1: This is the most basic weight. It considers direction of travel (NB, SB), time of day (three periods: 6-10AM, 10AM-4PM, 4PM+), and service line (three lines: Tonnelle Ave to Hoboken Terminal, Westside Ave to Tonnelle Ave, and 8th St to Hoboken Terminal).

- Method #2: This weight considers direction of travel (NB, SB), time of day (three periods: 6-10AM, 10AM-4PM, 4PM+), but breaks the service lines into six line segments (8th St. to Richard St., Westside Ave. to Garfield Ave., Liberty State Park to Essex St., Exchange Place to Hoboken Terminal, 2nd St. to Lincoln Harbor, and Port Imperial to Tonnelle Ave).

- Method #3: This weight considers direction of travel (NB, SB), time of day (three periods: 6-10AM, 10AM-4PM, 4PM+), terminal + transfer stations (8th St, Tonnelle Ave, Westside Ave, Exchange Place, and Hoboken Terminal), and five line segments excluding terminal and transfer stations (8th St. to Richard St., Westside Ave. to Garfield Ave., Liberty State Park to Essex St., Exchange Place to Hoboken Terminal, 2nd St. to Tonnelle Ave).

After consulting with NJ TRANSIT, it was determined that method #1 provided the best overall results. It had a high convergence with the mean, a small standard deviation, a small range, and very few observations with a very large weight. In addition, it provided and acceptable N-size. The weight was used to inflate the survey responses to represent average weekday ridership and also to correct for discrepancies between surveyed responses and actual ridership in terms of time of day and direction of travel. All results presented in the following sections are weighted, meaning that they represent riders instead of respondents. For this reason, the tables sum to almost 50,000, which approximates the observed number of average weekday riders for the system. Appendix 3 presents a more complete summary of the options explored to weight the survey data.

Individual and Household Characteristics of Riders

The survey questionnaire included a battery of questions related to personal and household characteristics. The tables in this section include the following columns:

- Number of riders – Number of riders was calculated by applying the weight variable to the survey responses to approximate average weekday HBLR ridership;
- Percent of riders – shows the estimated share of all riders based on the weighted data, including non-responses; and
- Percent of Responding Riders – shows the estimated share of riders responding to the question, excluding non-responses.

In some instances, rider characteristics are compared with the residents of Hudson County. All data pertaining to Hudson County in the tables are from the 2016 American Community Survey (ACS) 5-year summary. The percent of Hudson County population column shows the share of categories estimated from the ACS data. Percent of Riders which includes non-responses, is listed for reference purposes because response rates varied between questions.

Age and Sex

Table 9 shows the gender split of the HBLR riders, estimated from the survey data. As shown in the table the gender split for HBLR riders compared to Hudson County as a whole is almost identical. Table 10 shows the age distribution of the HBLR riders compared to the general population of Hudson County. The most significant difference is observed for people aged 65 and over. Compared to the county's 13.5 percent, only 3.2 percent of riders fall into this age cohort. Although it is generally known that individuals over the age of 65 are less likely to use conventional fixed-route transit, in the case of the HBLR, another factor that decreases the share of older riders is that the system is used predominantly for commuting trips by workers. Among the other age groups, the share of riders is generally similar to that of Hudson County's population with some small variations (less than 5 percent difference).

Table 9 – Gender distribution of HBLR riders

Gender	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
Male	23,218	46.2	48.8	49.7
Female	24,253	48.2	51.0	50.3
Transgender/Other	124	0.2	0.3	NA
Total	47,595	94.6	100.0	100.0
Non-response	2,696	5.4		
Total	50,291	100.0		

Table 10 – Age distribution of HBLR riders

Age	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
18-24 years	6,967	13.9	14.6	11.3
25-34 years	12,161	24.2	25.4	26.5
35-44 years	10,194	20.3	21.3	19.7
45-54 years	9,876	19.6	20.6	16.0
55-61 years	5,256	10.5	11.0	9.6
62-65 years	1,867	3.7	3.9	3.4
Over 65 years	1,527	3.0	3.2	13.5
Total	47,849	95.1	100.0	100.0
Non-response	2,442	4.9		
Total	50,291	100		

Race, Ethnicity, and Language

The distribution of the HBLR riders by race is presented in Table 11 and the share of Hispanic riders is presented in Table 12. As shown in Table 11, the racial breakdown of HBLR riders is generally similar to the breakdown of Hudson County's population overall. The share of White HBLR riders is slightly smaller, whereas the share of African American and Asian riders is slightly larger.

Table 11 – Distribution of riders by race

	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
White	24,211	48.1	54.5	55.5
Black or African American	6,621	13.2	14.9	12.7
Asian or Pacific Islander	7,669	15.2	17.3	15.0
American Indian or Alaska Native	632	1.3	1.4	0.3
Other	5,002	9.9	11.3	13.3
Multi-Racial	302	0.6	0.7	3.2
Total	44,436	88.4	100.0	100.0
Non-response	5,855	11.6		
Total	50,291	100		

Table 12 shows that the share of Hispanic riders is significantly smaller than the share of Hispanic individuals living in Hudson County (26 percent versus 43 percent). However, if compared to the share of Hispanic individuals living in within 1/2-mile of HBLR stations, the share is much closer (26 percent versus 31 percent). As shown in Table 1, only about 1/3 of station areas have a share of Hispanic population greater than the share of HBLR riders using the system. One possible reason for the remaining discrepancy could be the fact that the universe of HBLR riders includes individuals living

in areas beyond Hudson County. This is particular true for riders who access the system by automobile, NJ TRANSIT trains, and PATH trains, from areas where the share of Hispanic population is lower.

Table 12– Share of Hispanic and non-Hispanic riders

	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
Hispanic	12,230	24.3	25.9	43.1
Not Hispanic	35,010	69.6	74.1	56.9
Total	47,241	93.9	100.0	100.0
Non-response	3,050	6.1		
Total	50,291	100		

As shown in Table 13, the share of riders who speak a language other than English at home is higher than the population of Hudson County as a whole – 41 percent versus 59 percent. A small number of respondents who speak a language other than English at home also specified their languages. The most common language after English is Spanish, followed respectively by Hindi, Chinese, French, Arabic, Russian, and Tamil.

Table 13 – Language spoken at home

	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
English	27,933	55.5	58.9	40.6
Non-English	19,514	38.8	41.1	59.4
Subtotal	47,446	94.3	100.0	100.0
Non-response	2,845	5.7		
Total	50,291	100.0		

Household Income and Auto Availability

Table 14 shows the distribution of household income of HBLR riders. A comparison of riders with the general population of Hudson County shows that the share of riders with low income (all categories below $50,000) is smaller than the county as a whole, whereas the share of riders with medium and high income ($50,000 or higher) is greater than the county. The difference between riders and the county's population is particularly noticeable for the income level $200,000 or higher. While 6.4 percent of the county's population belong to households with such high income, the share of riders with that level of income is almost double.

These results indicate the riders come from households with higher income than the county as a whole. One reason for this result is likely the fact that residents living within 1/2-mile of HBLR station area have an average median household income 25 percent greater than Hudson County residents overall – $81,656 versus $60,894. See Table 1. Income differences are even more stark when compared to residents living in Core

System station areas, where average median household income is $129,215. Another reason may be the fact that riders who come from other parts of the state have higher income. Still another reason could be that most riders use the HBLR for work trips.

Table 14 – Household income

	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
Under $15,000	4,704	9.4	10.9	21.4
$15,000-$24,999	3,242	6.4	7.5	11.1
$25,000-$34,999	2,603	5.2	6.0	7.7
$35,000-$49,999	3,585	7.1	8.3	9.4
$50,000-$74,999	6,660	13.2	15.4	14.6
$75,000-$99,999	5,153	10.2	11.9	10.3
$100,000-$149,999	7,442	14.8	17.2	13.1
$150,000-$199,999	4,376	8.7	10.1	6.0
$200,000 or over	5,502	10.9	12.7	6.4
Subtotal	43,266	86.0	100.0	100.0
Non-response	7,025	14.0		
Total	50,291	100.0		

Table 15 shows riders by number of personal vehicles available in household. While the share of riders from zero- or one-vehicle households is smaller than the county as a whole, the share of riders from two- and three or more-vehicle households is significantly greater, indicating that car ownership is higher among HBLR riders than the county population overall. These results are consistent with the higher household incomes reported by HBLR riders (see Table 14) and the reasons for the discrepancy may be the same as those mentioned to describe the discrepancy of income.

Table 15 – Number of personal vehicles available in household

	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
Zero	12,865	25.6	27.2	32.2
One	18,010	35.8	38.1	45.0
Two	11,916	23.7	25.2	17.6
Three or more	4,470	8.9	9.5	5.2
Subtotal	47,261	94.0	100.0	100.0
Non-response	3,030	6.0		
Total	50,291	100.0		

Household Size

Table 16 shows the distribution of household size, or the number of persons, of all ages, in a household. It shows that the share of riders from single-person households is

significantly lower than the share of single-person households in Hudson County. The reason for the lower share of riders from single-person households could be many, including a greater concentration of single-person households in areas not well-served by the HBLR, greater propensity of persons from single-person households to travel to places not requiring the HBLR, and greater share of older persons in single-person households (because the share of older adult riders is small).

Table 16 – Number of persons in household

Number of Persons	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
One	7,222	14.4	15.4	29.8
Two	15,257	30.3	32.4	29.5
Three	10,881	21.6	23.2	18.7
Four or more	13,613	27.1	29.0	22.0
Subtotal	46,973	93.4	100.0	100.0
Non-response	3,318	6.6		
Total	50,291	100		

Duration of Residence

As shown in Table 17, the share of riders living in their current residence for less than one year and ten or more years is greater than the share of Hudson County residents reporting the same durations. At the same time, the share of riders living at their current residence between 1 year and 10 years is greater for Hudson County residents than HBLR riders. The substantially greater share of riders living in their current residence for less than one year suggests that HBLR riders are more transient/mobile. It could also reflect the concentration of rental housing in the areas along the HBLR corridor. The greater share of riders living in their current residence ten or more years indicates that those riders are more settled in place than the population of Hudson County as a whole.

Table 17 – Duration of time lived in current address

	No. of Riders	Percent of Riders	Percent of Responding Riders	Percent of Hudson County Population
Less than 1 year	8,849	17.6	18.7	6.1
Between 1 and 5 years	15,771	31.4	33.3	39.2
Between 5 and 10 years	7,368	14.7	15.5	31.9
10 years or more	15,420	30.7	32.5	22.8
Subtotal	47,408	94.3	100.0	100.0
Non-response	2,883	5.7		
Total	50,291	100.0		

Importance of the HBLR in Residential Choice

Survey participants were asked how important the HBLR was in choosing their home location. As shown in Table 18, for 36.9 percent of the riders the HBLR was very important and for another 24 percent it was somewhat important. This indicates that the HBLR was at least somewhat important for 63 percent of the riders when selecting their housing location.

Table 18 – Importance of the HBLR in choosing home residence

	No. of Riders	Percent of Riders	Percent of Responding Riders
Not Important	17,322	34.4	36.9
Somewhat Important	11,271	22.4	24.0
Very Important	18,390	36.6	39.1
Subtotal	46,983	93.4	100
Non-response	3,308	6.6	
Total	50,291	100	

Table 19 shows the cross-tabulation of the importance of the HBLR in choosing residence location and years in current residence. It is evident that the riders who have lived in their current residence longer tend to view the HBLR as less important compared to the riders who have lived in their current residence for shorter periods of time. This results may reflect the fact that residents living in some of the more established neighborhoods along the HBLR selected their residence location prior to the HBLR starting operation.

The drop-off in the importance of the HBLR in terms of choosing a residence location begins at about two years. While almost 80 percent of the riders who have lived in their current residence less than six months view the HBLR as very or somewhat important, only 72 percent of those who have lived 2-5 years, 65 percent of those who have lived in their residence 5-10 years, and only 42 percent of those who have lived more than 10 years hold a similar view. The greater importance of the HBLR for riders who moved to their current residence more recently appears to be a sign that individuals are selecting their residence location because of the HBLR (i.e., self-selection).

Table 19 – Importance of the HBLR by length of stay in current residence

Length of residence at current location	Not Important	Somewhat Important	Very Important	Total
Less than 6 months	20.1	29.2	50.7	100.0
Between 6 months and a year	25.0	24.4	50.6	100.0
Between 1 and 2 years	20.6	28.9	50.5	100.0
Between 2 and 5 years	28.2	28.7	43.1	100.0
Between 5 and 10 years	35.4	25.0	39.6	100.0
More than 10 years	58.3	16.3	25.4	100.0
Total	36.8	23.9	39.4	100.0

Disability

Only 1.7 percent of responding riders reported having a “physical condition” that made it difficult to use HBLR trains. Because the question was specific about the HBLR, the responses cannot be compared with ACS data on disability. About half of the survey respondents who reported having a disability also specified if they used a mobility device and what kind. Of that small number, 39 percent indicated using wheelchair and 61 percent indicated using other types of mobility devices.

Customer Travel and Use Patterns

In addition to questions related to individual and household characteristics, the survey included a lengthy battery of questions regarding how riders use of the HBLR system and other travel-related topics. The responses to those questions are summarized below under separate headings. In most cases, the tables in this section refer to number of riders, excluding non-responses and percent of responding riders which shows the estimated share of riders responding to the question, excluding non-responses. When appropriate, responses to multiple questions are combined and shown in the form of cross-tabulations.

Trip Purpose

Table 20 summarized data on trip purpose for all destinations combined and then breaks out trips with a New Jersey destination and those with a New York destination. Approximately 81 percent of the trips made for all destinations combined are for work commute purposes. Only 19 percent of trips are made for all other purposes combined.

This indicates that the HBLR serves primarily to meet riders’ commutation needs, which are often considered non-discretionary. Another type of non-discretionary trip, commuting to school, comprises the second largest category at 6.2 percent. In contrast, shopping, recreational, and personal business trips each constitute a very small share of all trips. Table 20 also shows that the share of commuting trips to work is somewhat higher for riders traveling to New York destinations (88 percent) compared to riders traveling to New Jersey destinations (79 percent).

Table 20 –Trip purpose by geographic destination

	All Destinations		New Jersey Destinations		New York Destinations	
	Riders	Percent	Riders	Percent	Riders	Percent
Work	33,356	80.6	25,881	78.7	7,475	88.1
Company business	178	0.4	129	0.4	49	0.6
School	2,555	6.2	2,327	7.1	228	2.7
Shopping	1,373	3.3	1,252	3.8	121	1.4
Recreation (e.g., dining/entertainment/ vacation)	1,191	2.9	919	2.8	272	3.2
Personal business (e.g., medical/visiting)	1,375	3.3	1,182	3.6	193	2.3
Other purposes	1,336	3.2	1,192	3.6	144	1.7
Total	41,365	100.0	32,882	100.0	8,483	100.0

Note: Rider estimates are less than total average weekday ridership due to non-response/missing data for the variable(s) analyzed.

Table 21 shows the percent distribution of HBLR riders' trip purposes by time of day. As might be expected given the significant number of riders using the HBLR to commute to work, slightly more than 70 percent for trips are made during between 6 AM to 10 AM and 4 PM and 8 PM. Travel for company business, school trips, shopping, personal business trips, and recreational trips are made more often between 10 AM and 4 PM. Although most work trips are made between 6 AM and 10 AM and 4 PM and 8 PM, one fifth of the work trips are also made between 10 AM and 4 PM, indicating that the system is also being used for off-peak work commutes. A reason for the large share of commute trips during the mid-day period could be due to flex-time at work, shift work, or other non-traditional work hours for some HBLR riders.

Table 21 – Trip purpose by time of day

	6-10 AM %	10 AM-4 PM %	4-8 PM %	8-11 PM %	Total %	Total Riders
Work	39.2	20.4	37.3	3.1	100.0	27,154
Company business	19.3	59.2	21.5	0.0	100.0	178
School	21.8	47.9	29.1	1.2	100.0	2,440
Shopping	6.0	50.0	44.0	0.0	100.0	1,338
Recreation (e.g., dining/entertainment/vacation)	3.7	54.1	30.6	11.7	100.0	1,140
Personal business (e.g., medical/visiting)	14.4	50.7	33.1	1.8	100.0	1,221
Other (specify)	11.5	44.1	38.1	6.3	100.0	1,177
Total riders	11,655	9,228	12,658	1,108		34,649
% of total	33.6	26.6	36.5	3.2	100.0	

Note: Rider estimates are less than total average weekday ridership due to non-response/missing data for the variable(s) analyzed.

Access Mode to Station

Access modes used by the HBLR riders from trip origin to boarding station are shown in Table 22. Nearly 52 percent of HBLR riders access their boarding station by walking, making walking the most common station access mode. The second most common mode is drive and park at station (13.4 percent), followed by NJ TRANSIT train (11.1 percent), PATH train (9.0 percent), and bus (8.9 percent), respectively. The share of the other modes is relatively small.

Table 22 – Access mode to HBLR station

Access Mode	No. of Riders	Percent of Riders
Drive Alone/Carpool and Park	6,431	13.4%
Auto Drop-off	1,619	3.4%
Bus	4,271	8.9%
NJ TRANSIT Train	5,357	11.1%
PATH Train	4,340	9.0%
Ferry	148	0.3%
Walk	24,920	51.8%
Bicycle	339	0.7%
Taxi	102	0.2%
Ride-Hailing	122	0.3%
Other	413	0.9%
Total	48,062	100%

Access Mode and Sociodemographic Characteristics

A more detailed analysis of access mode to station shows that a variety of sociodemographic characteristics appear to influence access mode choice. For example, Table 23 shows the male-female split of the HBLR riders by the most commonly used access modes. The share of walking riders is fairly similar to the Hudson County population and the riders as a whole (i.e., slightly more female than male), whereas NJ TRANSIT trains and PATH trains are used slightly more by men than women. Although the difference between men and women also appears to be small among car users, more detailed analysis showed that men are far more likely to drive alone and park than women (58 percent versus 42 percent), whereas women are far more likely to be dropped off or travel as a car passenger than men (60 percent versus 40 percent). Among the major mode users, the starkest difference between male and female is evident for bus users because they are overwhelmingly female (almost 62 percent).

Table 23 – Male-female split by access mode to station

Access Mode	Male	Female	Total
Walk	47.6	52.4	100.0
NJ TRANSIT Train	53.6	46.4	100.0
PATH Train	51.8	48.2	100.0
Auto (driver or passenger)	52.8	47.2	100.0
Bus	38.4	61.6	100.0

Table 24 shows the age distribution of riders by access mode. The share of riders walking to stations is noticeably higher for people aged 18-24, presumably because many in that age group do not own a car or possess a driver's license. In contrast, the share of riders over age 65 is low for all access modes despite minor variations. On the whole, the NJT train users, bus users, and car users are relatively older than walkers and PATH users, as the share for riders aged 55 or older is substantially higher for those three modes than walkers and PATH users.

Table 24 – Rider age by access mode

	Walk	NJT Train	PATH Train	Auto	Bus
18-24 years	19.2	6.5	7.8	7.4	12.3
25-34 years	28.5	15.3	30.3	18.6	26.3
35-44 years	20.7	17.3	24.0	24.3	21.5
45-54 years	16.1	33.4	21.9	27.0	18.5
55-61 years	8.6	20.5	6.5	15.4	13.4
62-65 years	3.4	3.3	6.2	5.1	5.3
Over 65 years	3.5	3.8	3.3	2.1	2.7
Total	100.0	100.0	100.0	100.0	100.0

Table 25 shows the racial distribution of riders by the most commonly used access modes to HBLR stations. The distributions can be compared with the racial distribution of all riders in Table 11. It shows that the share of white riders is the highest among NJ TRANSIT train users. Compared to 55 percent of all riders, 65 percent of those that use NJ TRANSIT train users to access the HBLR are white. A reason for this difference may be that the commuter rail lines connecting Hoboken Terminal to other parts of New Jersey serve areas with a higher share of white residents. The share of white riders is also slightly higher among the PATH train users and those that access the HBLR via auto. The share of Asian riders is disproportionately high among auto and bus users. The share of African-American riders is discernibly lower among NJ TRASIT train users and auto users compared to their share among all riders (15 percent).

Table 12 showed that the share of Hispanic riders among all HBLR riders was approximately 26 percent. Analysis by access mode showed that Hispanic riders are under-represented among NJ TRANSIT train users (13 percent), PATH train users (18

percent), and auto users (19 percent), whereas they are over-represented among bus users (44 percent) and walkers (28 percent).

Table 25 – Race of riders by access mode to station

	Walk	NJT Train	PATH Train	Auto	Bus
White	53.8	64.8	57.9	57.2	47.0
Black or African American	16.7	9.3	15.5	8.9	13.7
Asian or Pacific Islander	15.3	17.2	13.4	24.6	21.8
American Indian or Alaska Native	1.5	1.1	3.1	0.5	0.3
Other Race	11.8	7.6	9.7	8.3	16.6
Multi-Racial	1.0	0.0	0.4	0.4	0.7
Total	100.0	100.0	100.0	100.0	100.0

Figure 7 shows the income distribution of riders by access mode they used. For comparison, the distribution for all riders combined is also shown in the right hand side of the chart. The figure clearly shows that the share of riders with the highest income, $200,000 or over, is the highest for those using NJ TRANSIT trains, followed by those using auto. The same is true if one considers an income threshold of $150,000 instead of $200,000. PATH train users, on average, have moderate income; their income is clearly higher than walkers and bus users, but lower than NJ TRANSIT train users and auto users. Although many walkers have low incomes, about 10 percent have incomes over $200,000 and about 18 percent have incomes over $150,000. Compared to that, only about 10 percent of bus users have an income over $150,000. On the whole, the bus users appear to have the lowest income, followed by those who walk to stations.

