HUDSON COUNTY FERRY SERVICE EXPANSION STUDY

TECHNICAL MEMORANDUM #2

JUNE 30, 2021

NJTPA
NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

TECHNICAL MEMORANDUM

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INTRODUCTION

This Memorandum reports on the results of “Task 2C – Needs Assessment: Data Collection and Review, Quantification of Need” for the Hudson County Ferry Service Expansion Study (Study).

Prior to the Study, Hudson County (County) collected data on waterfront sites, bathymetry, infrastructure, and environmental conditions from several sources, including the NJTPA Inventory and Assessment of Waterborne Transportation Resources Study, and the National Oceanic and Atmospheric Administration. Through the review of this data, several general areas were selected for further analysis for ferry service in Hudson County: Hoboken, South Kearny, Jersey City’s Bayfront Redevelopment Area, Bayonne's Newark Bay coastline, West New York, and south Harrison.

During the Study, these six areas were assessed for the feasibility of ferry service expansion. The findings for this task are based on data provided by the County and data collected by the Consultant Team, which was further analyzed and combined with the Consultant Teams institutional knowledge to provide the County with best practices for a proposed ferry service as well as recommendations to narrow the breadth of the study.

This report is organized into the following sections:

1. Existing Conditions
2. Case Study Profiles
3. Best Practices

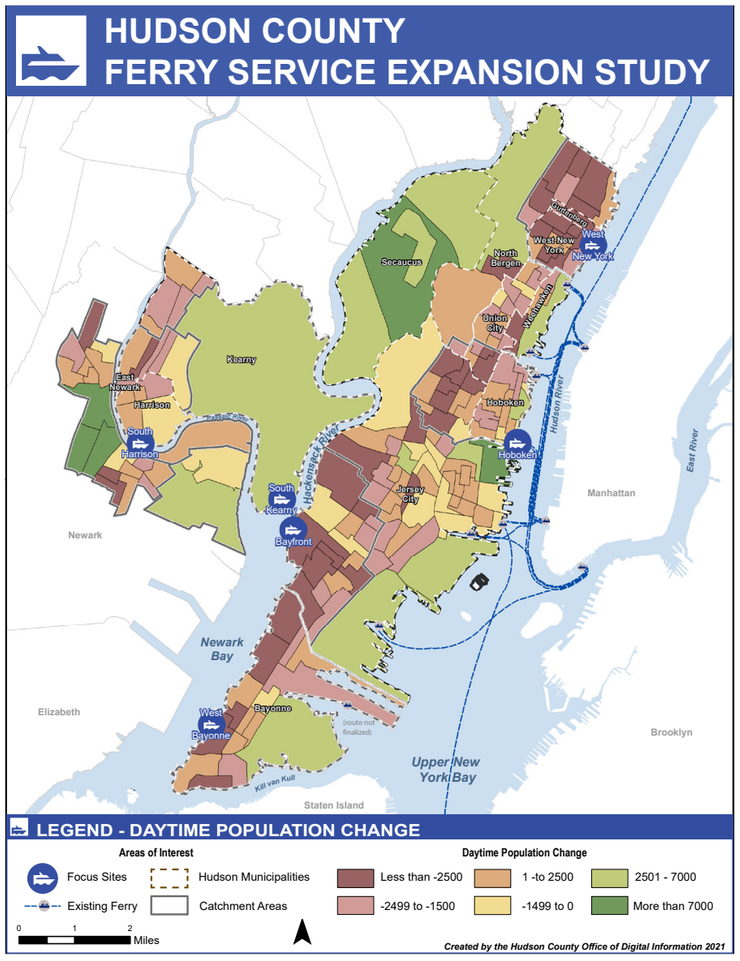


Figure 1 : Hudson County Daytime Population Change

Daytime Population Change can be an indicator of primarily residential areas, which tend to see a decrease in daytime population, or employment centers which tend to see increases in daytime population. Figure 1 shows the net daytime population changes in our catchment areas. The NJRTM-E includes daytime population change and it is accounted for in our analysis.

DATA COLLECTED

As part of this task, the Consultant Team reviewed existing studies and data collected from the County and internally to prepare a summary of Best Practices and identify the path forward for this study that best aligns with the findings. A list of the studies and resources reviewed can be found in **Appendix A**.

Existing Conditions Data

Demand Analysis

Data was collected on the populations in the catchment areas of the proposed sites, including total population numbers, daytime population change, environmental justice populations, income, employment and commuting patterns. This information was used to further analyze the characteristics of those who will be impacted by the addition of ferry service to an area. The following Existing Conditions Demand Analysis Memo summarizes this information and findings. This analysis can be found as a standalone document in **Appendix B**.