Figure 8 shows the HBLR riders tabulated by number of vehicles available in their household and access mode to boarding station. As expected, those who use an auto to travel to stations, on average, have more vehicles in their households than the other mode users. Close to 24 percent of them have three or more vehicles in their household. Vehicle availability among the NJ TRANSIT train users is only modestly lower than the auto users. PATH train users have a moderate vehicle availability rate, whereas walkers and bus users have very low vehicle availability rates. More than one third of walkers and bus users do not have a vehicle available in their household. Somewhat surprisingly, close to 27 percent of the PATH train users also do not have a vehicle available in their household. A reason for a large share of PATH train users not having a vehicle available may be that they travel primarily between New York City and areas near the HBLR, where parking is limited and/or expensive.

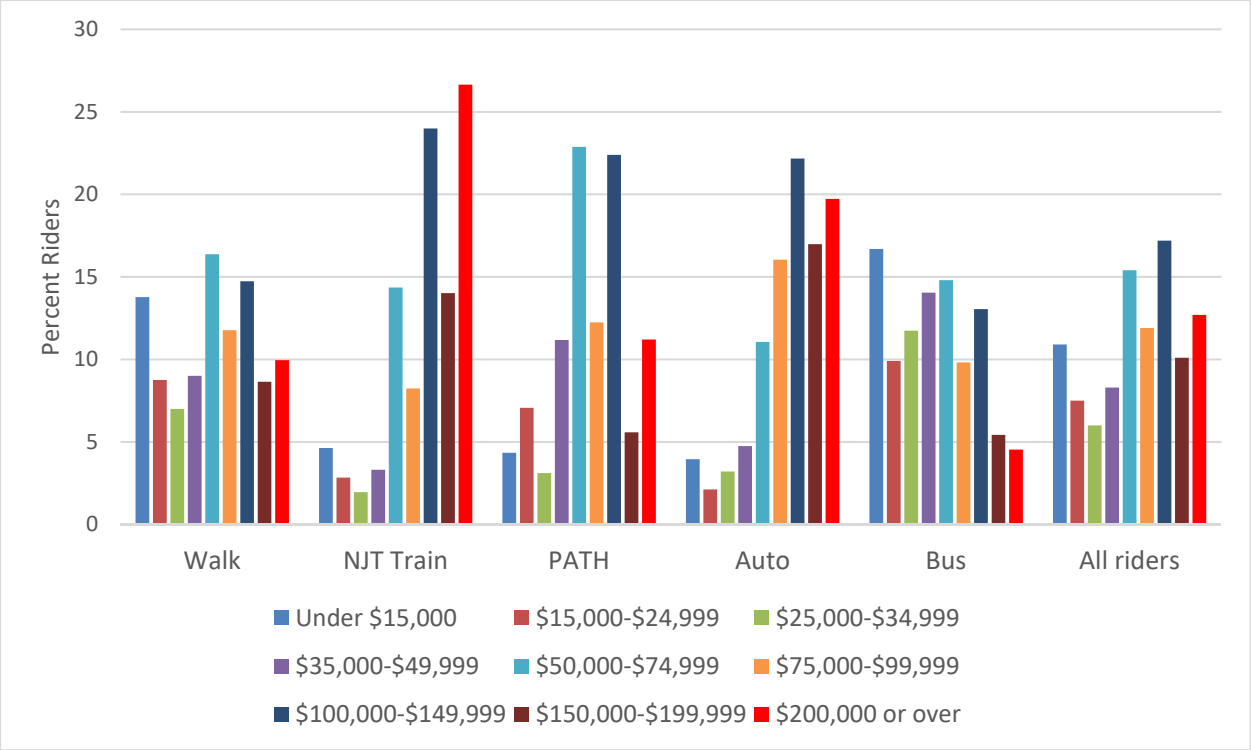

Figure 7. Household income by access mode to station

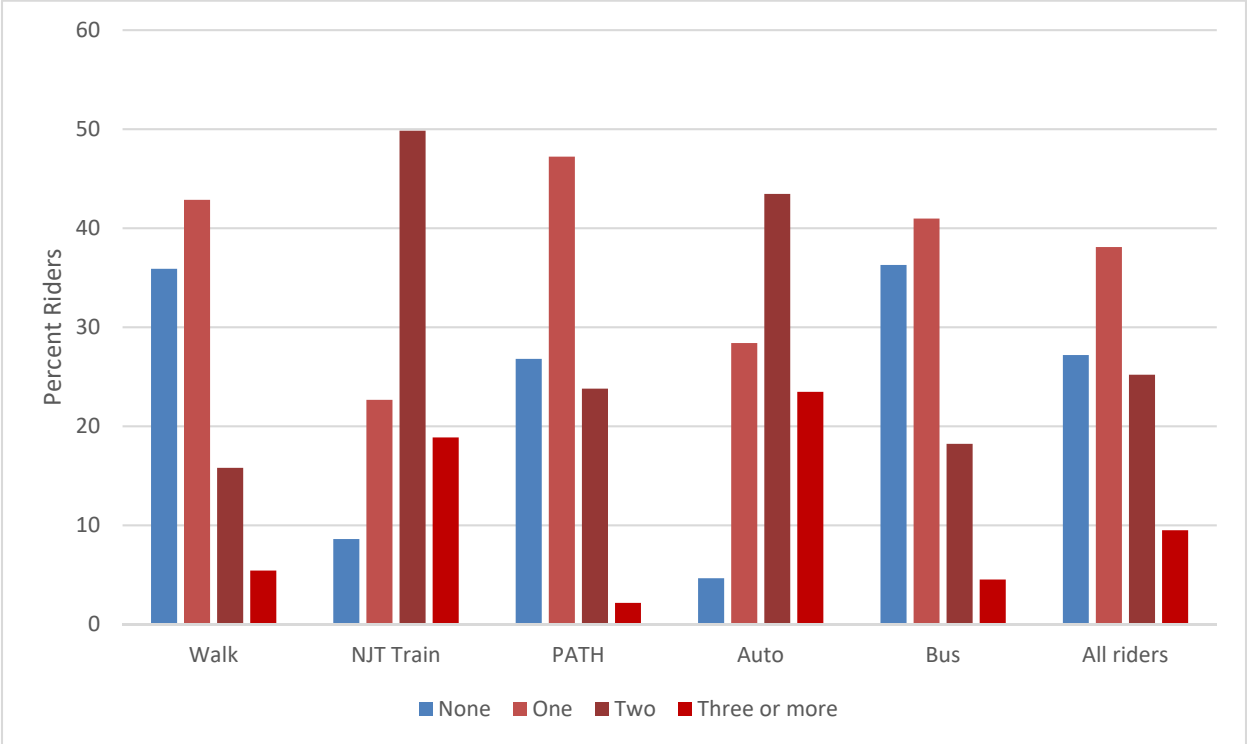

Figure 8. Number of cars in household by access mode to station

Access Mode and Trip Purpose

Table 26 shows the trip purpose of HBLR riders using different access modes to stations. The most distinct pattern relates to those who walk because their share of trips to work is noticeably lower than those who use other modes (71 percent versus 79 percent to 94 percent for other modes). It is not surprising that the walk share of school trips is higher because young people going to school are less likely to have autos than others. However, the share of walkers accessing the HBLR for shopping trips is also higher than other mode users. At more than 94 percent, the share of work trips is the highest for those who use NJ TRANSIT trains, indicating that there is a strong nexus between commuter trains serving Hoboken Terminal and the HBLR that facilitates multimodal commute trips for those riders.

Table 26 – Trip purpose by access mode

	Walk	NJT train	PATH train	Auto	Bus
Work	71.2	94.3	79.4	89.4	80.1
Company business	0.4	0.6	1.6	1.3	0.0
School	8.6	1.0	4.3	4.4	7.5
Shopping	6.1	0.2	0.8	1.3	2.3
Recreation	5.0	1.4	2.9	0.7	1.6
Personal business	4.6	0.9	6.6	1.8	3.5
Other	4.2	1.6	4.4	1.1	5.0
Total	100.0	100.0	100.0	100.0	100.0

Egress Mode from Station

Egress mode from alighting station to final trip destination is shown separately for riders traveling to New Jersey destinations and New York destinations in Tables 27 and 28, respectively. As shown in the bottom row of Table 27 the share of walking trips to destinations in New Jersey is more than 78 percent. The second most common egress mode is bus (6.0 percent), followed by NJ TRANSIT train (4.3 percent), and PATH train (4.1 percent). Table 28 shows the egress mode of riders traveling to New York City. As expected, PATH is the most common egress mode for HBLR riders traveling into New York City. More than 77 percent of HBLR riders traveling to New York City use PATH as their egress mode. An unexpectedly large number of respondents reported subway as their egress mode; however, subways are not available in New Jersey.

The most likely explanation for this result is that many riders considered PATH to be a subway train, as most of the riders reporting subway alighted their HBLR train at Hoboken, Newport, or Exchange Place stations. All of these stations are served by PATH trains. Another possible explanation might be that some riders used PATH, ferry, or bus to travel from their alighting station to New York City and then rode subway trains to their final destination. It is worth noting in Table 28 that two types of buses were included in the question for riders traveling to New York: NJ TRANSIT bus and other

bus. This distinction was not made in the question for riders alighting for New Jersey destinations. This was also the case for access mode to boarding stations.

Table 27 – Egress mode from HBLR station to final New Jersey Destination

Egress Mode	No. of Riders	Percent of Riders
Drive Alone/Carpool/Auto Pick-up	1,176	3.9%
Bus	1,808	6.0%
NJ TRANSIT Train	1,301	4.3%
PATH Train	1,226	4.1%
Ferry	66	0.2%
Walk	23,582	78.4%
Bicycle	157	0.5%
Taxi	171	0.6%
Ride-Hailing	236	0.8%
Other	369	1.2%
Total	30,092	100.0%

Table 28 – Egress mode from HBLR station to final New York Destination

Egress Mode	No. of Riders	Percent of Riders
PATH Train	7,791	77.6%
Ferry	513	5.1%
NJ TRANSIT Bus	226	2.3%
Other Bus	94	0.9%
Subway	1,264	12.6%
Other Modes	152	1.5%
Total	10,040	100.0%

Rider-Specified Distance from Trip Origin to Boarding Station

The survey included a question that asked riders how far their journey was from origin to their boarding station. Although many riders living close to the HBLR stations can walk, many others travel by other modes such as cars, PATH trains, NJ TRANSIT trains, buses, etc., before they board HBLR trains. Table 29 shows the distribution of distance from trip origin to boarding station. As shown in the table, 38.7 percent of riders travel less than 1/4 mile, whereas 53 percent (i.e., 38.7 percent+14.3 percent) travel 1/2 mile or less.

Table 29 – Distance from trip origin to boarding station

Distance	No. of Riders	Percent of Riders	Percent of Responding Riders
Up to 1/4 mile	18,559	36.9	38.7
1/4 - 1/2 mile	6,866	13.7	14.3
1/2 - 1 mile	5,551	11.0	11.6
1-2 miles	4,360	8.7	9.1
2-3 miles	2,781	5.5	5.8
3-5 miles	2,292	4.6	4.8
5-10 miles	3,252	6.5	6.8
Over 10 miles	4,289	8.5	8.9
Subtotal	47,950	95.3	100.0
Non-response	2,341	4.7	
Total	50,291	100.0	

The riders who traveled more than 10 miles were asked to specify the actual distance. Of the 4,289 riders who traveled more than 10 miles, 2,702 (63 percent) specified a distance. Analysis of that data revealed that 22.5 percent travel between 10 and 14 miles, 18.1 percent travel 15 to 19 miles, 24.9 percent travel 20 to 29 miles, 22.5 percent travel 30 to 49 miles, and the remaining 12.0 percent travel more than 50 miles. This shows that some riders travel from long distances before boarding HBLR trains.

Network Distance to Boarding Station

In addition to analyzing self-reported information on distance to boarding station, the research team also calculated distance between trip origin and boarding station using ArcGIS Network Analyst. The distribution of riders by GIS-estimated distance between trip origins and boarding station is compared with the distribution of riders by rider-specified distance in Table 30.

As shown in the table, riders often specified distances shorter than the network distances estimated by GIS. For example, 53 percent of riders specified that they traveled a 1/2-mile or less to their boarding station, whereas calculated distances suggest that only about 36 percent of riders have origins located a 1/2-mile or less from their boarding station. There is obviously an element of subjectivity when riders provide information on distance between trip origins and boarding stations, especially when they do not drive a car to the station and take odometer readings. Because of the familiarity with their travel routes, riders may also underestimate distance to stations. On the other hand, GIS-based distance calculations are objective. This is not to say that GIS-calculated distances are without limitations. First, GIS-based calculations can be estimated only for riders who provided information on location of their trip origin, so not all of the survey responses could be analyzed. Second, because GIS uses the road network to estimate distance, it cannot accurately measure distances for walking trips that involve short-cuts through paths, parks, parking lots, etc.

Table 30 – Comparison of rider-specified and GIS-estimated distance from trip origin to boarding station

Distance	Rider-specified			GIS-based		
	No. of Riders	Percent of Riders	Percent of Responding Riders	No. of Riders	Percent of Riders	Percent of Responding Riders
Up to 1/4 mile	18,559	36.9	38.7	6,509	12.9	16.3
1/4 - 1/2 mile	6,866	13.7	14.3	3,979	7.9	10.0
1/2 - 1 mile	5,551	11.0	11.6	6,319	12.6	15.8
1-2 miles	4,360	8.7	9.1	7,038	14.0	17.6
2-3 miles	2,781	5.5	5.8	3,056	6.1	7.7
3-5 miles	2,292	4.6	4.8	3,286	6.5	8.2
5-10 miles	3,252	6.5	6.8	4,405	8.8	11.0
Over 10 miles	4,289	8.5	8.9	5,344	10.6	13.5
Subtotal	47,950	95.3	100.0	39,935	79.4	100.0
Non-response	2,341	4.7		10,356	20.6	
Total	50,291	100.0		50,291	100.0	

Distance and Travel Time Between Trip Origin and Destination

In addition to a question related to trip distance, survey participants were also asked to estimate the one-way, door-to-door travel time between their trip origin and final destination. The distribution of reported travel time categories is presented in Table 31.

Table 31 – Door-to-door travel time reported by riders

	No. of Riders	Percent of Riders	Percent of Responding Riders
Less than 15 min	1,947	3.9	4.3
15-29 min	7,037	14.0	15.6
30-44 min	9,008	17.9	20.0
45-59 min	8,682	17.3	19.3
60-74 min	8,682	17.3	19.3
75-89 min	3,760	7.5	8.4
90+ min	5,906	11.7	13.1
Subtotal	45,021	89.5	100.0
Non-Response	5,270	10.5	
Total	50,291	100.0	

As shown in the table, reported door-to-door travel times vary widely. Sixty-seven percent of riders reported estimated travel times of between 30-90 minutes from origin to final destination. Nearly 20 percent reported trips that took less than 30 minutes and approximately 13 percent reported trips that took 90 minutes or more. The mean travel time for all riders was found to be 52.3 minutes with standard deviation 30.5 minutes. For riders with trip origins in New Jersey, the mean was 50.8 minutes with standard deviation 29.9 minutes, whereas for riders with New York trip origins, the mean was 66.5 minutes with standard deviation 30.7 minutes. These large standard deviations reflect the wide variation in travel times reported by responding riders.

To investigate the veracity of reported travel times, the research team used ArcGIS Network Analyst to estimate network travel time between trip origins and destinations if traveling by car. The estimated travel distance for all riders from origin to destination was found to be 9.1 miles with standard deviation 8.4 miles. The mean distance for riders whose trip origin was in New Jersey, the mean distance was 8.9 miles with standard deviation 8.5 miles. The mean distance for riders with New York origin was 11.1 miles with standard deviation 6.8 miles.

The mean travel time by car between trip origins and destinations was found to be only 12.0 minutes with a standard deviation 10.8 minutes. This is substantially lower than the mean estimated from rider responses. When restricted to New Jersey trip origins only, the mean travel time was 11.7 minutes with standard deviation 11.0. For riders with New York trip origins, the mean travel time was 14.8 minutes with standard deviation 8.5.

The GIS estimated travel times are significantly lower than the rider-reported travel times for several possible reasons. First, the GIS estimates are based on car travel whereas the reported travel times likely included multimodal trips involving the HBLR, other transit modes, and walking. If transit modes are used, they invariably require wait time to access each mode used. Second, the GIS estimates are based on free-flow traffic conditions instead of real-life conditions. Severe local congestion during peak periods in the areas around the HBLR delays at Hudson River crossings between New Jersey and New York City will make trips longer than estimated using GIS. With that said, the travel times reported by survey respondents may also be overstated. Real world travel times are likely somewhere in between those reported and the GIS calculated times.

Return Trip

In addition to being asked about the last one-way trip they took using the HBLR, survey participants were asked how they would typically make their return trip. As shown in Table 32, four out of five HBLR riders (81.4 percent) typically make their return trip by using the HBLR in the opposite direction. The large share or return trips by the HBLR is consistent with the large share of trips made by the riders for commuting to work because commuters typically travel by the same mode when going to and coming back from work.

Many riders who stated that they would use a bus for their return trips also specified the bus route they would take. Although no specific route was mentioned by an overwhelming proportion, the responses indicate that NJT Bus Routes #80 to #89—all serving Jersey City and surroundings areas–were the most common responses. Among those who mentioned that they would return by a mode other than the HBLR or bus, most mentioned walking, followed by PATH train and driving or carpooling, respectively.

Table 32 – Return trip mode

	No. of Riders	Percent of Riders	Percent of Responding Riders
Travel the same way in opposite direction	36,645	72.9	81.4
Take a bus	3,332	6.6	7.4
Other	5,038	10.0	11.2
Subtotal	45,014	89.5	100.0
Non-response	5,277	10.5	
Total	50,291	100	

Frequency of Using HBLR

Table 33 shows how frequently HBLR riders use the system. Just over 60 percent of riders use the HBLR five days a week. This is consistent with the large share of riders reporting their trip purpose was to commute to work. It is interesting to note that another 11 percent use the HBLR more than five days a week. These riders presumably use the system for work trips as well as trips for other purposes, such as shopping and recreation.

Table 33 – Frequency of using HBLR trains

Frequency	No. of Riders	Percent of Riders	Percent of Responding Riders
First time customer	442	0.9	0.9
Less than one day/month	1,369	2.7	2.8
1-3 days/month	1,625	3.2	3.3
1-2 days/week	3,465	6.9	7.1
3 days/week	3,095	6.2	6.3
4 days/week	3,837	7.6	7.8
5 days/week	29,748	59.2	60.8
6 days/week	2,390	4.8	4.9
7 days/week	2,977	5.9	6.1
Subtotal	48,946	97.3	100.0
Non-response	1,345	2.7	
Total	50,291	100.0	

Table 34 shows frequency of using the HBLR by trip purpose. As expected, riders that use the HBLR to commute to work are more frequent users. Less frequent users are more likely to use the HBLR for discretionary trips such as for shopping, recreation and personal business.

Table 34 – Frequency of using HBLR by trip purpose (percent)

	Work	Company business	School	Shopping	Recreation	Personal business	Other	Total Percent	Total
First time customer	9.4	7.8	2.2	11.0	22.1	25.5	22.0	100.0	442
< one day/month	6.3	3.1	3.6	28.0	14.4	25.4	19.3	100.0	1,349
1-3 days/month	21.5	1.7	2.1	23.4	22.0	17.3	11.9	100.0	1,609
1-2 days/week	30.0	1.2	14.4	17.1	14.6	14.6	8.0	100.0	3,446
3 days/week	65.0	1.1	11.1	6.9	2.7	6.7	6.6	100.0	3,095
4 days/week	74.5	0.0	16.4	0.8	2.8	2.5	3.0	100.0	3,820
5 days/week	92.3	0.4	4.8	0.4	0.5	0.2	1.5	100.0	29,717
6 days/week	86.8	0.9	4.9	0.0	2.5	3.6	1.3	100.0	2,374
7 days/week	73.3	0.5	9.1	4.9	2.3	5.9	3.8	100.0	2,977
Total	38,025	319	3,378	1,898	1,612	1,876	1,721		48,829
% of total	77.9	0.7	6.9	3.9	3.3	3.8	3.5	100.0	

Time Using HBLR

Survey participants were asked how long they have been using the HBLR. Table 35 shows that approximately half of HBLR riders (49.1 percent) have been using the HBLR from two to ten years, while 14.6 percent have been using the system from one to two years. One in five riders (20.1 percent) have been using the HBLR for a year or less and the remaining 16.2 percent are long-time riders, using the system for 10 years or more.

Table 35 – Time using the HBLR

Duration	No. of Riders	Percent of Riders	Percent of Responding Riders
Less than 6 months	5,763	11.5	11.7
6 months to 1 year	4,122	8.2	8.4
1 to 2 years	7,151	14.2	14.6
2 to 5 years	13,210	26.3	26.9
5 to 10 years	10,892	21.7	22.2
10 years or more	7,947	15.8	16.2
Subtotal	49,086	97.6	100.0
Non-response	1,205	2.4	
Total	50,291	100.0	

Ticket Type and Purchase Method

There are many ways to ways to pay the fare for riding the HBLR. Survey participants were asked what type of HBLR ticket they used to make their most recent trip. As shown in Table 36, nearly half of riders (45.2 percent) reported using a monthly pass.