The Hudson County Ferry Expansion Study seeks to identify potential ferry sites that would provide an alternate mode of transport for residents and others who visit various parts of Hudson County.

The County proposed six potential ferry sites to be investigated through a series of site evaluations.

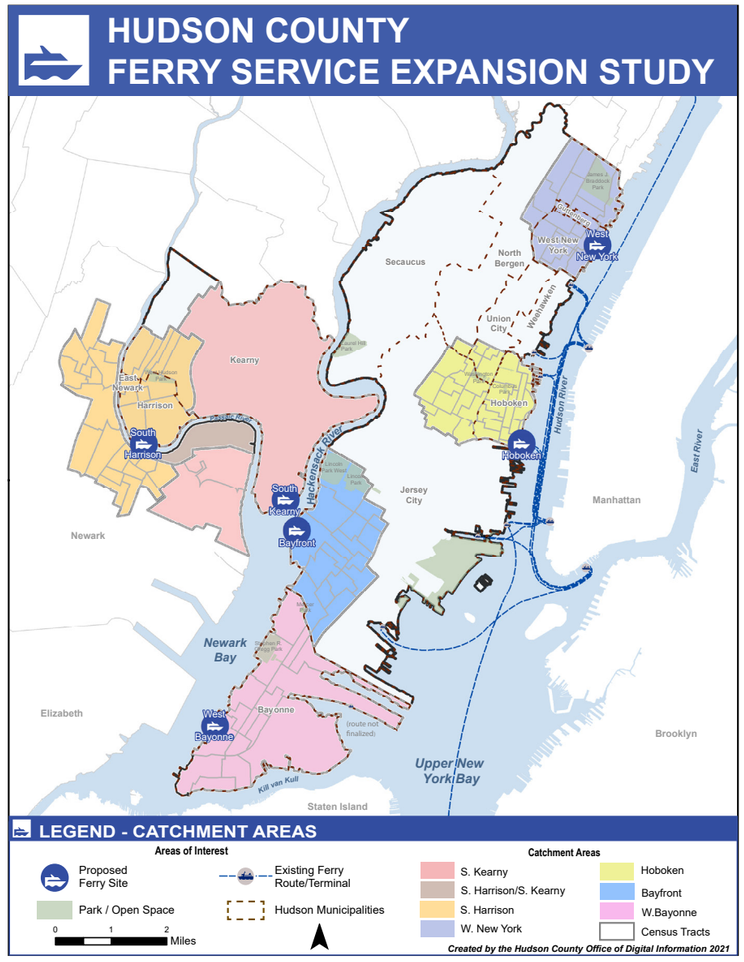


Figure 2: Potential Ferry Terminal Sites and Catchment Areas

Figure 2 shows the approximate location of these ferry terminal sites and the catchment areas of each site. Catchment areas around a location serve as the primary market for these potential ferry terminal sites. The catchment areas used in this initial analysis are high level and will be refined as part of the more detailed modeling taking place later in the study. The catchment areas used in this analysis will not limit the detailed modeling from including ridership outside of these initial areas. Catchment

areas were generally determined by selecting a 10-15-minute drive time radius around the proposed ferry terminal locations and excluded areas that had competing modes of transportation with easier access. Some sites have larger catchment areas reflecting the fact that they are very accessible via car or other connecting transit services. In these cases, connecting modes can increase the geographical draw of the ferry as they allow potential riders the ability to quickly and reliably access the ferry landing. The quality of the feeder service can have a significant impact on overall demand as people make choices based on the entire trip's characteristics, not just the ferry portion.

Travel Demand

Travel demand looks at the number of existing trips from a particular origin to a destination to better understand the number of trips that are being made between regions. This forms the basis of determining what share of trips can be diverted from other modes of transport to ferry transport.

NJTPA NJTRME Model Total Travel Demand (2018)

The NJTPA is the metropolitan planning organization for 13 counties in Northern New Jersey. NJTPA has developed and maintains the North Jersey Regional Transportation Model – Enhanced (NJRTM-E) to understand and plan for the region's multimodal transportation needs. The data below in the following two tables is based on the model's 2018 annual estimates. **Table 1** shows the number of estimated total daily trips made from the ferry site catchment areas (rows) to all other ferry site catchment areas, and to the rest of Hudson County (columns).