The next most frequently reported ticket option was a one-way fare (17.8 percent), followed by round-trip (7.8 percent, and 10-trip (7.2 percent). Another 7.2 percent reporting using a monthly bus pass. NJ TRANSIT customers with a two-zone or greater bus pass can travel on Hudson-Bergen Light Rail at no additional charge during the period it is valid.

As might be expected, there is a relationship between frequency of HBLR use and ticket type purchased. Riders who use the HBLR five days a week are the most likely to use monthly passes (47.2 percent). One way tickets are more common for riders who use trains less than five days a week (33.9 percent). Interestingly, one-way tickets are also somewhat common among riders who use HBLR more than five days a week.

Table 47 shows how riders purchase HBLR tickets. Among all purchasing options, ticket vending machines are the most common, accounting for 70.1 percent of all ticket purchases. Obtaining tickets through employer (8.6 percent), purchasing through the MyTix app (8.2 percent) and ticket agent (6.8 percent) are the most frequently used options among those that do not use a ticket vending machine.

Table 36 – Share of ticket type by frequency of using trains

Ticket type	Frequency of using HBLR (%)			% of Total	Total
	Less than 5 days/week	5 days/week	More than 5 days/week		
Monthly	16.6	58.6	44.9	45.2	21,948
Monthly with Parking	2.4	8.7	2.3	6.2	3,022
Monthly with Ferry	0.0	0.2	0.3	0.2	77
Bus Monthly	6.7	7.4	7.1	7.2	3,477
One way	33.9	9.2	24.4	17.8	8,654
Round-trip (2 One-way) with parking	4.4	1.3	2.5	2.3	1,134
Round-trip (2 One-way)	15.3	4.1	9.2	7.8	3,794
10-trip	10.4	6.6	4.6	7.5	3,623
Discounted Senior Citizens/Children/Disability	8.7	2.2	2.1	4.0	1,933
Complimentary/Free Ticket	1.2	1.7	0.5	1.4	689
Hudson Go Pass	0.5	0.0	2.1	0.4	184
Total %	100.0	100.0	100.0	100.0	48,535
Total	13,743	29,466	5,326	48,535	

Table 37 – Methods used to purchase HBLR tickets by ticket type used (Percent)

Ticket Type	Ticket Agent	Ticket Vending Machine (TVM)	On-board Train	MyTix (Mobile App)	Mail-Tik/ Quik-Tik	Employer/ Wage Works	Other	Total %	Total
Monthly	8.0	57.9	0.3	13.4	3.2	14.2	3.0	100.0	21,736
Monthly with Parking	2.9	78.7	1.8	2.7	2.1	11.8	0.0	100.0	3,002
Monthly with Ferry	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0	76
Bus Monthly	18.0	31.0	0.0	21.3	9.7	10.2	9.9	100.0	3,347
One way	4.6	90.8	1.4	0.9	0.2	0.7	1.4	100.0	8,550
Round-trip (2 One-way) with parking	4.5	89.9	1.1	0.9	0.0	0.9	2.7	100.0	1,090
Round-trip (2 One-way)	3.2	91.1	0.5	0.3	1.2	1.6	2.0	100.0	3,740
10-trip	0.6	97.4	0.0	1.4	0.0	0.7	0.0	100.0	3,599
Discounted Senior Citizens/Children/ Disability	9.2	84.9	0.0	0.8	0.0	1.6	3.4	100.0	1,950
Complimentary/Free Ticket	8.0	20.7	2.8	9.2	1.6	21.0	36.7	100.0	676
Hudson Go Pass	15.0	64.1	0.0	0.0	0.0	10.5	10.5	100.0	153
Total	3,273	33,603	295	3,936	1,149	4,133	1,530		47,919
% of Total	6.8	70.1	0.6	8.2	2.4	8.6	3.2	100.0	

Visiting and Spending on Businesses Near Stations

To document spending patterns in HBLR station areas, survey participants were asked several questions about the types of businesses they frequent within a 1/2-mile of their boarding stations. They were also asked how much money they spent on each type of business per month. Less than half of HBLR riders (40.9 percent) reported frequenting station area businesses.

The spending patterns of riders that frequent area business are summarized in Table 38. The first column shows the number of riders confirming that they visited each type of business, the second column shows the share of riders visiting each type of business, the third column shows the total number of monthly visits made by those riders, and the fourth column shows the total amount spent per month by the riders. Annual visits and amounts spent were estimated by multiplying the monthly visits and dollars spent by 12. The final column shows the share of annual spending by type of business.

Table 38 – Visits to businesses within 1/2-mile of boarding stations and dollars spent

Business Type	Visiting Riders	% of Total Riders	Monthly		Annual			
			Visits	Total Spent	Visits	% Visits	Total Spent	% of Total Spent
Sit-down Restaurant	4,954	9.9%	21,135	$584,595	253,626	8.7	$7,015,144	16.7
Fast Food/Take-out	6,059	12.0%	40,354	$405,000	484,253	16.6	$4,859,995	11.6
Coffee/Snack Shop	8,849	17.6%	84,900	$472,901	1,018,806	34.8	$5,674,816	13.5
Supermarket/Mini-market	5,394	10.7%	26,806	$744,170	321,670	11.0	$8,930,037	21.3
Health Club/Gym	1,529	3.0%	15,767	$120,851	189,207	6.5	$1,450,218	3.5
Dry Cleaners	1,571	3.1%	4,286	$64,371	51,427	1.8	$772,457	1.8
Retail (clothing, home furnishing, gifts)	3,235	6.4%	15,602	$373,543	187,227	6.4	$4,482,518	10.7
Wine/Liquor	2,483	4.9%	16,653	$164,651	199,838	6.8	$1,975,807	4.7
Daycare	1,126	2.2%	9,596	$357,999	115,148	3.9	$4,295,982	10.3
Auto Repair	709	1.4%	396	$17,318	4,749	0.2	$207,813	0.5
Other businesses	1,441	2.9%	8,288	$185,137	99,460	3.4	$2,221,645	5.3
Total	NA	NA	243,784	$3,490,536	2,925,410	100.0	$41,886,431	100.0

Note: NA stands for Not Applicable. Because respondents could select multiple business types, sum of visiting riders is not an estimate of total riders visiting any type of business. For the same reason, the percentages will not add up to 100 percent.

Table 38 shows that HBLR riders visit station area businesses approximately 243,800 times in a month and spend approximately $3.5 million. When annualized, this translates to approximately 2.9 million visits and about $42 million in spending. Among the various types of businesses, coffee/snack shops generate the most visits, followed by fast-food/take-out businesses. In terms of total spending, however, supermarkets/mini-markets rank first, followed by sit-down restaurants and coffee/snack shops, respectively.

Estimating the overall economic impact of station area spending was beyond the scope of this study. However, another study by the Voorhees Transportation Center provides insight about the economic benefits accruing from transit users' spending. Using regional input-output models, the study [25] found that the spending of $14.7 million by North Jersey Coast Line (NJCL) riders in one summer season generated 225 jobs, $9.1 million in earnings, $1.1 million in state taxes, $600,000 in local taxes, and $15.4 million in gross domestic product. Although these rates are not directly applicable to the HBLR riders' spending because benefits generated from spending vary by economic sector and region, it can be observed that spending by HBLR riders is 2.8 times greater than the spending documented by the NJCL seasonal riders. Therefore, it is reasonable to expect spending by HBLR riders to generate significant economic multiplier effects.

Reason for Using HBLR

Survey participants were asked why they used the HBLR with three answer options: (a) There is no way to travel other than taking the HBLR, (b) HBLR is the best choice, and (c) HBLR is not the usual travel mode but used only occasionally. Table 39 shows a summary of responses in relation to the number of private vehicles available the rider's household. This cross tabulation was prepared because it was expected that riders without vehicles available would be more likely than others to feel that they have no other way to travel.

The results show that the HBLR is considered the best choice by the vast majority of riders (70.4 percent). Less than one-quarter of riders (21.5 percent) report using the HBLR because there is no other choice, and 8.1 percent use the HBLR only occasionally. Less than a third of riders from zero-vehicle households reported that they used the HBLR because there was on other means to travel. Sixty-one percent of riders from zero-vehicle households reported that the HBLR is simply the best choice for them.

Table 39 – Reasons for using HBLR by vehicles in household

Answer Option	Number of vehicles in household					Total	% of Total
	None	One	Two	Three	Four or more		
No way to travel other than HBLR	31.3	20.3	16.0	12.5	16.2	9,918	21.5
HBLR is the best choice	61.1	71.5	76.3	76.3	77.6	32,456	70.4
HBLR used only occasionally	7.6	8.3	7.7	11.2	6.3	3,729	8.1
Total %	100.0	100.0	100.0	100.0	100.0		100.0
Total	12,406	17,647	11,634	3,217	1,199	46,103	

Rider Satisfaction with System Attributes

Finally, survey participants were asked a series of satisfaction questions related to specific HBLR system attributes. Riders were asked to score each attribute using a 11-point scale where zero was not acceptable and 10 was excellent. Rider satisfaction with various system attributes is summarized in Table 40. Table 41 presents mean and median scores for each system attribute. As shown in Table 41, riders gave the HBLR an average overall system rating of 6.84. The highest scoring attributes were employee performance, trip time, safety and overall value for the money. The lowest scores were for communication, followed by security. Interestingly, overall satisfaction with NJ TRANSIT as a whole is lower than the riders' satisfaction with the HBLR.

Responses to an additional survey question shows that the vast majority of riders (84.6 percent) were very likely or somewhat likely recommend the HBLR to friends and relatives. Only 5.4 percent stated that they were very unlikely and 3.9 percent indicated that they were somewhat unlikely to recommend the service, whereas 6.1 percent reported being uncertain whether they would recommend that others use the HBLR.

Table 40 – Satisfaction with different system components (percent)

Attributes	0	1	2	3	4	5	6	7	8	9	10	N/A
Scheduling	2.8	1.5	2.6	4.4	6.2	21.8	5.8	12.1	15.7	8.9	17.6	0.6
Seating Availability	2.3	1.8	2.5	4.5	6.3	21.1	5.4	12.4	15.2	10.2	17.8	0.5
Comfort On-Board	1.9	1.2	2.5	3.0	5.6	20.9	7.0	13.7	17.0	10.5	16.4	0.3
Trip Time	1.2	0.6	1.5	2.8	3.8	19.2	5.7	12.1	16.6	14.3	22.0	0.2
Communications	5.1	2.9	4.7	6.9	7.8	19.4	6.9	10.3	12.1	8.3	13.2	2.4
On-time Performance	2.2	0.9	2.4	4.3	5.0	17.1	6.1	11.0	18.5	13.5	18.3	0.7
Safety	2.7	0.9	2.0	3.5	4.9	17.4	5.7	10.9	16.4	14.0	20.7	0.9
Security	5.9	1.9	3.5	5.3	5.5	18.4	6.3	11.1	14.0	11.1	15.6	1.4
Employee Performance	2.1	1.0	1.3	2.4	4.1	18.0	4.9	10.4	15.1	13.7	20.4	6.6
Overall Value for the Money	2.5	1.1	2.4	3.7	5.4	17.2	5.6	11.3	16.4	13.2	20.4	0.8
Overall Satisfaction with NJ TRANSIT	2.8	1.6	2.3	3.8	5.8	17.2	7.3	14.1	17.1	12.1	15.5	0.4

Table 41 – Mean and median scores for HBLR attributes

HBLR Attributes	Mean	Median
Scheduling	6.62	7
Seating Availability	6.67	7
Comfort On-Board	6.78	7
Trip Time	7.26	8
Communications	6.07	6
On-time Performance	6.99	8
Safety	7.08	8
Security	6.39	7
Employee Performance	7.47	8
Overall Value for the Money	7.02	8
Average Overall System Rating	6.84	
Overall Satisfaction with NJ TRANSIT	6.75	7

COMPARISON OF 2017 SURVEY DATA TO PREVIOUS HBLR SURVEYS

Prior to this study, there were two HBLR customer surveys conducted. One completed in 2005 and a second in 2008. While of interest, two major constraints make it challenging to directly compare survey results:

- Different system components – At the time of the 2005 survey, none of the stations north of 9th Street/Congress Street in Hoboken were operational. As a result, the system was operating with only 19 stations. By the time the 2008 survey was taken, there were 23 stations in operation. The 8th Street Station in Bayonne was added in 2011.

- Different sample sizes – Although the 2005 survey included riders from all of the 19 stations that existed at that time, the 2008 survey was conducted only for riders using the six stations served by the Northern Extension – 2nd St, 9th St/Congress St, Lincoln Harbor, Port Imperial, Bergenline Ave, and Tonnelle Ave. Of these six, only 2nd St and 9th St/Congress stations were operational at the time of the 2005 survey. Consequently, the partial survey conducted in 2008 did not generate data on riders using other parts of the system.

  At the time of the 2005 survey, the HBLR's average weekday ridership was slightly more than 10,000. By the time the 2008 survey was conducted, average weekday ridership had increased significantly to around 40,000. The 2005 system-wide survey collected data from 2,682 riders. The 2008 partial survey collected data from just 1,022 riders. The current (2017) system-wide survey collected data from 3,322 riders. The weighed 2005 data equaled 10,557 riders—the approximate average weekday ridership at that time. However, the weighted 2008 survey data equaled just 5,852 riders, only a small fraction of 40,000 average weekday ridership at the time.

Given these constraints, the ability to compare across surveys is limited. In particular, the limited nature of the 2008 survey, make many comparisons inappropriate. As a result, the limited number of comparisons presented in this section pertain mostly to the results of the 2005 and 2017 surveys.

Demographic and Socioeconomic Characteristics

Over the past 12 years, the gender profile of HBLR riders has changed slightly. There has been a small increase in the share of women riders and decrease in the share of men riders using the HBLR. In 2005, the share of female riders was 48.5 percent, which increased to 51 percent in 2017. The age distribution of riders in the two surveys, presented in Table 42, shows that the share of older riders increased between 2005 and 2017. The increase in riders is most noticeable for those age 55-64, although there was a slight increase also among those aged 65 and over. There was also a slight increase in the youngest cohort of riders, those between age 18 and age 24. The share of riders between age 25 and age 44 has decreased over time.

Table 42 – Percent of riders by age category 2005 vs. 2017

Age group	2005	2017	% Change
18 – 24 years	12.8	14.6	14%
25 – 34 years	31.3	25.4	-19%
35 – 44 years	27.3	21.3	-22%
45 – 54 years	18.6	20.6	11%
55 – 64 years	8.4	14.9	77%
65 years and over	1.5	3.2	113%
Total	100.0	100.0	

As shown in Table 43, the share of white riders increased slightly between 2005 and 2017 (from 51 percent to 54.5 percent), whereas the share Asian riders increased substantially (from 10.2 percent to 17.3 percent) between 2005 and 2017. The share of African-American riders remained fairly stable between the two surveys (14.6 percent and 14.9 percent in 2005 and 2017, respectively), but the share of Hispanic riders increased significantly, from 17.8 percent to 25.9 percent.

Table 43 – Share of riders by race and ethnicity 2005 vs. 2017

	2005	2017	% Change
White	51.0	54.5	7%
Black	14.6	14.9	2%
Asian	10.2	17.3	70%
Hispanic	17.8	25.9	46%

The distributions of rider household income in the 2005 and 2017 surveys are shown in Table 44. Because the value of dollars changed between 2005 and 2017, comparisons between the surveys can be made only in a relative sense, but not to examine if income increased or decreased between the years. The table shows that there has been an increase in the number of very low-income riders (i.e. those earning less than $15,000), but also in the number of high-income riders earning between $150,000 and $200,000 and above $200,000. Thus, the share of lower- and middle-income riders has declined. The change in income distribution may be due to a number of factors, including change in age distribution of riders, the extension of the service to areas not served in 2005, and in- or out-migration of people from places near stations.

Table 44 – Percent of riders by income category 2005 vs. 2017

Household income	2005	2017	% Change
Under $15,000	6.9	10.9	58%
$15,000-$24,999	7.7	7.5	-3%
$25,000-$34,999	7.9	6.0	-24%
$35,000-$49,999	13.7	8.3	-39%
$50,000-$74,999	20.0	15.4	-23%
$75,000-$99,999	13.8	11.9	-14%
$100,000-$149,999	16.7	17.2	3%
$150,000-$199,999	7.9	10.1	28%
$200,000 or over	5.4	12.7	135%
Total	100.0	100.0	

Boarding and Alighting Riders

Detailed tables of boarding and alighting riders from the surveys are not presented because NJ TRANSIT maintains its own dataset from regularly conducted counts. According to the survey results, the station that experienced the highest number of boarding between 2005 and 2017 is Hoboken Terminal, followed by Westside Ave, 9th St/Congress St, and Newport stations, respectively. In 2017, a large number of riders also boarded at Tonnelle Ave, Bergenline Ave, and 8th St stations—all built between 2005 and 2017. In terms of percent increase, 9th St/Congress St, 2nd St, and Hoboken Terminal stations experienced the most growth in number of boarding between 2005 and 2017 (49.9 percent, 43.4 percent, and 11.9 percent, respectively).

In terms of absolute number of alighting riders, Exchange Place, Newport, and Harborside stations experienced the highest increase between 2005 and 2017. In terms of percent increase, Danforth Ave, 34th St, and 45th St Stations experienced the most increase. The share of riders alighting at the Hoboken Terminal station decreased between 2005 and 2017, but that is because the number of alighting riders increased at other stations.

Access Mode to Stations

Table 45 shows the share of riders boarding by different station access modes according to the 2005, 2008, and 2017 surveys. The table shows that the share of driving alone trips to stations decreased from 16.3 percent in 2005 to 13.6 percent in 2017. However, the share of walk trips to stations also decreased from 65 percent in 2005 to 58.5 percent in 2017. On the other hand, the share of bus trips and PATH trips increased between 2005 and 2017. One of the reasons for the low share of PATH users in 2005 could be that many riders utilized other means of travel during the two-year restoration period following the 9/11 terrorist attack, that limited PATH service into and out of lower Manhattan.

It should also be noted that although NJT commuter train service to Hoboken Terminal existed in 2005 and 2008, the mode was not included in the survey as a specific mode. A review of data for the two periods shows that among the 103 riders who selected "other mode," and wrote down the description of the mode, 85 (83 percent) identified NJ TRANSIT train as their access mode. In the partial survey of 2008, out of 95 riders who selected "other mode" and wrote down the specific mode 23 (25 percent) wrote down NJ TRANSIT train. If NJ TRANSIT train were provided as a separate mode in the survey, one can assume that many more riders would have selected this mode in 2005 and 2008 because most riders who select "other mode" did not specify which mode they used.

Due to the omission of NJ TRANSIT train as an access mode in the 2005 and 2008 surveys, the share of access modes in the 2017 survey have been shown by excluding that mode in the last column of Table 45. Because ride-hailing is a new mode that was also not included in the 2005 and 2008 surveys, that mode has also been excluded from the column so that the comparisons can be made between the common modes included in the three surveys.

Table 45 – Share of riders using different access modes

Access mode to station	2005		2008		2017		
	Riders	Percent	Riders	Percent	Riders	Percent	% without NJT train
Drove alone and parked	1,716	16.3	615	10.5	5,777	12.0	13.6
Carpooled and parked	41	0.4	7	0.1	574	1.2	1.3
Car drop off	296	2.8	295	5.0	1,619	3.4	3.8
Passenger in carpool	20	0.2	14	0.2	80	0.2	0.2
Ride-hailing service	NA	NA	NA	NA	122	0.3	NA
Bus	377	3.6	1,246	21.3	4,271	8.9	10.0
NJT Train	NA	NA	NA	NA	5,357	11.1	NA
PATH	534	5.1	0	0.0	4,340	9.0	10.2
Ferry	55	0.5	10	0.2	148	0.3	0.3
Walk	6,858	65.0	3,553	60.7	24,920	51.9	58.5
Taxi	38	0.4	21	0.4	102	0.2	0.2
Bicycle	54	0.5	11	0.2	339	0.7	0.8
Other	568	5.4	81	1.4	413	0.9	1.0
Total	10,557	100.0	5,852	100.0	48,062	100.0	100.0

DEFINING THE HBLR RIDERSHIP CATCHMENT AREA

As noted in the Literature Review section of this report, the term “catchment area” in the field of transportation has historically been used for defining the markets and areas served by regional transportation systems and various system components. The identification of catchment areas has many applications in transit planning, including ridership forecasting, economic development assessment, and network connectivity assessment. An important task of this study is to define the catchment area(s) of the HBLR system and its stations, primarily from the perspective of ridership demand. To achieve this objective, the research team analyzed HBLR rider origins and destinations, the modes used to access the HBLR as well as measures of walkability within a 1/2-mile of HBLR stations.

HBLR Rider Origins and Destinations

Analysis began with the examination of the places HBLR riders come to use the system and where they travel to. Figure 9 shows the trips origins and destinations of all HBLR riders. Figures 10 through 14 are presented to show that the trip origins and destinations of HBLR riders that use different access and egress modes to and from HBLR stations are different.

As shown in Figure 9, many HBLR rider originate and end their trips in places located proximate to the service. At the same time, a substantial minority of riders travel from places that are quite far from the system, including places in Sussex, Morris, and Monmouth Counties in New Jersey and Orange and Rockland Counties in New York State. The New Jersey counties that generate the most riders are Hudson, Bergen, Essex, Union, Middlesex, and Passaic Counties. Most New York origins and destinations are concentrated in Manhattan and Staten Island. On the whole, it is clear that the catchment area of the HBLR extends beyond what is generally perceived to be the catchment area of light rail systems.

As shown in Figure 10, compared to other mode users, HBLR riders that access the system by walking travel the shortest distances. While most walker origin and destinations are within a 1/2-mile or less of stations, walkshed of stations appears to extend beyond the 1/2-mile buffer out to one mile from stations. Figure 11 shows that bus users make longer trips than walkers but shorter trips than the users of other modes. Interestingly, it appears that they tend to travel to the HBLR more from the north (southern Bergen County) and the south (Staten Island) than the east (Essex and Union Counties). HBLR rider access the system by auto come from distant places in all directions, but as shown in Figure 12, a larger number of auto users travel from Bergen County and Staten Island than the counties directly east of the system.

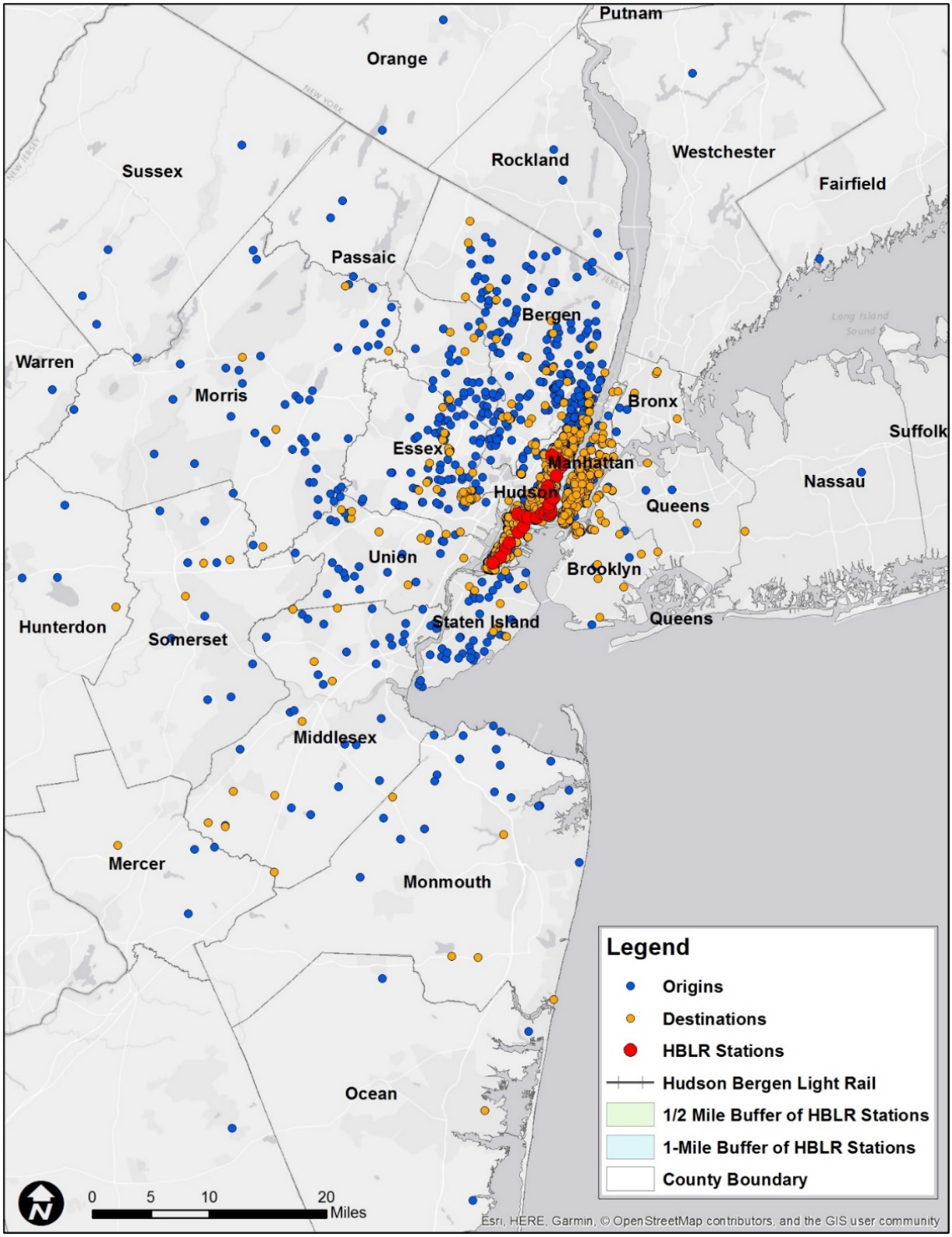

Figure 9. Trip origins and destinations of all HBLR riders surveyed

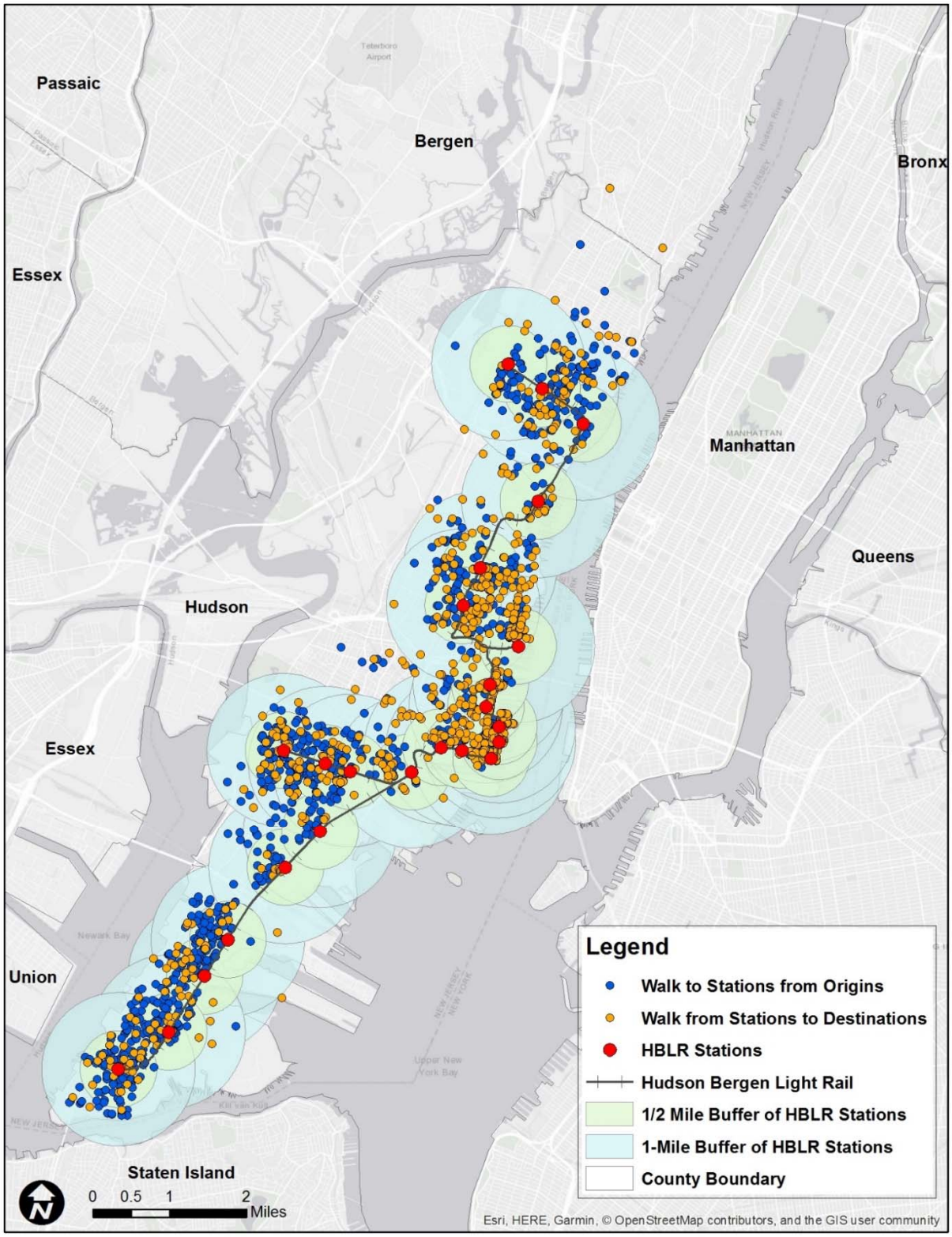

Figure 10. Trip origins and destinations of HBLR riders walking to and from stations

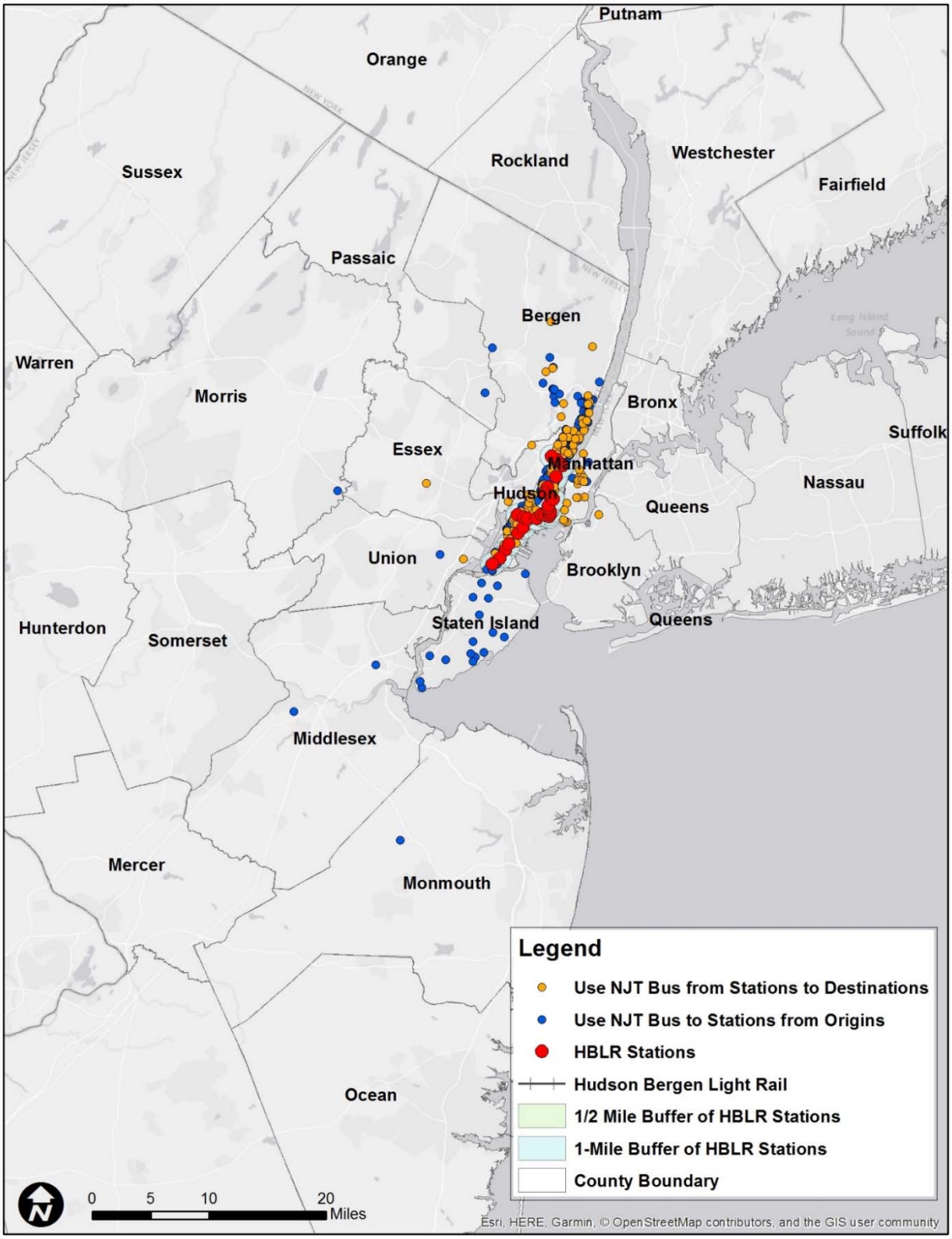

Figure 11. Trip origins and destinations of riders using buses to and from stations

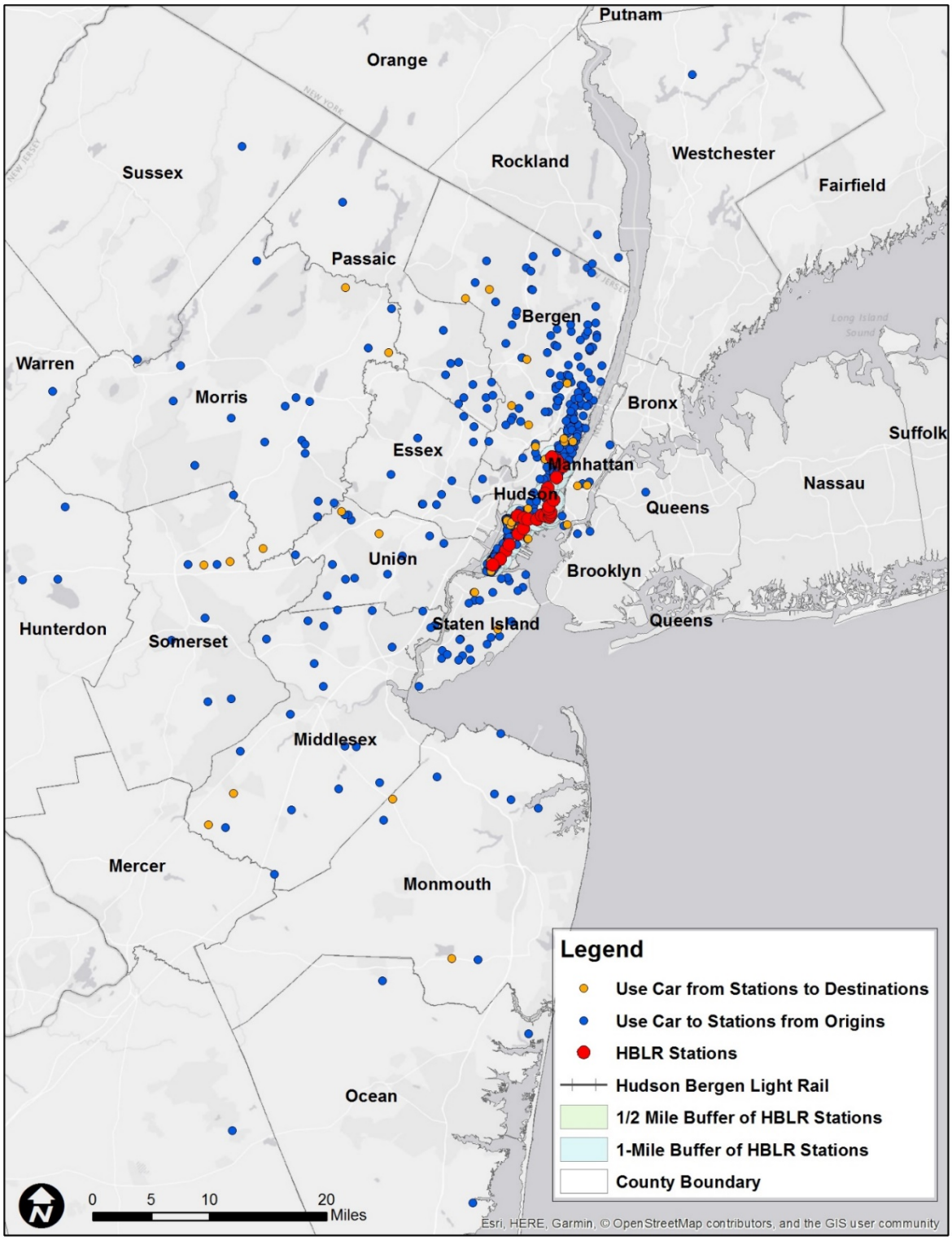

Figure 12. Trip origins and destinations of riders using cars (as driver or passenger) to and from stations

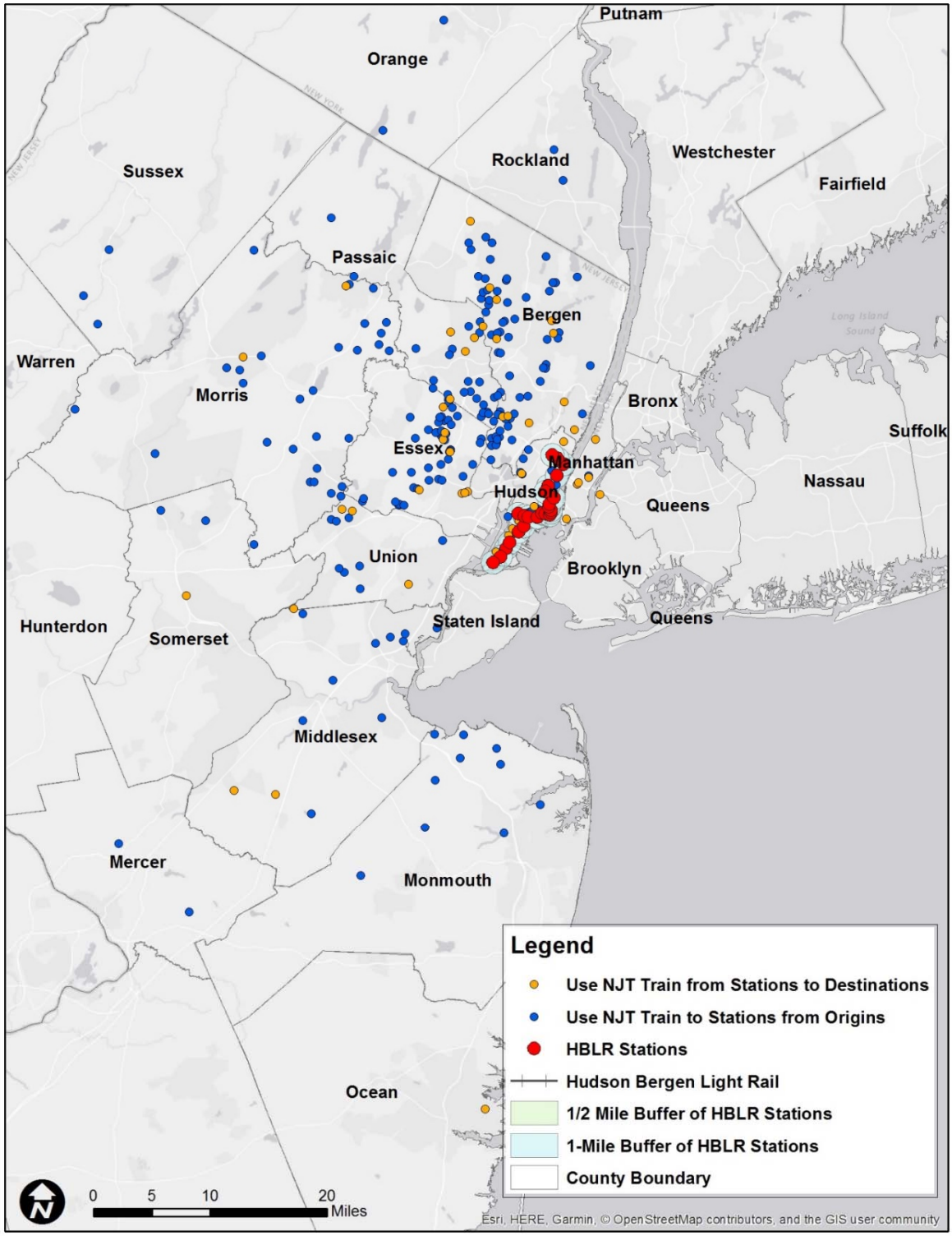

Figure 13. Trip origins and destinations of riders using NJ TRANSIT trains to and from stations

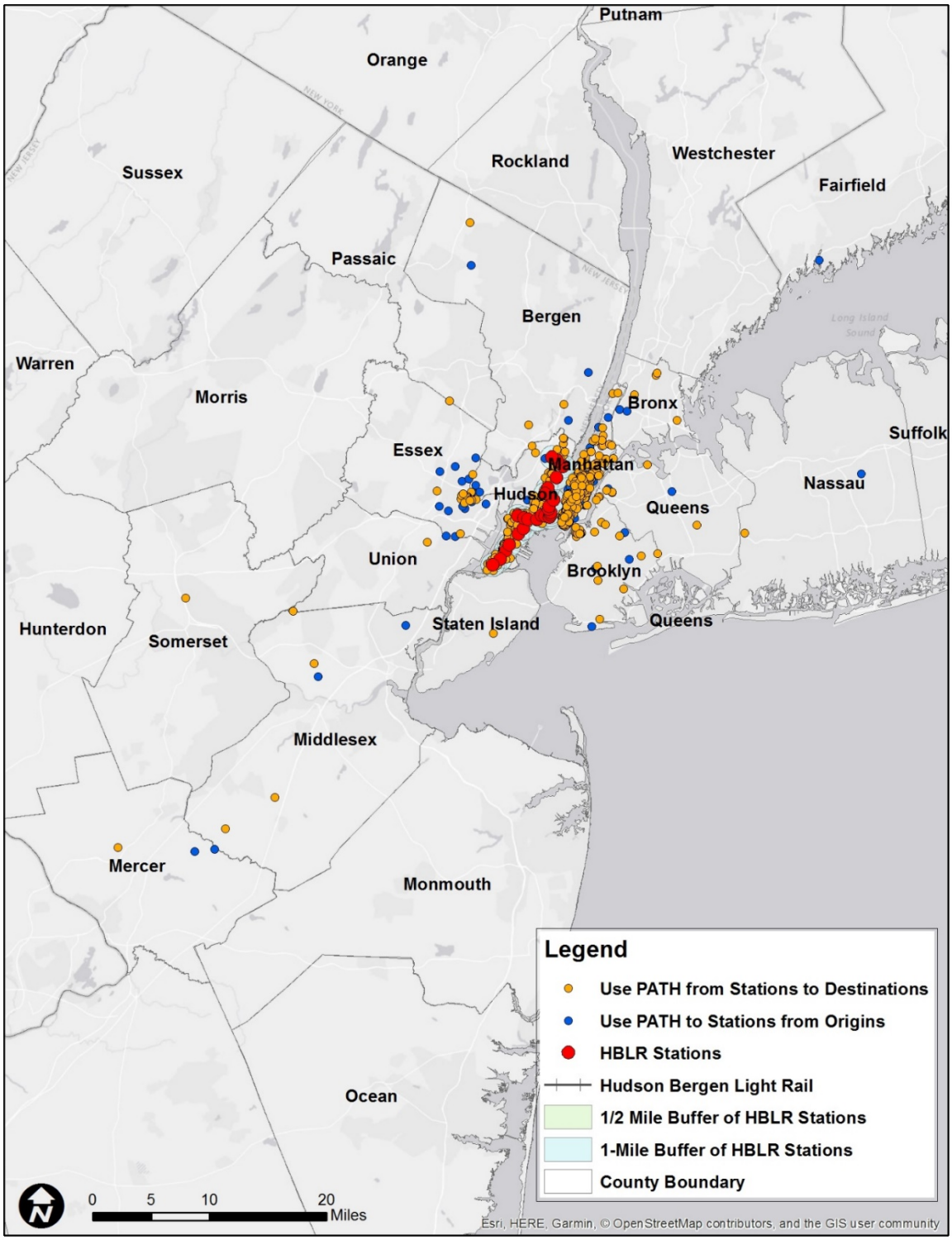

Figure 14. Trip origins and destinations of riders using PATH trains to and from stations

Figure 13 shows that the users of NJ TRANSIT trains also travel from distant places, but their trip origins and destinations appear to follow the commuter rail lines with one-seat rides to Hoboken, namely, the Pascack Valley Line, the Main Line, the Bergen Line, the Montclair-Boonton Line, and to a certain extent, the North Jersey Coast Line. Figure 14 shows that the PATH users travel from a shorter distance to the HBLR than the those traveling by auto and NJ TRANSIT trains. As might be expected given the extent and purpose of the PATH system, users of PATH are far more likely to start or end their trip in New York City and to a lesser extent Harrison and Newark, NJ, than the users of other modes.