Manhattan is a major destination for employment, leisure and other trips and has several ferry terminals. To segregate demand, Manhattan is divided in to three sections:

1. South of 14th St which has several ferry terminals including those at Brookfield Place, Battery Maritime Building/Slip 5, Pier 11 and Whitehall Ferry Terminal where the Staten Island Ferry;
2. 14th St to 59th St which includes the Pier 79 Midtown Ferry Terminal, Stuyvesant Cove and East 34th Street; and
3. 3. North of 59th St and Islands which includes terminals at West 125th Street and East 90th Street.

Table 2 shows the breakdown of trips from the ferry sites to the different boroughs and Manhattan zones.

Table 1: Total Daily Travel Demand from Potential Ferry Catchment Areas to Major Destinations in the Region

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County
South Harrison	-	8,150	1,086	530	1,472	851	10,390
South Kearny	10,419	-	316	94	330	118	2,198
Bayfront	3,497	1,592	-	6,716	3,826	1,075	35,744
West Bayonne	1,885	786	15,043	-	2,193	762	16,229
Hoboken	2,298	648	2,173	1,102	-	4,371	60,313
West New York	1,671	284	752	624	7,100	-	38,355

Source: NJTPA NJRTME travel demand estimates for 2018

Table 2: Total Daily Travel Demand from Potential Ferry Catchment Areas to New York City Locations

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
South Harrison	5,588	9,794	2,508	374	703	556	931
South Kearny	941	1,442	361	45	125	130	134
Bayfront	5,686	7,054	1,227	228	1,097	750	666
West Bayonne	5,014	7,410	979	120	726	529	2,397
Hoboken	13,825	24,648	4,607	738	2,534	1,104	273
West New York	3,987	12,637	5,903	1,121	598	473	181

Source: NJTPA NJRTME travel demand estimates for 2018

Table 3: Potential Ferry Ridership from Ferry Sites to Major Destinations in the Region

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County
South Harrison	-	326 - 2,445	43 - 326	21 - 159	59 - 442	34 - 255	416 - 3,117
South Kearny	417 - 3,126	-	13 - 95	4 - 28	13 - 99	5 - 35	88 - 659
Bayfront	140 - 1,049	64 - 478	-	269 - 2,015	153 – 1,148	43 - 323	1,430 - 10,723
West Bayonne	75 - 566	31 - 236	602 - 4,513	-	88 - 658	30 - 229	649 - 4,869
Hoboken	92 - 689	26 - 194	87 - 652	44 - 331	-	175 - 1,311	2,413 - 18,094
West New York	67- 501	11 - 85	30 - 226	25 - 187	284 - 2,130	-	1,534 - 11,507

Source: Steer Analysis of Travel Demand estimates from NJTPA NJRTME Model

Potential Ferry Ridership

Table 3 shows potential ferry ridership estimates based off total travel demand estimates from the NJTPA NJRTM-E Model and ferry capture rates typical of the region. The estimates reflect that typically in the New York Region, ferries capture anywhere between 4%-30% of total travel demand within a given catchment area. Capture rates are based on the potential service's time and cost competitiveness. The rates shown here are very rough ranges. Detailed capture rates will be estimated using the NJRTM-E model. The trips outside of the

Table 4: Number of Persons Residing in the Ferry Catchment Area and Working in Other Catchment Areas

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York
South Harrison	-	2,334	103	59	274	107
South Kearny	1,482	-	30	20	210	15
Bayfront	594	580	-	890	841	252
West Bayonne	466	214	710	-	686	139
Hoboken	886	302	720	189	-	661
West New York	473	314	313	204	1,292	-

Source: Census Transportation Planning Products – Residence and Workplace flows

Table 5: Number of Persons Residing in the Ferry Catchment Area and Working in New York City

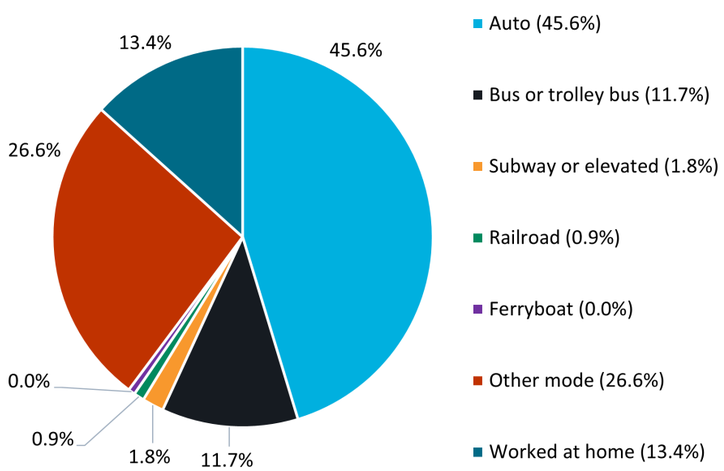
	Manhattan south of 14th St	Manhattan 14th - 59th St	Manhattan north of 59th St	Bronx	Brooklyn	Queens	Staten Island
South Harrison	1,012	1,894	587	74	443	331	24
South Kearny	87	220	108	20	14	24	10
Bayfront	1,088	2,166	471	118	288	234	59
West Bayonne	914	1,322	319	80	159	211	148
Hoboken	4,853	12,962	1,504	242	679	322	109
West New York	1,998	5,950	1,412	207	389	333	40