Access Mode and Travel Distance by Station

The origin and destination patterns observed visually in Figures 9-14 are confirmed empirically through an analysis of distance traveled by riders to access the HBLR system. As noted earlier in the report, a majority of all HBLR riders (nearly 52 percent) access their boarding station by walking. However, a substantial number of riders access the system using other modes, including auto (16.7 percent), NJ TRANSIT train (11.1 percent), PATH train (9.0 percent), and bus (8.9 percent). When examined in detail, it is evident that patterns of access vary by station.

As shown in Table 46, access mode share is strongly influenced by the availability of multimodal transit connections and/or the availability of parking at each station. For example, NJ TRANSIT train accounts for more than half of the HBLR riders boarding at Hoboken Terminal, whereas the share of that mode for all other stations is very small. Similarly, the share of riders accessing the HBLR via PATH trains is large for Exchange Place, Newport, and Hoboken Terminal stations, but as might be expected very small from other HBLR stations that are not served directly by PATH.

The share of bus trips is highest at the Port Imperial station, followed by Bergenline Ave station. Tonnelle Ave and Liberty State Park stations show higher shares of auto access because ample and comparatively inexpensive public parking is available at these stations. Several of the Bayonne Branch stations also show higher rates of driving and parking, presumably because these stations serve Staten Island residents using the system. As might be expected, the stations with higher shares of NJ TRANSIT train, PATH train, bus, and automobile trips show lower shares of walking trips. The share of walking trips is highest at 9th St/Congress St station followed by the 45th St, MLK Jr. Blvd, 8th St, Harborside, and 22nd St stations, respectively.

Table 47 shows the mean network distance traveled by HBLR riders between their origin and their boarding station. As was the case with access mode, distance traveled by HBLR riders to access their boarding station varies by station and is strongly influenced by the multimodal connections available at the station. Travel distances are longest for riders accessing the Liberty State Park, Hoboken Terminal, Tonnelle Avenue and Exchange Place stations. In all cases, the distance traveled to access these stations are longer than the mean travel distance for all stations combined.

Table 46 – HBLR rider access mode by station (percent)

Boarding Station	Auto	Bus	NJT Train	PATH	Walk	Other Modes	Total percent	Total
Tonnelle Avenue	65.2	9.7	0.8	0.8	22.5	0.9	100.0	3,685
Bergenline Avenue	7.3	32.1	0.9	0.7	55.5	3.5	100.0	3,233
Port Imperial	11.9	46.2	1.0	2.6	31.8	6.5	100.0	1,518
Lincoln Harbor	20.1	4.3	1.8	4.4	69.4	0.0	100.0	730
9th St/Congress St	0.9	9.8	0.4	0.7	86.8	1.3	100.0	2,108
2nd Street	1.1	1.8	0.0	0.0	95.2	1.8	100.0	858
Hoboken	1.6	3.9	57.7	18.4	16.6	1.9	100.0	8,359
Newport	9.4	4.8	1.9	42.0	40.5	1.4	100.0	2,783
Harsimus Cove	20.0	0.0	0.0	0.0	73.3	6.6	100.0	379
Harborside	9.3	4.6	2.9	2.1	77.3	3.9	100.0	1,004
Exchange Place	9.6	6.1	5.6	45.8	29.8	3.0	100.0	2,620
Essex Street	7.8	6.2	4.7	1.9	74.8	4.6	100.0	841
Marin Boulevard	4.7	3.8	2.3	12.1	72.4	4.7	100.0	412
Jersey Avenue	2.2	4.4	7.4	0.0	79.7	6.3	100.0	425
Liberty State Park	61.1	1.4	0.9	0.9	32.7	3.1	100.0	2,247
Garfield Avenue	7.1	0.0	0.0	3.9	86.8	2.2	100.0	893
MLK Drive	7.6	8.4	0.0	1.7	79.4	2.9	100.0	1,712
West Side Avenue	18.6	12.2	0.5	0.0	67.2	1.6	100.0	4,028
Richard Street	5.8	1.9	0.0	0.0	92.4	0.0	100.0	503
Danforth Avenue	9.3	3.1	2.2	2.2	75.6	7.5	100.0	931
45th Street	13.8	0.0	1.2	0.0	83.0	2.0	100.0	1,617
34th Street	24.2	17.9	0.0	1.8	53.6	2.5	100.0	2,159
22nd Street	24.1	0.0	2.2	1.4	71.4	0.9	100.0	2,261
8th Street	15.3	3.0	0.0	1.1	79.4	1.2	100.0	2,754
All Stations	**16.7**	**8.9**	**11.1**	**9.0**	**51.9**	**2.3**	**100.0**	
Total	**8,050**	**4,271**	**5,357**	**4,340**	**24,920**	**1,124**		**48,062**

Notes: 1) Rider estimates are less than total average weekday ridership due to non-response/missing data for the variable(s) analyzed. 2) Auto includes drive/carpool and park and auto drop-off. 3) Other modes include ferry, ride-hailing, taxi, bicycle, shuttles, etc.

Table 47 – Mean travel distance by access mode to station (miles)

Boarding Station	Auto	Bus	NJT Train	PATH	Walk	Other Modes	All Modes
Tonnelle Avenue	9.8	4.8	N/A	N/A	1.2	N/A	7.5
Bergenline Avenue	2.1	2.3	N/A	N/A	0.9	N/A	1.5
Port Imperial	4.4	4.3	N/A	N/A	0.9	N/A	3.1
Lincoln Harbor	1.5	SS	N/A	N/A	0.9	N/A	1.1
9th St/Congress St	N/A	1.4	N/A	N/A	0.9	N/A	1.0
2nd Street	N/A	N/A	N/A	N/A	1.2	N/A	1.2
Hoboken	12.1	3.8	18.0	5.5	2.7	N/A	11.3
Newport	4.3	5.9	N/A	5.8	1.7	N/A	3.7
Harsimus Cove	N/A	N/A	N/A	N/A	1.6	N/A	1.6
Harborside	N/A	N/A	N/A	N/A	0.7	N/A	0.7
Exchange Place	5.2	8.7	N/A	8.1	1.4	N/A	6.1
Essex Street	N/A	N/A	N/A	N/A	0.8	N/A	0.8
Marin Boulevard	N/A	N/A	N/A	N/A	2.1	N/A	2.1
Jersey Avenue	N/A	N/A	N/A	N/A	1.4	N/A	1.4
Liberty State Park	23.5	N/A	N/A	N/A	2.8	N/A	14.9
Garfield Avenue	N/A	N/A	N/A	N/A	0.6	N/A	0.76
MLK Drive	N/A	N/A	N/A	N/A	0.7	N/A	0.7
West Side Avenue	5.5	1.1	N/A	N/A	1.0	N/A	1.8
Richard Street	N/A	N/A	N/A	N/A	0.6	N/A	0.6
Danforth Avenue	N/A	N/A	N/A	N/A	0.3	N/A	0.3
45th Street	2.1	N/A	N/A	N/A	2.4	N/A	2.2
34th Street	5.8	9.1	N/A	N/A	1.4	N/A	3.5
22nd Street	3.0	N/A	N/A	N/A	0.8	N/A	1.3
8th Street	1.1	N/A	N/A	N/A	1.4	N/A	1.3
All Stations	9.5	3.5	17.1	6.1	1.3	N/A	4.5

Notes: 1) Rider estimates are less than total average weekday ridership due to non-response/missing data for the variable(s) analyzed. 2) Auto includes drive/carpool and park and auto drop-off. 3) Other modes including ferry, ride-hailing, taxi, bicycle, shuttles, etc. 4) N/A distances were not calculated because less than 100 riders report using this mode to access the station.

Mean travel distance between rider origins and Liberty State Park station, where there is a sizeable park and ride lot, is 14.9 miles for all modes and 23.5 for riders that drive to the station. The mean distance traveled by HBLR riders boarding at Hoboken Terminal is 11.3 miles for all modes. The vast majority of riders boarding in Hoboken (76.1 percent) arrive by NJ TRANSIT train and PATH trains. Travel distances for these access modes are 18.0 and 5.5 miles respectively. Riders that access Hoboken Terminal travel by auto travel an average of 12.1 miles.

Tonnelle Avenue station, which is the northernmost station on the HBLR Northern Extension is a park and ride station and is also well served by multiple bus routes. Mean travel distance for all modes to Tonnelle Avenue station is 7.5 miles, 9.8 miles for riders accessing the station by auto, and 4.8 miles for riders accessing the station by bus. Exchange Place station is served by PATH trains, which is the access mode for nearly 46 percent of HBLR riders boarding at the station. Exchange place is also served by multiple nearby bus routes. Mean travel distance for riders boarding at Exchange Place is 6.1 miles for all modes, 8.7 miles for riders accessing the station by bus, 8.1 miles for riders using PATH trains and 5.2 miles for riders that access the station by auto.

Geographic Destination by Access Mode

Table 48 shows where HBLR riders travel to using the HBLR system. For the purpose of this table, destinations include Hudson County locations, New Jersey locations outside Hudson County, and locations in New York State, including the five boroughs of New York City and New York counties located north of New Jersey. This table provides interesting evidence regarding the role the HBLR plays as both a collector/distributer system as well as a connecting system that facilitates inter-county travel.

Table 48 – Destination by access mode to boarding station

	Hudson County	New Jersey Outside Hudson County	New York	Total
Walk	64.3	8.8	27.0	100.0
NJT train	91.8	7.5	0.7	100.0
PATH	84.5	6.6	8.8	100.0
Auto	67.0	6.8	26.2	100.0
Bus	85.7	5.9	8.4	100.0

As shown in the table, for all modes, most HBLR riders are traveling to locations in Hudson County. Riders who access their HBLR boarding station by walking or by auto are more likely to travel to New York than riders traveling by NJ TRANSIT train, bus, or PATH train. Walkers most likely live in one of the HBLR station areas and use the HBLR to travel to work destinations primarily in Hudson County and New York City. For walkers, this likely indicates a pattern of self-selection where riders destined to job locations in New York City are selecting their residence location so they can walk to the HBLR and then connect to other modes, in particular PATH trains, as part of their work commute. This theory is supported by evidence from the survey that a large majority of riders reported that the presence of the HBLR influenced their selection of residence.

Those who access their HBLR station by auto most likely live more distant from stations but use comparatively inexpensive parking at HBLR park and ride lots on their way to work destinations in Hudson County and New York City. This makes intuitive sense given the nature of New Jersey residential patterns and the concentration of jobs along the Hudson River waterfront in Jersey City and in mid-town and lower Manhattan.

HBLR riders that access their boarding station by PATH trains are most likely New York residents destined for work locations along the waterfront; and finally, HBLR riders that access their boarding station by taking NJ TRANSIT trains are likely traveling from other New Jersey counties destined for work locations in Hudson County. NJ TRANSIT rail riders alighting in Hoboken and destined for work destinations in New York City would have little reason to access the HBLR given the availability of New York-bound PATH trains and ferries at Hoboken Terminal.

These patterns are further supported by additional analysis of HBLR rider egress modes to their final destinations. Close to 60 percent of the alighting HBLR riders take PATH trains to travel to New York City, whereas a similar proportion alighting HBLR riders take NJ TRANSIT trains to travel to New Jersey counties outside of Hudson County. Ninety-six percent of alighting HBLR riders that walk to their final destinations are traveling to locations within Hudson County whereas the other four percent walk to nearby destinations outside Hudson County, mostly in southern Bergen County.

The role of walkability and defining the HBLR Catchment Area

More than half of all HBLR riders walk to their boarding station. It is clear that the catchment area of the system overall and for each station to varying degrees includes the neighborhoods that surround each station. An attempt has been made in this section to examine the relationship between walkability of the areas near stations (within 1/2-mile) and number of riders boarding at specific stations. This is essentially an assessment of station catchment area at the micro level, where the primary focus is on walking.

Walk Score

Walk Score (https://www.walkscore.com), a web-based service created by urban planners, environmentalists, and technical experts, can be used to obtain the walk scores, transit scores, and bike scores for specific locations with the United States. Walk scores are estimated on the basis of distance to nearby amenities and pedestrian friendliness of the area. The scores vary from 0 to 100, where 100 is the most walkable and 0 is the least walkable. The scores for each location is divided into five categories, Walker's Paradise (scores 90 to 100), Very Walkable (scores 70 to 89), Somewhat Walkable (scores 50 to 69), Car-Dependent I (scores 25-49), and Car-Dependent II (scores 0 to 24). The scores are obtained by considering amenities and distance. Amenities within a 5-minute walk (1/4 mile) are given 100 points and amenities up to 30 minutes are given points on the basis of a distance-decay function up to 30 minutes of walk (1.5 miles). Amenities beyond 30 minutes of walking are given no points. The points are then normalized to values between 0 and 100. The seven types of amenities considered are drinking and dining, groceries, shopping, errands, parks, schools, and culture and entertainment.

Transit scores are estimated on the basis of frequency, type of route (bus, rail, etc.), and distance to nearest station/stop. Bike scores are estimated on the basis of bike infrastructure (lanes, trails, etc.), hills, destinations, and road connectivity. The walk,

transit, and bike scores for each of the HBLR stations were obtained from the Walk Score website.

Walk Score and Station Boarding

Table 49 shows the walk scores, transit scores, and bike scores for all HBLR stations. Figure 15 shows the walk scores in the form of a map. As shown in Table 49, the walk scores are available for all stations, but the transit scores and bike scores are available only for selected stations.

The stations with the highest walk score are Bergenline Ave, 9th St/Congress St, Marin Blvd, Harsimus Cove, 22nd St, Newport, and MLK Drive Stations. Port Imperial Station has the lowest walk score, which is not surprising because on the east side it has the Hudson River and on the west side it has the ridge separating the waterfront from the rest of the community. Lincoln Harbor, Danforth Ave, and Liberty State Park Stations have the next lowest scores, respectively.

Transit scores are influenced not only by the presence of the HBLR but also by the availability of buses, PATH, and NJ TRANSIT trains. It is not surprising that the area served by HBLR Core System stations from Hoboken Terminal to about Marin Blvd have higher transit scores. These station areas are served by two HBLR service lines and the areas are also well connected to other transit modes, including buses, PATH and NJ TRANSIT trains.

A schematic comparison between number of riders boarding at stations and walk scores is made in Figure 16. The figure's left vertical axis measures station walk score. The right vertical axis measures number of total riders boarding at the station and the number of riders who walked to stations. Assuming that walk scores have a positive effect on number of riders that walk to the station, then the stations that have lower walk scores should have a smaller number of walking riders and stations that have higher walk scores should have a greater number of riders walking to the station.

This relationship appears to generally hold true, although not in all cases. For station areas with lower walk scores such as Port Imperial, Lincoln Harbor, Liberty State Park, Richard Street and Danforth Avenue, the number of HBLR riders accessing the stations by walking is comparatively low. These stations also generally have fewer boardings overall. Stations with high walk scores such as Bergenline Avenue, 9th Street/Congress Street, Westside Avenue, 2nd Street, and 8th Street, have a comparatively high number of riders accessing the system by walking. However, for other stations such as Newport, Harsimus Cove, and Marin Boulevard there does not seem to be any association between walk score and number or riders accessing the HBLR by walking. Each of these station have a high walk score but comparatively few riders walking to the station.

Table 49 – Walk, transit, and bike scores for the HBLR stations

Station	Walk Score	Transit Score	Bike Score
Tonnelle Ave	79		
Bergenline Ave	96	81	
Port Imperial	55		
Lincoln Harbor	65		
9th St/Congress St	94	76	63
2nd St	85		70
Hoboken Terminal	87	90	64
Newport	90	88	64
Harsimus Cove	92	84	69
Harborside	87	84	64
Exchange Pl	86	83	63
Essex St	89	80	61
Marin Blvd	94	82	70
Jersey Ave	79	78	70
Liberty State Park	71	65	50
Garfield Ave	83	69	59
Martin Luther King Dr	90	72	58
West Side Ave	89	70	73
Richard St	72	66	67
Danforth Ave	68	68	64
45th St	77	64	
34th St	85	64	
22nd St	91	63	
8th St	86	65	

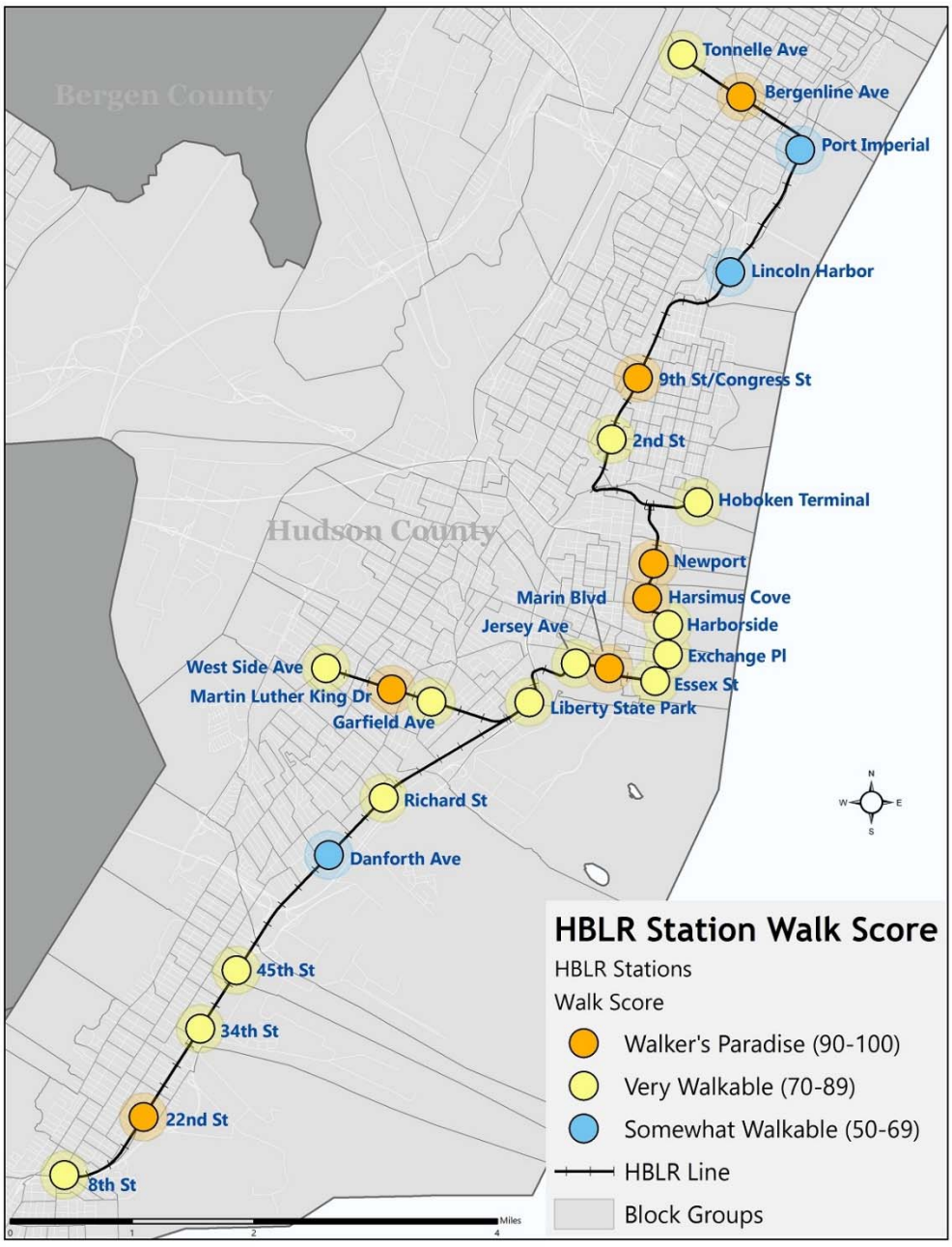

Figure 15. Walk scores for HBLR stations

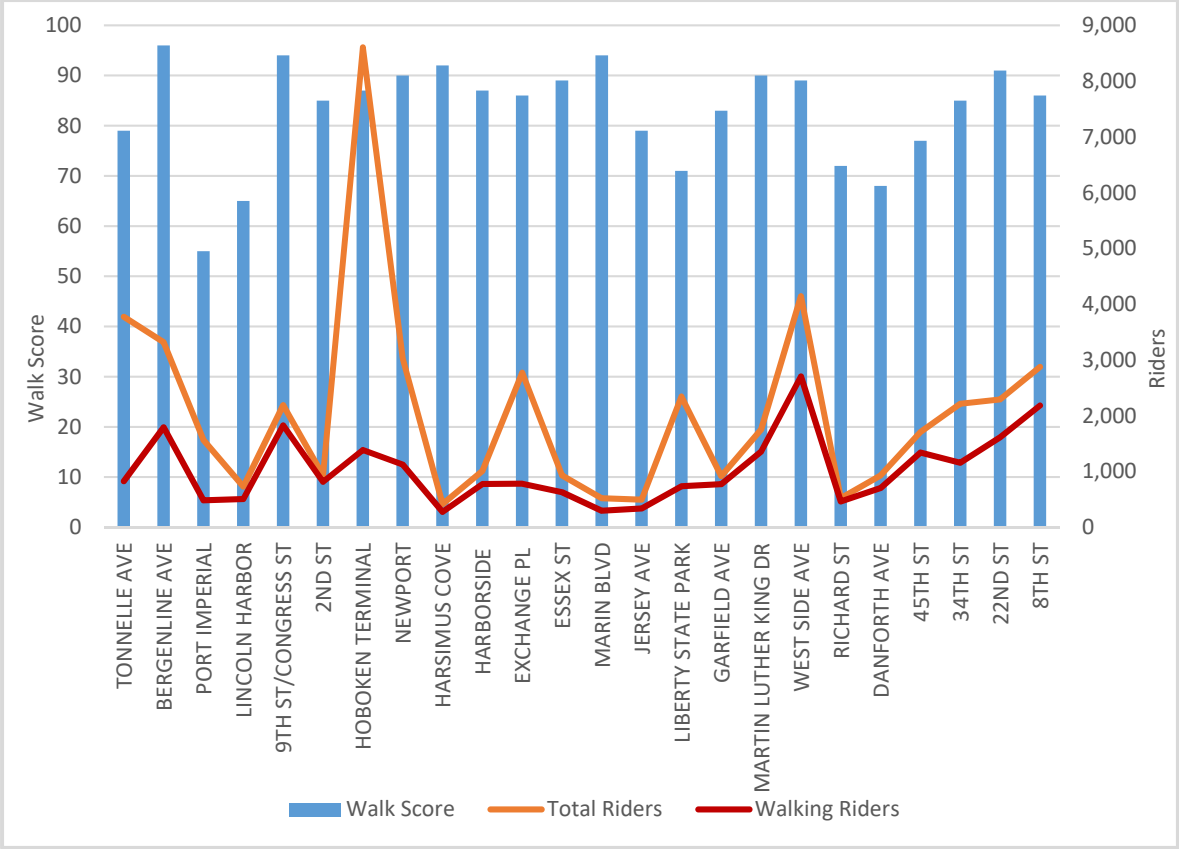

Figure 16. Ridership volumes compared with walk score for stations

To explore the relationship between walk score and riders walking to access the HBLR, the research team undertook a correlation analysis to see if there was a statistically significant association between the number of riders walking to the HBLR and walk score values. The analysis found that there is a statistically significant relationship between walk access and walk scores. The correlation coefficient between walk score and number of riders accessing their boarding station by walking was positive and significant at the 5 percent level ($r=0.42$, $p=0.04$). So, it can be concluded that the presence of neighborhood amenities in the areas around HBLR stations generally increasing the number of riders that walk to their boarding station.

Assessment of Catchment Areas by Station

Based on the evidence from this study, the catchment and market areas served by each station have been identified. Table 50 identifies the catchment and market areas of each HBLR station. As shown in the table, all of the HBLR stations serve a neighborhood market area. Many stations serve other market areas as well. Table 51 lists the HBLR stations by market area served and the basic characteristics of stations in each category.

Table 50 – HBLR catchment areas by station

Station	Micro-Catchment Area		Macro-Catchment Area	
	Neighborhood Market (0.5 mile buffer)	Local Market (1-mile buffer)	Intermediate Market (1-5 mile buffer)	Regional Market (>5 mile buffer)
Tonnelle Ave	✓	✓	✓	✓
Bergenline Ave	✓		✓	
Port Imperial	✓		✓	
Lincoln Harbor	✓	✓		
9th St/Congress St	✓	✓		
2nd St	✓			
Hoboken Terminal	✓	✓	✓	✓
Newport	✓	✓	✓	✓
Harsimus Cove	✓	✓		
Harborside	✓			
Exchange Pl	✓	✓	✓	✓
Essex St	✓			
Marin Blvd	✓	✓		
Jersey Ave	✓	✓		
Liberty State Park		✓	✓	✓
Garfield Ave	✓			
Martin Luther King Dr	✓			
West Side Ave	✓	✓	✓	
Richard St	✓			
Danforth Ave	✓			
45th St	✓	✓	✓	
34th St	✓	✓	✓	✓
22nd St	✓		✓	
8th St	✓	✓		

Table 51 – HBLR stations by markets served

		HBLR Stations	Characteristics
MICRO-CATCHMENT AREA	Neighborhood Market Stations (0.5 mile linear buffer)	2nd Street Harborside Essex Street Garfield Avenue Martin Luther King Drive Richard Street Danforth Avenue	• Primarily serve neighborhoods located within 0.5 linear mile buffer of station • Mean network access distances are generally 0.9 mile or less • The vast majority of riders access the stations by walking (75 percent or more)
	Local Market Stations (1-mile linear buffer)	Lincoln Harbor 9th Street/Congress Street Harsimus Cove Marin Boulevard Jersey Avenue 8th Street	• Serve the neighborhood market as well as an extended local market area within a 1-mile linear buffer of station • Mean network access distances are generally 1.5 miles or less • Primary access mode is walking (69-87 percent), but the share riders accessing stations by auto and bus is somewhat higher than neighborhood market stations
MACRO-CATCHMENT AREA	Intermediate Market Stations (1-5 mile linear buffer)	Bergenline Avenue Port Imperial Westside Avenue 45th Street 22nd Street	• Serve the neighborhood market area and an intermediate market area within a 5-mile linear buffer around stations • May also serve the local market area but not always • The share of riders accessing stations by auto and bus is greater than neighborhood market stations • Mean network access distances are generally between 1.5-5.5 miles
	Regional Market Stations (> 5 mile linear buffer)	Tonnelle Avenue Hoboken Terminal Newport Exchange Place Liberty State Park 34th Street Station	• Serve neighborhood, local and intermediate market areas as well as a regional market that extends beyond the 5-mile linear buffer of stations • Share of riders accessing station by non-walking modes is substantially higher • Mean network access distances range up to 23.5 miles • Multimodal connections via bus, NJ TRANSIT trains, PATH trains and park and ride lots extend the reach of the HBLR to Bergen, Essex, Middlesex, Monmouth, Morris, Passaic, Sussex, and Union Counties in New Jersey as well as New York City and Orange and Rockland Counties in New York

The Micro-Catchment Area

The communities served directly by stations and, in particular, the immediate areas around stations make up the system's micro-catchment area which includes a neighborhood market that is within a 1/2-mile linear buffer of stations and a local area market that extends to a 1-mile linear buffer of stations. The micro-catchment area is defined primarily by walking distance. Network walking distances of one mile or less generally fall within a 1/2-mile linear buffer of stations, while network walking distances of between one and 1.5 miles generally fall within a 1-mile buffer of stations.

All of the HBLR stations serve a ***neighborhood market***. Seven stations (2nd Street, Harborside, Essex Street, Garfield Avenue, Martin Luther King Drive, Richard Street, and Danforth Avenue) serve primarily a neighborhood market, where the vast majority of riders (75 percent or more) access their boarding station by walking. Riders that access neighborhood market stations by walking travel a mean network distance of a 0.9 miles or less to board the HBLR.

Six stations appear to also serve an extended ***local market*** that encompasses the area within a 1-mile linear buffer of stations. These include: Lincoln Harbor, 9th Street /Congress Street, Harsimus Cove, Marin Boulevard, Jersey Avenue, and 8th Street. For these local market stations, walking remains the primary mode of access; however, the share of riders accessing the station by other modes is higher than for neighborhood stations. For example, the share of riders accessing Lincoln Harbor and 8th Street stations by auto is 20.1 percent and 15.3 percent respectively.

The mean network distance traveled riders walking to these local market stations generally ranges from 1.2 to 1.6 miles. However, for Marin Boulevard station the mean walking distance is 2.1 miles which indicates that at least some riders boarding at the station travel from origins located outside the 1-mile linear buffer of the station. For riders accessing the Lincoln Harbor and 8th Street stations by auto, the mean travel distance is 1.5 miles and 1.1 miles respectively.

The assessment of the micro-catchment area markets described above is further supported by the analysis of rider destinations which showed that 96 percent of alighting HBLR riders walk to final destinations within Hudson County. The vast majority of these destinations are concentrated along the HBLR corridor within a 1-mile linear buffer of HBLR stations. Finally, the analysis of station area walk scores for the neighborhood market confirmed the positive relationship between neighborhood amenities and walk up access.

The Macro-Catchment Area

In addition to having a micro-catchment area, evidence from this study makes clear that the HBLR also has a macro-catchment area. The macro-catchment area, which includes both an intermediate market (a 1-5 linear mile buffer) and a regional market (>5-mile buffer) is defined by the various transportation modes that connect with the system at key stations. The intermediate market is connected to the HBLR primarily via

bus and auto modes, while the regional market is connected via auto, bus, NJ TRANSIT trains and PATH trains.

In addition to serving the neighborhood market, five stations (Bergenline Avenue, Port Imperial, Westside Avenue, 45th Street and 22nd Street also serve an ***intermediate market*** area that incorporates the area within a 5-mile linear buffer of stations. As shown in Table 50, some serve the local market area as well, but not all. The share of riders accessing intermediate market stations by auto and bus is generally greater than neighborhood and/or local market stations.

This is particularly true for Bergenline Avenue and Port Imperial stations which have a bus access mode share 32.1 and 46.2 percent respectively. These stations appear to be extending the reach of the HBLR into southern Bergen County. The mean distance traveled by riders accessing Bergenline Avenue station is 2.3 miles, while the mean distance traveled by riders using bus to access Port Imperial station is 4.3 miles. The Westside Avenue, 45th Streets and 22nd Street stations have auto access mode shares ranging from 13.8 percent at 45th Street station, to 18.6 percent at Westside Avenue to 24.1 percent at 22nd Street station. Mean travel distances to these three stations by auto range from 2.1 miles at 45th Street station to 5.5 miles at Westside Avenue.

Finally, there are six stations (Tonnelle Avenue, Hoboken Terminal, Newport, Exchange Place, Liberty State Park and 34th Street) that serve a ***regional market*** area in addition to intermediate, local and neighborhood markets. These stations have a catchment area that extends beyond a 5-mile linear buffer of the stations. The share of riders accessing these station by modes other than walking is substantially higher than other stations and mean network access distances range up to 23.5 miles. For these stations, multimodal connections via bus, NJ TRANSIT trains, PATH trains and park and ride lots extend the reach of the HBLR into Bergen, Essex, Middlesex, Monmouth, Morris, Passaic, Sussex, and Union Counties in New Jersey as well as New York City and Orange and Rockland Counties in New York.

DISCUSSION AND CONCLUSION

The results of this comprehensive survey of more than 3,300 HBLR riders provides important insight regarding the characteristics of HBLR riders and how riders are using the system. Although the sociodemographic characteristics of riders, in general, closely matches the characteristics of Hudson County overall, there are some interesting differences. For example, HBLR riders a somewhat younger than Hudson County's population overall. HBLR riders also have higher household incomes and more vehicles available in their household than Hudson County residents. In addition, a substantially greater proportion of HBLR riders are new to Hudson County and have lived for only a short time at their current residence when compared to how long Hudson County residents overall have lived in their current residence.

Perhaps one of the most interesting findings from the study is the fact that nearly two-thirds of HBLR riders reported that the HBLR was somewhat or very important when they selected their current residence location. This number increases to more than 80 percent of residents living in their current residences for two years or less.

The vast majority of HBLR riders use the system to commute to work. Approximately 81 percent of all trips made on the HBLR are for work commute purposes. The most common means of accessing the HBLR is by walking. Nearly 52 percent of HBLR riders walk to their boarding station. The second most common mode is driving and parking (12 percent), followed by NJ TRANSIT train (11.1 percent), PATH train (9.0 percent), and bus (8.9 percent), respectively. The share of the other access modes is relatively small.

The vast majority of HBLR riders are frequent users. Seventy-one percent of riders use the HBLR at least five days a week. In addition, a majority of riders have been using the system for more than two years. More than one-third have been using the system of five or more years. Many HBLR riders (40.9 percent) frequent area businesses within 1/2-mile of their boarding station. In total, HBLR riders report spending $3.4 million per month and more than $41 million annually. Finally, in a testament to the importance of the HBLR service to its riders and the communities it serves, the vast majority of riders (70.4 percent) reported that they use the HBLR because it is the best choice for them to meet their travel needs.

In addition to understanding better who is using the HBLR, how, and why, an important objective of this research was to use the results of the survey and analysis of secondary data to identify the ridership catchment area of the HBLR system. As discussed in previous sections of the report, HBLR riders travel to and from stations by diverse modes. Although more than half HBLR riders travel to boarding stations by walking, a substantial number of riders access the system by auto, bus, NJ TRANSIT trains, and PATH trains. Those traveling by modes other than walking sometime travel significant distances. Evidence from the analysis of HBLR riders' origins and destinations and access and egress modes suggests that the HBLR plays a dual role in northern New Jersey transportation landscape.

The analyses indicate that the HBLR system and many of its stations have both a macro- and a micro- catchment area that includes neighborhood, local, intermediate and regional markets. Similar to many light rail systems throughout the world, the HBLR serves an important function as a collector/distributer system. In the case of the HBLR, the system facilitates intra-county travel in Hudson County along the waterfront. At the same time the HBLR also connects travelers to the larger regional transportation system facilitating inter-county travel via a variety of multimodal connections.

Lessons Learned from the Survey and Recommendations

The findings from this study and the dataset generated by this research can be used by NJ TRANSIT for transit service planning, modeling, and forecasting. Although the dataset generated by this research will be profoundly useful for such purposes, it is not free from limitations. One major issue with the dataset is with egress modes. Although

riders with New Jersey destinations and New York destinations were asked two different questions about egress modes with two different sets of specified modes to choose from, some riders were confused and responded to both questions, irrespective of their destination. In addition, because respondents were allowed to report use multiple egress modes, in some cases it was difficult to identify the mode that the riders took first when alighting at HBLR stations. Future surveys should be structured in such a way that the sequence of modes can be easily identified. A comprehensive list of modes for all riders, irrespective of destination, would also reduce respondents' confusion.

Second, the survey conducted as a part of this research, as well as past surveys of HBLR riders, involved distribution of surveys onboard as well as on platforms. A problem with the distribution of surveys on platforms is that the respondents cannot always be matched to the lines they used because the station platforms on which surveys were distributed serve multiple service lines. Although distribution of surveys on platforms helped to generate more data with less effort than distributing surveys onboard trains, the data collected in that manner may be incomplete.

Third, some riders were confused about trip origins and destinations, especially because they perceived trips as a two-way instead of one-way. As a result, they included the same location at both ends of the trip. A solution to this problem may be to as about the origins and destinations simultaneously instead of asking about the origin first and then asking about destination. Asking about origins and destinations side by side in a table could reduce riders' confusion. It may also help if the survey clarified that a trip is one-way rather than two-way.

Fourth, the time of travel for each trip in the survey was integrated on the basis of assignment sheets created for the survey. Although it was possible to categorize the trips into broad time categories such as morning peak, mid-day, and afternoon peak, more precise time could be obtained by including a question in the survey on trip start time. That would also allow analysts to cross-validate time of trip with assignment sheets.

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APPENDICES

1. Task 2 Report: Focus Group Summary
2. On-board Survey Questionnaire
3. Survey Data Weighting Analysis Memorandum (April 6, 2018

Research Project # 2016-04

Defining the Hudson Bergen Light Rail Catchment Area

Draft
Task 2 Report

March 24, 2017

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DISCLAIMER STATEMENT

The contents of this report reflect the views of the author(s) who is (are) responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the New Jersey Department of Transportation, NJ TRANSIT or the Federal Highway Administration. This report does not constitute a standard, specification or regulation.

INTRODUCTION

The Hudson Bergen Light Rail (HBLR) system is a major component of northern New Jersey's transportation network. It provides a north-south transit connectivity along the Hudson River waterfront in Hudson County. The first phase of the system, which included lines connecting the 34th Street station in Bayonne to the Exchange Place station in Jersey City along the southern branch, and the West Side Avenue station to the Liberty State Park station along the western branch, began operating in April 2000. Subsequent service extensions included service: north to Pavonia/Newport in November 2000; north to Hoboken Terminal in 2002; south to 22nd Street in Bayonne in 2003, north to Lincoln Harbor in 2004; north to Port Imperial on 2005; north to Tonnelle Avenue in North Bergen in 2006; and finally, south to 8th Street Station in Bayonne in 2011. Today the HBLR system is over 17 miles long with 24 stations, providing daily service to seven municipalities along the Hudson River, including Bayonne, Jersey City, Hoboken, Weehawken, Union City, West New York, and North Bergen.

While much is known about overall HBLR ridership and ridership growth over the past 15 years there has never been a comprehensive assessment of HBLR ridership in terms of passenger origins and destinations since the system has been fully operational. In addition, no research to date has sought to define the full "catchment area" of the HBLR system in the context of the system's connectivity with other travel modes. Given forecasted population and employment growth in Hudson County and its surrounding areas, it has become increasingly important to more fully understand the association between the HBLR system catchment area and potential new developments within the system's area of influence.

RESEARCH OBJECTIVES

The research objectives for this study are to:

1. Conduct a comprehensive onboard origin and destination survey of HBLR weekday riders.
2. Examine data from past NJ TRANSIT surveys and also other pertinent secondary data to inform the definition of the HBLR ridership catchment area.
3. Use the results of the survey and analysis of secondary data to identify the ridership catchment area of the HBLR system, in the context of its interaction with other transportation modes in the area.

HBLR CUSTOMER FOCUS GROUPS

As part of Task 2 of this study, the research team worked with NJ TRANSIT staff to organize and conduct two HBLR customer focus groups. The purpose of the focus groups was to help NJ TRANSIT and the research team better understand the rationales and thought processes riders use to select the HBLR as their travel mode of choice. The focus groups also provided an opportunity to pre-test the draft questionnaire to be used to conduct the on-board customer survey as part of Task 3 of the study.

The focus groups were conducted at Hoboken Terminal on January 18, 2017. The first took place from 5:30 to 7:00 PM. The second took place from 7:30 to 9:00 PM. Twenty-two customers participated in the two sessions. Focus group participants were recruited via email using contact information exported from the NJ TRANSIT Customer Scorecard database. Each focus group participant received a cash incentive of $100, provided by NJ TRANSIT.

Chris Henry and Michael Ahillen, from Fitzgerald Halliday, Inc. the subcontractor for this study, served as focus group facilitators. Jon Carnegie, the principal investigator for the study, was also present. Patrick Glasson, Rossana Ybasco, and Neal Fitzsimmons from NJ TRANSIT observed the sessions but did not actively participate in the focus group discussions.

A copy of the focus group facilitator topic guide and participant recruitment materials are attached as appendices. Signed informed consent and confidentiality forms were obtained from each participant as a record of their participation. These forms are confidential and therefore are not attached to this report.

The following summary consolidates the key observations and themes gleaned from the focus groups:

General Questions

- Participants use HBLR on most weekdays. Only one participant uses HBLR fewer than three times per week. Most used HBLR Monday through Friday.
- Most participants use HBLR for commuting to work. Running errands, appointments, and social gatherings were other reasons people use HBLR, but commuting to work was the primary reason for most participants.
- The majority primarily used HBLR during the AM and PM commute periods. Few participants said they ride the HBLR in off-peak hours.
- When asked what they like most about traveling on HBLR, participants said it was convenient, comfortable, and affordable. Several participants said driving was frustrating, time-consuming, and unreliable. One participant mentioned affordability.

- Crowded trains, especially during the AM and PM peak periods, was what most participants considered their least favorite aspect of HBLR. More signage, more comfortable shelters, and better ticket enforcement on the trains were other areas for improvement. Participants also would like to see an etiquette campaign for riders, improved security, and better real time information. Additionally, several participants noted that the elevators at the Congress Street and Bergenline Avenue stops are often broken. The following were mentioned by only one or two participants:
    - The warning system for closing doors does not provide ample time or warning. This is particularly challenging for riders bringing strollers on board.
    - The ticket vending machine is confusing. One participant accidently bought a monthly pass instead of an all-day pass.
    - Clearing snow from bus stops has been a problem.
    - Essex Street Station does not have a shelter.
    - A station at 1st Street in Bayonne is needed.

Questions about Last HBLR Trip

- Participants named the following origin-destination pairs:
    - 22nd Street-Exchange Place
    - 45th Street to Hoboken Terminal
    - Danforth Avenue to Hoboken Terminal
    - Garfield Avenue to Exchange Place
    - Newport to Tonnelle Avenue
    - Bergenline to Haborside
    - 9th Street to Exchange Place
    - Tonnelle Avenue to Harborside
    - Bergenline to Hoboken Terminal
    - 8th Street to Newport
    - 9th Street to Newport

- Most participants walk to their stop. Participants who started their last trip at Tonnelle Avenue drove. Those who drove to Tonnelle Avenue said they buy the monthly parking pass.
- All participants said they walk to their final destination.
- Monthly passes are the most common way participants paid for their trip. Four participants buy individual tickets or a ten pack.

- Two participants in the first group use HBLR on a part of their trip to New York City. These participants transfer to the PATH to reach Wall Street and Bryant Park.

Questions about Station Spending

- Most participants visited an eating establishment, convenience store, or coffee shop on their way to the HBLR station. Coffee or small food purchases (e.g., Dunkin Donuts) are the most common purchases.
- Participants' visits to coffee shops and eating establishments varied greatly. Whereas some said they visit a business almost every day, others said they go once a week or less often.
- Participants spend between $5 and $200 per month at businesses in the immediate vicinity of HBLR stations. Some individuals said they spend more than $200 on groceries and lottery ticket locations near HBLR stations.

Questions about HBLR and Where Participants Live

- Although five participants have lived at their address for two years or less, the remainder have lived at their address for 5 to 15 years.
- Most participants live 2 to 10 blocks from a HBLR station. A handful of participants who drive to Tonnelle Avenue live 10 miles or more away from the station.
- Most participants who walk to the closest HBLR station spend about 10 minutes or less walking. At least one individual walks twenty minutes. Another participant noted that she sometimes walks 40 minutes to work instead of taking the HBLR.
- Only two participants said HBLR service was an important factor in choosing where they live. The remainder of participants said HBLR did not factor into their decision. Several participants noted that they would rather live near a PATH station.
- Participants suggested that if they had to move today that transit would be an important factor for them. The HBLR in particular is not important. Participants reiterated their desire to live closer to a PATH station or other transit options.

Questions about the Survey Itself

- Nearly all participants said the survey was easy to complete. A few people had some confusion.
- A number of participants suggested that the survey was too long. At least one participant suggested there are too many questions that ask for more specificity if the respondent answers “Yes.” Examples include questions 34, 35, and 41.
- Participants suggested that they would prefer filling out the survey online instead of the paper copy. Participants said the trains were too crowded to fill out on the train.
- Participants emphasized the importance of drawings for prizes. This is a key motivator for people taking the survey, and the incentive should be prominently displayed on the survey.
- One participant suggested that “Customer Survey” does not mean anything to the customers. Instead, the survey should be titled in a way that suggests the results will have an impact (e.g., Transit Improvement Survey).
- Another participant suggested that a review of some feedback already gleaned from other surveys may encourage people to complete the survey. “Be part of a groundbreaking study…” was suggested language.
- Some participants said advertisement on the train draws attention. An advertisement for the survey may help remind people to fill it out, especially if that advertisement contains a link to the online survey and highlights incentives (e.g., drawings for prizes).
- Feedback on individual survey questions is listed in Table 1.

Table 1. Question-specific Comments

No.	Question Language	Participant Comment(s)
5	What is [your origin] address?	Some participants expressed reluctance to leave address, especially if the origin address is their home address.
10	What is the total estimated door-to-door travel time for this entire one-way trip?	One participant said there needs to be clarification that this refers to the entire trip, not just the HBLR portion of the trip.
13	How do you typically travel for your return trip?	One participant said they were confused by this question. This individual assumed everyone did the same trip on return.
20	Which electronic devices do you typically carry with you on the light rail?	One participant selected cell phone because it was listed first. This participant then saw smartphone and crossed out the first response.
23	Has your travel pattern changed since Superstorm Sandy in October 2012?	One person said Superstorm Sandy felt too long ago to remember, so this question was challenging to answer. Also, this question has an incorrect logic – some participants skipped to Question 30 as directed.
41	Do you take advantage of commuter tax benefits to pay for any part of your commuting expenses?	Several participants said this question was confusing because they did not know the difference between the taxable amount and what they pay.
42	What is your approximate annual household income?	One participant suggested that selecting income should be listed as optional. As an alternate, there could be an option such as, “I prefer not to answer.”

New Jersey Department of Transportation
2016 Research Program
Project No. 2016-04
Defining the Hudson Bergen Light Rail Catchment Area

FOCUS GROUP TOPIC GUIDE

Last Revised: 6/8/2016

WELCOME, OVERVIEW AND INTRODUCTIONS

First, let me begin by saying thank you. We really appreciate you volunteering to participate in our focus group today. My name is _____ and I am going to lead our discussion with my partner _____. We work in New Brunswick at the Voorhees Transportation Center at Rutgers University.

We are currently working on a project for NJ TRANSIT that is focused on learning more about the travel patterns and experiences of people that ride the Hudson Bergen Light Rail (HBLR) system. The information we collect will help the research team understand who is using the HBLR and how they are using it, and will also inform the preparation of a survey questionnaire that will eventually be handed out on-board HBLR trains. The survey data we eventually collect will be shared with NJ TRANSIT to help them continue to operate the HBLR in a safe, convenient and efficient manner and to help them understand where HBLR riders live and work.

Before we get started, I will be passing out an **informed consent form** describing our study for us to read together and for you to sign and return to us.

Participants read and sign consent and the focus group facilitator collects them.

If you have never participated in a focus group before we want you to know that focus groups are used in all kinds of research projects and they allow researchers like us to learn more about specific topics – in this case we are interested in learning about how and why you use the HBLR.

Here are some general guidelines for our conversation today:

- First, our discussion will last about 1.5 hours.
- Feel free to visit the bathroom; enjoy some refreshments/snacks; and/or move around whenever you need to.
- We ask that each of you participate as much as you feel comfortable doing; that you are kind and respectful of one another, even if you have different opinions, and that you turn off or lower the volume of your cell phones. And remember, let's have some fun!
- At the end of our discussion today each of you receive $100 cash to thank you for your participation. If for some reason you are not able to complete the focus group, you can still receive the cash incentive, but you will need to wait until after the focus group is completed.

ACTIVITY 1 – "ROAD TEST" DRAFT SURVEY QUESTIONNAIRE

The first thing we are going to do together tonight is to test out the draft survey questionnaire we put together. I mentioned before that part the study we are doing for NJ TRANSIT is to conduct a survey of HBLR riders. The survey will be handed out on-board HBLR trains and people will be asked to fill it out while riding or to take it with them, fill it out and turn it in the next time they ride the HBLR. People will also have the options of mailing it back or going on-line to complete the survey.

When we hand out the survey on board the train, we are going to be asking people about the trip they are making when they receive the survey questionnaire. So…for tonight, I want you to think about the last trip you made using the HBLR before coming to the focus group this evening. Does everyone have a trip in mind?

Ok great! Keep this trip in mind and answer the survey while thinking about this trip.

Facilitator distributes surveys and participants complete the questionnaire.

ACTIVITY 2 – GROUP DISCUSSION

Alright, now that everyone has finished filling out the survey, we can start our discussion.

Let's start by taking a few minutes right now to introduce ourselves and to get to know each other better.

Please tell us your **first name**; **where you live; if you work, tell us what you do for work; and tell us how long you have been using the HBLR.**

Now that we all know each other a little better, let's begin our discussion.

GENERAL QUESTIONS

1. How frequently do you use the HBLR?
2. What type of trips do you make on the HBLR? (Prompts: travel to work, school, social activities, recreation, shopping and to your doctor's and dentist offices?)
3. When do you most frequently travel on the HBLR? (Prompts: day of the week, time of day)
4. When you start your trip, what station do you most frequently use?
5. When you end your trip, which station do you usually get off?
6. What do you like MOST about traveling on the HBLR? Why? *(Listen for stories/experiences)*
7. What do you like LEAST? Why?

QUESTIONS ABOUT YOUR LAST HBLR TRIP

The next set of questions is about how you use the HBLR. For the next set of questions, I want you to think about the last trip you took using HBLR before coming to the focus group this evening. That should be the same trip you were thinking about when you filled out the survey questionnaire. Does everyone have that trip in mind again? Great!

8. What was the last trip you took on the HBLR? Where did you travel to and from?
9. What is the main purpose of this trip?
10. How frequently do you make this trip?
11. For this trip, what boarding station did you use?
12. How did you travel to your boarding station? (Prompts: Drive & park, walk, bike, bus, UBER/Lyft, other?)
    a. If you drove and parked at the station for that trip, what type of parking did you use? (e.g., Station lot parking, street parking, parking lot near the station/stop)
13. When you got off the HBLR, what station/stop did you use?
14. How did you travel to your final destination? (Prompts: walk, bike, bus, UBER/Lyft, etc.)
15. How did you travel for your return trip? (Prompts: traveled the same way in the opposite direction, took a different mode)
    a. If you took a different mode, how did you travel?
    b. How often do you use this mode for the other half of your trip?
16. What type of HBLR ticket do you use for the trip? (Prompts: monthly, monthly with parking, monthly with ferry, round trip, 10 trip, one way, etc.)
    a. How did you purchase your ticket?

OK, before we move on…one last question?

17. How many of you travel to/from New York City using the HBLR?
    a. If you travel to/from New York City, how do you get into the City? (Prompts: NJT commuter rail, PATH, Ferry, Bus)
    b. Where are you going in New York City when you use the HBLR?

QUESTIONS ABOUT STATION SPENDING

For the next set of questions, I want you to continue to think about the last trip you made before coming to the focus group tonight…

18. Did you visit any businesses within a half-mile of your boarding station prior to getting on the HBLR?
    a. What type of business did you visit? (Prompts: Sit-down restaurant, fast food/takeout, coffee/snack shop, dry cleaners, health club/gym, retail store, other?)
19. How many times would you say you visit these businesses each month?
20. How much do you think you spend at these businesses each month?
21. Which one shop/store/services is it most important for you to have near your boarding station?

QUESTIONS ABOUT HBLR AND WHERE YOU LIVE

22. How long have you lived at your current address?
23. How far would you say you currently live from the nearest HBLR station/stop?
24. When you selected where to live, how important was HBLR service in choosing where to live?
    a. In what way was it important? Why?
25. If you had to move from your current location to somewhere new, how important would HBLR service be in selecting your new home location? Why?

QUESTIONS ABOUT THE SURVEY ITSELF

26. Did you find the survey easy or hard to fill out?
27. Which questions gave you the most trouble?
28. If you received a survey on-board, how likely would you be to fill it out?
    a. Would you fill it out while riding or would you more likely fill it out and return it the next time you ride the HBLR, fill it out and mail it back or take the on-line version of the survey? Why?
29. What other observations do you have about filling out the survey?

CONCLUSION

Thank you for participating. Your input is extremely valuable to us. Now, in order to receive your cash incentive for participating tonight, I need to you to sign an acknowledgment that you received the money. Again, thank you for your help.

Focus Group Recruitment Materials

RUTGERS
Edward J. Bloustein School
of Planning and Public Policy

NJTRANSIT
The Way To Go.

Subject: NJ TRANSIT & Rutgers Conducting HBLR Focus Group Discussion

Dear Customer:

You are invited to participate in a focus group as part of a research study being conducted by the Alan M. Voorhees Transportation Center at Rutgers University on behalf of NJ TRANSIT. The purpose of the study is to learn more about the travel patterns and experiences of people that ride the Hudson-Bergen Light Rail (HBLR) system. The information we collect during the focus group will help the research team and NJ TRANSIT understand who is using the HBLR and how. The information will also help the research team to prepare a survey questionnaire that will be distributed to customers using the HBLR system in the spring of this year.

Two focus groups will be held on January 18, 2017. Each meeting will take about 90 minutes. The first focus group will start at 5:30 PM and the second will start at 7:30 PM. Both focus groups will be held at Hoboken Terminal. **Sandwiches and/or light refreshments will be provided at no cost to participants. In addition, each participant will receive $100 in cash as a thank you for their participation.**

If you are interested in participating in one of the two focus groups, please call (848) 932-2845 and leave a voice mail that includes your full name, a phone number where you can be reached and your preference regarding which time you would like to attend–either 5:30 or 7:30. Every person leaving a voice mail will receive a return phone call from a member of the Rutgers research team.

Space is limited to 10-12 participants at each focus group. Please call by January 10, 2017 to reserve a spot. If you have any questions about the research study or the focus group, please feel free to contact me.

Thank you.

Jon A. Carnegie, AICP/PP
Executive Director
Alan M. Voorhees Transportation Center
Edward J. Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey
33 Livingston Avenue
New Brunswick, New Jersey 08901
Email: carnegie@ejb.rutgers.edu
(848) 932-2840 (direct) | 732) 932-3714 (fax)

HBLR Focus Group Recruitment Call-in Line Voicemail Message

You have reached the Hudson Bergen Light Rail Focus Group registration line at Rutgers University. If you are interested in participating in one of the two focus groups we have scheduled for January 18, 2017, please leave your name and phone number after the tone and someone from our research team will get back to you within 24 hours. Please speak slowly. State your full name, spell your last name and provide a phone number we can call to confirm the details with you. Thank you.

HBLR Catchment Survey Pre-Focus Group Recruitment Screener

Name:_____ Contact #: _____

Participant original call date/time:_____ Call back date:_____

Confirmed: Y / N on what date:_____

1. **How long have you been riding the HBLR?** _____
2. **How frequently do you ride the HBLR?**
   - ❑ Everyday
   - ❑ At least a couple times per week
   - ❑ Several times per month
   - ❑ Less frequently
3. **Why do you most often use the HBLR?**
   - ❑ To travel to/from work
   - ❑ School
   - ❑ Shopping
   - ❑ Recreation/entertainment
   - ❑ Personal business
   - ❑ Other: _____
4. **Besides walking, do you usually use the HBLR in combination with another travel mode?**
   - ❑ Yes
   - ❑ No
   - ❑ If Yes, which other modes?

     _____
5. **What race or ethnicity best describes you?**
   - ❑ White, not Hispanic
   - ❑ Black, not Hispanic
   - ❑ White, Hispanic
   - ❑ Black, Hispanic
   - ❑ Asian American
   - ❑ Native American
   - ❑ Other race
   - ❑ More than one race
   - ❑ Prefer not to answer
6. **Are you?**
   - ❑ Male
   - ❑ Female
   - ❑ Transgender/other
7. **What is your annual household income?**
   - ❑ $0 - $24,999
   - ❑ $25,000 - $49,999
   - ❑ $50,000 - $74,999
   - ❑ $75,000 - $100,000
   - ❑ More than $100,000
   - ❑ Prefer not to answer

Survey Questionnaire (English)

hudson—bergen light rail

Market Research Survey

This survey is the **first-ever comprehensive survey** of Hudson-Bergen Light Rail customers since the system opened. This is not the same as the NJ TRANSIT Scorecard Survey. The purpose of this survey is to **learn more about customer use patterns and experiences** so that NJ TRANSIT **can serve you better**. Please complete this survey and return it to a survey agent, drop it in a collection box located at a Hudson-Bergen Light Rail station, or **complete the survey online at www.hblrsurvey.org**. You can also mail it to us in the **postage paid** envelope provided. All responses will be kept confidential.

To show our appreciation for your help, if you provide us with your contact information at the end of the survey, we will enter your name in a drawing to **win one of ten prizes for a free NJ TRANSIT monthly light rail pass or equivalent one-way tickets worth $100**.

FOR YOUR HUDSON-BERGEN** LIGHT RAIL **TRIP TODAY. . .

1. At what station did you board the Hudson-Bergen Light Rail today?

❍ Tonnelle Avenue	❍ Harsimus Cove	❍ MLK Drive
❍ Bergenline Avenue	❍ Harborside	❍ West Side Avenue
❍ Port Imperial	❍ Exchange Place	❍ Richard Street
❍ Lincoln Harbor	❍ Essex Street	❍ Danforth Avenue
❍ 9th St/Congress St	❍ Marin Boulevard	❍ 45th Street
❍ 2nd Street	❍ Jersey Avenue	❍ 34th Street
❍ Hoboken	❍ Liberty State Park	❍ 22nd Street
❍ Newport	❍ Garfield Avenue	❍ 8th Street

2. How did you get to the Hudson-Bergen Light Rail station? *(indicate your primary mode and select one)*

- ❍ Drove alone and parked
- ❍ Carpooled and parked
- ❍ Car-Dropped off
- ❍ Passenger in carpool
- ❍ Ride-hailing service such as UBER or Lyft
- ❍ Bus _____ *(specify carrier/bus route)*
- ❍ NJT Train _____ *(specify station boarded)*
- ❍ PATH _____ *(specify station boarded)*
- ❍ Ferry _____ *(specify station boarded)*
- ❍ Walk
- ❍ Taxi
- ❍ Bicycle
- ❍ Other _____ *(specify)*

3. If you drove and parked at or near the station, what type of parking did you use?

- ❍ Station lot parking
- ❍ Lot parking near station
- ❍ On-street parking

4. Where did you begin this trip today?

❍ Home ❍ Work ❍ Other _____ *(specify)*

5. What is the address where you began your trip today *(not your boarding station)*? ***(please print clearly)***

_____
Company Name/Business/School/Landmark

_____
Street Address (or nearest Intersection/Landmark)

_____ ☐☐ ☐☐☐☐☐
Borough/Town/City State Zip Code

6. Approximately how many miles is it from the above address to your boarding station?

- ❍ Up to ¼ mile
- ❍ ¼ - ½ mile
- ❍ ½ - 1 mile
- ❍ 1-2 miles
- ❍ 2-3 miles
- ❍ 3-5 miles
- ❍ 5-10 miles
- ❍ Over 10 miles _____ *(specify miles)*

7. Where will you get off this Hudson-Bergen Light Rail car?

- ❍ Tonnelle Avenue
- ❍ Bergenline Avenue
- ❍ Port Imperial
- ❍ Lincoln Harbor
- ❍ 9th St/Congress St
- ❍ 2nd Street
- ❍ Hoboken
- ❍ Newport
- ❍ Harsimus Cove
- ❍ Harborside
- ❍ Exchange Place
- ❍ Essex Street
- ❍ Marin Boulevard
- ❍ Jersey Avenue
- ❍ Liberty State Park
- ❍ Garfield Avenue
- ❍ MLK Drive
- ❍ West Side Avenue
- ❍ Richard Street
- ❍ Danforth Avenue
- ❍ 45th Street
- ❍ 34th Street
- ❍ 22nd Street
- ❍ 8th Street

8. Where is your final destination?

❍ Home ❍ Work ❍ Other_____ *(specify)*

9. What is that address *(not your exiting station)*? ***(please print clearly)***

_____
Company Name/Business/School/Landmark

_____
Street Address (or nearest Intersection/Landmark)

_____ ☐☐ ☐☐☐☐☐
Borough/Town/City State Zip Code

10. What is the total estimated door-to-door travel time for this entire one-way trip (**NOT** just the time you spent on the Light Rail train)?_____ minutes

PLEASE ANSWER IF YOUR FINAL DESTINATION IS IN NEW YORK CITY. . .

11. How will you reach New York City? *(select all that apply)*

- ❍ Take the PATH (PATH boarding station?)_____
  (PATH exiting station?)_____
- ❍ Take the Ferry (which Ferry?)_____
  (Ferry exiting location?)_____
- ❍ Take an NJ TRANSIT bus (which route?)_____
- ❍ Take another bus (which route?)_____
- ❍ Take NYC Subway (which line?)_____
- ❍ Other (specify)_____

PLEASE ANSWER IF YOUR FINAL DESTINATION IS IN NEW JERSEY. . .

12. How will you reach your final destination after you get off the light rail train? *(select all that apply)*

- ❍ Walk
- ❍ Drive and park
- ❍ Driver in carpool and park
- ❍ Passenger in carpool
- ❍ Car-Drop off
- ❍ Bicycle
- ❍ Taxi
- ❍ Ride-hailing service such as UBER or Lyft
- ❍ Bus (specify route) _____
- ❍ NJ TRANSIT train (specify station) _____
- ❍ PATH (specify station) _____
- ❍ Ferry (specify) _____
- ❍ Other (specify) _____

ALL CUSTOMERS, FOR THE OTHER HALF OF YOUR TRIP. . .

13. How do you typically travel for your return trip?

- ❍ Travel the same way in opposite direction
- ❍ Take a bus (which route?) _____
- ❍ Other (specify) _____

14. How often do you use this mode for the other half of your trip?

- ❍ 7 days/week
- ❍ 6 days/week
- ❍ 5 days/week
- ❍ 4 days/week
- ❍ 3 days/week
- ❍ 1-2 days/week
- ❍ 1-3 days/month
- ❍ Less than one day/month
- ❍ First time customer

ALL CUSTOMERS, FOR YOUR TRIP TODAY. . .

15. What is the main purpose of this trip? *(select one)*

- ❍ Work
- ❍ Company business
- ❍ School
- ❍ Shopping
- ❍ Recreation _____ *(specify, e.g., dining/entertainment/vacation)*
- ❍ Personal business *(e.g., medical/visiting)*
- ❍ Other _____ *(specify)*

16. How often do you make this trip? *(select one)*

- ❍ 7 days/week
- ❍ 6 days/week
- ❍ 5 days/week
- ❍ 4 days/week
- ❍ 3 days/week
- ❍ 1-2 days/week
- ❍ 1-3 days/month
- ❍ Less than one day/month
- ❍ First time customer

17. How long have you been riding the Hudson-Bergen Light Rail? *(select one)*

- ❍ Less than 6 months
- ❍ 6 months to 1 year
- ❍ 1 to 2 years
- ❍ 2 to 5 years
- ❍ 5 to 10 years
- ❍ 10 years or more

18. What type of Hudson-Bergen Light Rail ticket are you using for this trip?

- ❍ Monthly
- ❍ Monthly with Parking
- ❍ Monthly with Ferry
- ❍ Bus Monthly
- ❍ One way
- O Hudson Go Pass
- ❍ Round-trip (2 One-way) with parking
- ❍ Round-trip (2 One-way)
- ❍10-trip
- ❍ Discounted Senior Citizens/Children/Disability
- ❍ Complimentary/Free Ticket

19. How did you purchase the light rail ticket you are using for this trip?

- ❍ Ticket Agent
- ❍ TVM (Ticket Vending Machine)
- ❍ On Light Rail Car
- ❍ MyTix (Mobile App)
- ❍ Mail-Tik/Quik-Tik
- ❍ Employer/WageWorks
- ❍ Other _____ *(specify)*

20. Which electronic devices do you typically carry with you on the light rail? *(select all that apply)*

- ❍ Smartphone
- ❍ Cell phone (not a smartphone)
- ❍ Tablet or iPad
- ❍ Laptop Computer
- ❍ Other _____ *(specify)*
- ❍ None of the above

YOUR STATION SPENDING. . .

21. Do you visit any businesses within a half-mile of your boarding station on your way to/from the light rail?

- ❍ No, I do not visit any businesses within a half-mile of my boarding station. → **Skip to Question 23**
- ❍ Yes, I do visit businesses within a half-mile of my boarding station. → **Continue**

Please estimate how often you visit and the amount ($) you spend at the following types of businesses on your way to/from your **boarding** station:

	Types of Businesses	Number of Times Visited Per Month	Dollars Spent Per Month
1	Sit-down Restaurant		$
2	Fast Food/Take-out		$
3	Coffee/Snack Shop		$
4	Supermarket/Mini-market		$
5	Health Club/Gym		$
6	Dry Cleaners		$
7	Retail (clothing, home furnishing, gifts)		$
8	Wine/Liquor		$
9	Daycare		$
10	Auto Repair		$
11	Other *(specify)* _____		$

22. Please choose from the numbered list in Question 21 above which **one** shop/store/service is **most important** to have near your boarding station:

MOST IMPORTANT shop/store/service ▶ 1 2 3 4 5 6 7 8 9 10 11

YOUR TRAVEL PATTERN CHANGE. . .

23. Has your travel pattern changed since Superstorm Sandy in October 2012 (not necessarily due to Sandy)?

- ❍ Yes, my travel pattern has changed.
- ❍ No, my travel pattern has not changed. → **Skip to Question 25 on the next page**

24. How has your travel pattern changed? *(select all that apply)*

- ❍ I increased the number of days I work at home (telecommute) to _____ days/month
- ❍ I switched to my current boarding station from a different Hudson-Bergen Light Rail station _____ *(specify boarding station you switched from)*
- ❍ I switched to light rail from another mode of transportation _____ *(specify mode)*
- ❍ I changed my work location. I used to work in _____ *(specify town, state, zip code)*
- ❍ I changed my home address. I used to live in _____ *(specify town, state, zip code)*
- ❍ Other change in travel pattern _____ *(specify)*

25. How many times have you traveled to each of the following areas in the past year by <u>any</u> travel mode?

Destination	N/A	1-3 times/ year	4-6 times/ year	7-9 times/ year	10 or more times/year
Philadelphia, PA	❍	❍	❍	❍	❍
Washington, DC	❍	❍	❍	❍	❍
Stamford/Norwalk, CT	❍	❍	❍	❍	❍
New Haven, CT	❍	❍	❍	❍	❍
Boston, MA	❍	❍	❍	❍	❍
Newark Liberty International Airport	❍	❍	❍	❍	❍
Meadowlands Sports Complex	❍	❍	❍	❍	❍

YOUR SATISFACTION WITH HUDSON-BERGEN LIGHT RAIL SERVICE. . .

26. In general, on a scale of 0 to 10, where 0=Not Acceptable, 5=Acceptable and 10=Excellent (N/A = Does Not Apply), how would you rate each of the following?

	NOT ACCEPTABLE ▼					ACCEPTABLE ▼					EXCELLENT ▼	DOES NOT APPLY ▼
Scheduling	0	1	2	3	4	5	6	7	8	9	10	N/A
Seating Availability	0	1	2	3	4	5	6	7	8	9	10	N/A
Comfort On-Board	0	1	2	3	4	5	6	7	8	9	10	N/A
Trip Time	0	1	2	3	4	5	6	7	8	9	10	N/A
Communications	0	1	2	3	4	5	6	7	8	9	10	N/A
On-time Performance	0	1	2	3	4	5	6	7	8	9	10	N/A
Safety	0	1	2	3	4	5	6	7	8	9	10	N/A
Security	0	1	2	3	4	5	6	7	8	9	10	N/A
Employee Performance	0	1	2	3	4	5	6	7	8	9	10	N/A
Overall Value for the Money	0	1	2	3	4	5	6	7	8	9	10	N/A
Overall Satisfaction with NJ TRANSIT	0	1	2	3	4	5	6	7	8	9	10	N/A

27. How likely are you to recommend this service to a friend or relative?

❍ Very Likely ❍ Somewhat Likely ❍ Do Not Know ❍ Somewhat Unlikely ❍ Very Unlikely

28. Additional comments: _____

_____

29. Which of the following statements best applies to you? *(select <u>one</u>)*

- ❍ I have <u>no other way</u> to travel, so I use the Hudson-Bergen Light Rail.
- ❍ I use the Hudson-Bergen Light Rail because it is the <u>best choice</u> for me, even though there are other ways I could make this trip.
- ❍ I usually use <u>another type</u> of transportation, but I occasionally take the Hudson-Bergen Light Rail.

TELL US ABOUT YOURSELF. . .

30. Are you ... ?

❍ Male ❍ Female

31. What is your age?

- ❍ 18 - 24 years
- ❍ 25 - 34 years
- ❍ 35 - 44 years
- ❍ 45 - 54 years
- ❍ 55 - 61 years
- ❍ 62 - 65 years
- ❍ Over 65 years

32. Are you of Spanish/Hispanic/Latino origin?

❍ No ❍ Yes_____*(specify origin)*

33. What is your race? *(select all that apply)*

- ❍ White
- ❍ Black or African American
- ❍ Asian or Pacific Islander
- ❍ American Indian or Alaska Native
- ❍ Other_____*(specify)*

34. Do you speak a language other than English at home?

- ❍ No
- ❍ Yes, I speak _____ at home *(specify language)*

35. Do you have a physical condition that makes it difficult for you to use the Hudson-Bergen Light Rail?

- ❍ No
- ❍ Yes → Do you use a...? ❍ Wheelchair ❍ Other mobility device

36. How many people, including yourself, live in your household?

❍ One ❍ Two ❍ Three ❍ Four ❍ Five or more

37. Are there any children under 12 in your household?

❍ Yes ❍ No

38. How many cars are currently available in your household?

❍ None ❍ One ❍ Two ❍ Three ❍ Four or more

39. How long have you lived at your current address?

- ❍ Less than 6 months
- ❍ Between 6 months and a year
- ❍ Between 1 and 2 years
- ❍ Between 2 and 5 years
- ❍ Between 5 and 10 years
- ❍ More than 10 years

40. How important was Hudson-Bergen Light Rail service in choosing your home location?

❍ Very Important ❍ Somewhat Important ❍ Not Important

41. Through your employer, do you take advantage of commuter tax benefits, such as TransitChek, WageWorks, or eTrac to pay for any part of your commuting expenses? *(select one)*

- ❍ Yes → What is the monthly value of your commuter tax benefit?_____*(specify total amount)*
- ❍ No, my employer doesn't offer commuter tax benefits
- ❍ No, I don't take advantage, but my employer does offer
- ❍ Not currently employed
- ❍ Not applicable/Do not know

42. What is your approximate annual household income? *(select one)*

- ❍ Under $15,000
- ❍ $15,000-$24,999
- ❍ $25,000-$34,999
- ❍ $35,000-$49,999
- ❍ $50,000-$74,999
- ❍ $75,000-$99,999
- ❍ $100,000-$149,999
- ❍ $150,000-$199,999
- ❍ $200,000-$249,999
- ❍ $250,000 or over

If you would like to enter our drawing for **ONE OF TEN PRIZES FOR A FREE NJ TRANSIT MONTHLY LIGHT RAIL PASS OR EQUIVALENT ONE-WAY TICKETS,** please give us your name, address, phone numbers and email address *(print clearly)*.

Your Name

Mailing Address

Borough/City/Town State Zip Code

Daytime Phone Number:
□□□-□□□-□□□□

Evening Phone Number:
□□□-□□□-□□□□

Your Email Address

Your comments are important to us. If you have any specific comments, please tell us....

Thank you for participating in the survey!

Please be assured that all information you provide is strictly for internal NJ TRANSIT use and will not be sold to any outside entity.

NJTRANSIT The Way To Go.
Research

MEMORANDUM

TO: Susan O'Donnell, Matthew Ledger, Matthew Safer, and Rossana Ybasco

FROM: Jon Carnegie and Deva Deka

DATE: April 6, 2018

RE: Defining the HBLR Catchment Area – Survey Data Weighting Analysis

At our February 22, 2018 quarterly progress meeting, we agreed to develop weighting options based on:

1. Direction of travel;
2. Time of day (6 AM to 10 AM, 10 AM to 4 PM, and after 4 PM); and
3. Service line (e.g., Tonnelle Ave to Hoboken Terminal line).

We were also asked to review the data to determine if is possible to develop additional weights based on route segments (e.g., 8th Station to Liberty State Park Station, Westside Ave to Liberty State Park, etc.); station clusters (e.g., treating terminal stations and stations with high boarding individually and combining smaller stations); and if feasible, by individual stations.

We were able to develop weights for all of these options except for weights by individual station because of the small sample size for many stations. The results of the weight analysis are shown below along with our recommendations.

WEIGHTING ANALYSIS RESULTS

During the Spring and Fall of 2017, Rutgers survey teams collected data from 3,322 riders through onboard surveys. The surveys were conducted from 6 AM to 11 PM on Tuesday, Wednesdays, and Thursdays. For this study, NJ TRANSIT provided the research team with a spreadsheet showing ridership counts by station and service line, including the number of passengers boarding and alighting at each station. We aggregated data from the spreadsheet to obtain ridership volumes by line, direction, time of day, station clusters, and line segments. According to these data, system-wide HBLR average weekday ridership is approximately 51,000. Based on a total weekday ridership of 51,000, a mean weight for all riders of approximately 15 could be expected. This expected weight was derived by dividing total weekday riders by the number of completed surveys in our sample (51,000/3,322=15.3).

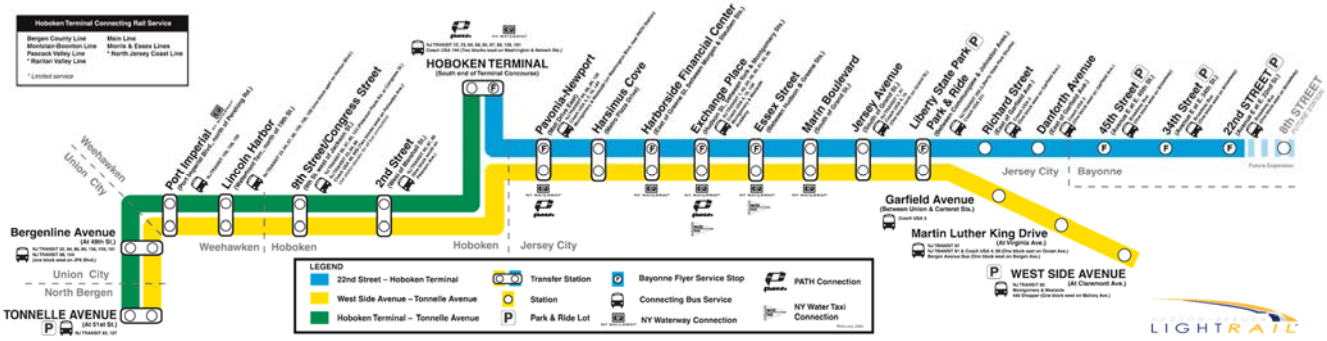
Following our discussion at the February 22, 2018 quarterly meeting, we developed three weight variables. Based on the recommendation of Matthew Safer, we utilized a basic weighting methodology similar to the one that was used for the Local Bus Market Study. The bus data weighting methodology involved only time of day and direction, but here we use additional operational characteristics.

The weight variables were specified as follows:

Weight #1: This is the most basic weight. To calculate this weight, we considered direction (NB, SB), time of day (Three periods: 6-10AM, 10AM-4PM, 4PM+), and service line [Three lines: (1) Tonnelle Ave to Hoboken Terminal, (2) Westside Ave to Tonnelle Ave, and (3) 8th St to Hoboken Terminal].

Weight #2: To calculate this weight, we considered direction (NB, SB), time of day (Three periods: 6-10AM, 10AM-4PM, 4PM+), and line segments [Six segments: (1) 8th St. to Richard St., (2) Westside Ave. to Garfield Ave., (3) Liberty State Park to Essex St., (4) Exchange Place to Hoboken Terminal, (5) 2nd St. to Lincoln Harbor, and (6) Port Imperial to Tonnelle Ave].

Weight #3: To calculate this weight, we considered direction (NB, SB), time of day (Three periods: 6-10AM, 10AM-4PM, 4PM+), terminal + transfer stations (8th St, Tonnelle Ave, Westside Ave, Exchange Place, and Hoboken Terminal), and line segments *excluding terminal and transfer stations* [Five segments: (1) 8th St. to Richard St., (2) Westside Ave. to Garfield Ave., (3) Liberty State Park to Essex St., (4) Exchange Place to Hoboken Terminal, (5) 2nd St. to Tonnelle Ave].



Hudson Bergen Light Rail Service Lines and Stations

Evaluation Criteria

Several criteria can be used to evaluate the weight. They are:

a) Size of the weight: Smaller is better. However, a smaller weight can be achieved only by increasing sample size. For example, if we collected data from all 51,000 weekday riders, the weight would be close to 1 for all riders.

b) Convergence with the mean: We know that the mean of the aggregate dataset would be close to 15. Therefore, a weight that is close to 15 for a large proportion of riders can be considered a good weight.

c) Standard deviation. A smaller standard deviation is better because it indicates smaller variation of weights across riders.

d) Range. The difference between the maximum and the minimum gives the range. If the lowest weight for riders 5 and the largest weight is 55, the range is 55-5=50. A smaller range is better because it indicates smaller variation of weight across riders.

e) Histogram. A histogram shows the spread of the weights across different values. If it shows a large proportion of weights away from the mean, the weight is not good.

f) Number of riders (N) applicable to. A weight is better if it can be applied to more riders. If a weight cannot be applied to a large proportion of the riders because of missing values for those riders on any of the variables used for the calculation of the weight, its value diminishes. For example, if service line is a variable used to calculate the weight but service line is not known for many riders, the weight cannot be applied to riders with missing service line information.

Evaluation of the Weights

Weight #1: The distribution of the weight is graphically shown in Figure 1. The related statistics are presented in Table 1. Because a large proportion of rider weights (close to 2,000) are close to the mean (within 10 and 20), another large proportion has very small size (less than 10), and very few weights are very large (larger than 30 or 40), and the standard deviation (SD) is also small, the weight can be considered a good weight. Its only limitation is that its N size is slightly smaller than the other weights.

It is worth noting that the original data from the surveys distributed on platforms did not have information on train line. It was therefore essential to assign line name to those surveys on the basis of origin and destination stations. For some riders, it was still not possible to assign line names because of missing data.

Figure 1: Weight1

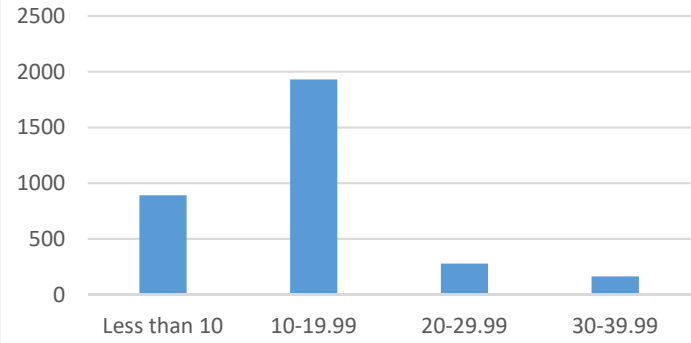


Table 1. Mean, SD, range, and N for Weight #1

Min	Max	Mean	SD	N
6.15	38.72	15.41	7.14	3,264

Weight #2: The distribution of the weight is graphically shown in Figure 2. The related statistics are presented in Table 2. Weight #2 is inferior to Weight #1 in regards to range (larger), standard deviation (larger), and convergence with the mean (smaller proportion in the 10-20 category), but it is superior in regards to the N size and the size of the mean (smaller). The N size is larger because this weight did not use line as a variable. Because line was not one of the variables used, the missing line information for some of the platform surveys did not affect it. The slightly smaller mean for this weight is because of the larger N.

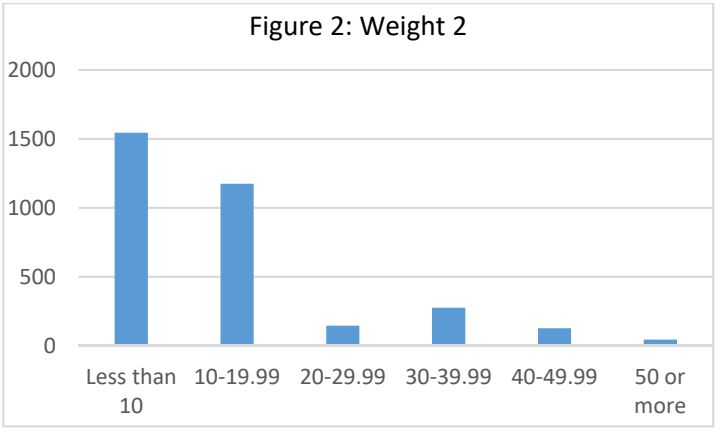


Table 2. Mean, SD, range, and N for Weight #2

Min	Max	Mean	SD	N
7.07	129	15.18	11.80	3,314

Weight #3: The distribution of the weight is graphically shown in Figure 3. The related statistics are presented in Table 3. In terms of convergence with the mean, Weight #3 is better than Weight #2. In terms of its overall deviation it is worse because the standard deviation is larger and the range is also larger. The highest weight is 258 compared to 129 for Weight #2. The N size is slightly smaller for Weight #3 than Weight #2.

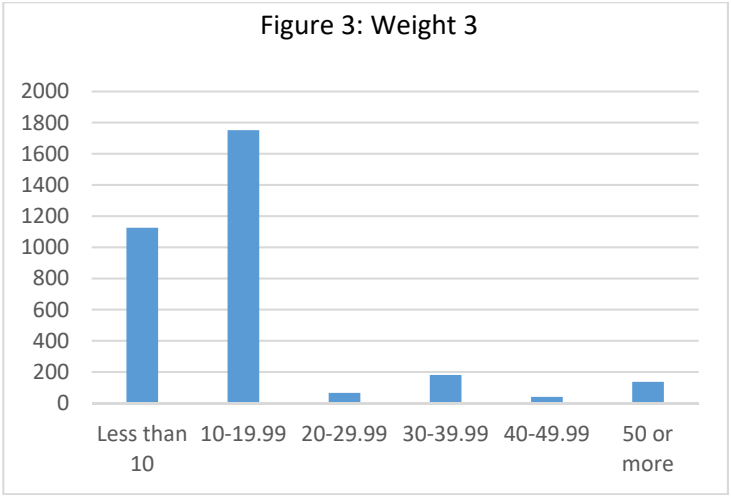


Table 3. Mean, SD, range, and N for Weight #3

Min	Max	Mean	SD	N
4.04	258	15.24	13.84	3,301

RECOMMENDATION

Based on the analysis, Weight #1 appears to be the best overall. It has a high convergence with the mean, small standard deviation, a small range, and very few observations with very large weight. Its only limitation is that its N size (3,264) is slightly smaller than Weights #2 and #3 (N=3,314 and 3,301, respectively). Despite a slightly smaller N size, we recommend using Weight #1 as the preferred weight. If for any reason Weight #1 is not preferred, we recommend using Weight #2 because it has a smaller standard deviation, range, and a lower max value than Weight #3. Another strategy may be to use Weight #1 for all riders for whom the weight is available and then use the smallest weight from the other two weights for the riders with missing values.