Source: Census Transportation Planning Products – Residence and Workplace flows

primary catchment areas, labeled as “Rest of Hudson County” in the table below would be expected to have very low or no capture rates. These low capture rates would be the result of the long access and egress trips to the ferry landings.

Home locations and work locations

Census Transportation Planning Products (CTPP) provides data on the home and work locations of people based on responses to the American Community Surveys from 2012-2016. **Table 4** shows the number of persons residing in the ferry site catchment areas (rows) whose place of work is in the other ferry sites catchment areas. A list of the census tracts used in this analysis are available in **Appendix C**.

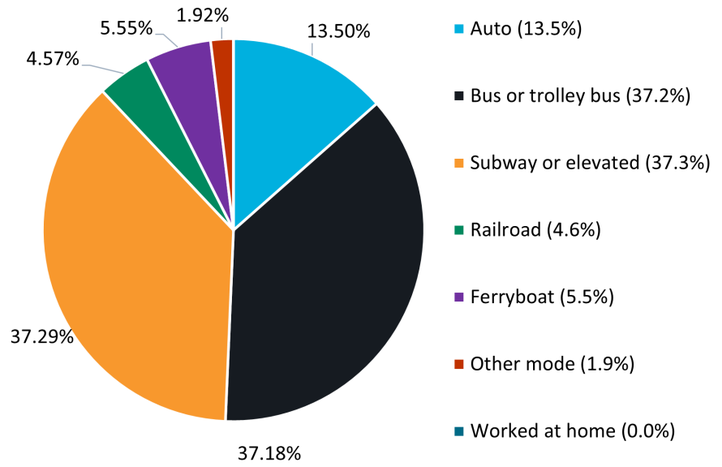


Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 3: Commute mode shares for residents who live in the catchment areas and work in other catchment areas

Table 5 shows the number of people who reside in the ferry catchment areas and have work locations in the different boroughs of New York City and the zones of Manhattan.

CTPP data also provides information on how people generally commute. This information is displayed in **Figures 3** and **4**. The modes shown are those used in the American Community Survey, which is used to develop CTPP data. This survey asks respondents to choose from the following modes: Car, truck or van; Bus or trolley bus; Streetcar or trolley car; Subway or elevated; Railroad; Ferryboat; Taxicab; Motorcycle; Bicycle; Walked; Worked at home; or Other method. A limitation in using this data for Hudson County is that it is not clear which category some modes of transportation may fit within the choices available from the Census. For example, for respondents to the Census for this question, the Hudson-Bergen Light Rail may potentially be considered a “Streetcar or trolley car” or a “Railroad”. Additionally, the Port Authority Trans-Hudson (PATH) could potentially be considered either a “Subway or elevated” or a “Railroad”. However, the American Community Survey remains one of the most comprehensive data sources available and is worth examining for consideration.



Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 4: Commute mode share for residents who live in the catchment areas and work in NYC

Individual tabulations of the above data for each of the potential ferry sites are below.

South Harrison

Demographics

Table 6: Sociodemographic data for South Harrison catchment area

	2008-2012 ACS	2014-2018 ACS	Annual Growth Rate 2012-2018
Population			
South Harrison	101,409	106,487	0.82%
Hudson County	636,194	668,631	0.83%
Labor Force			
South Harrison	82,324	85,229	0.58%
Hudson County	520,536	544,263	0.75%
Total Employed			
South Harrison	47,704	53,177	1.83%
Hudson County	324,150	352,378	1.40%
Median Income (2019 USD)			
South Harrison	$41,261	$37,013	(1.79%)
Hudson County	$70,994	$72,819	0.42%

Source: NJTPA NJRTME travel demand estimates for 2018

It is important to note that any future year estimates will be based on NJTPA forecasts and approved developments.

2018 Travel Demand

Table 7: 2018 Travel Demand from South Harrison catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
South Harrison	112,821	8,150	1,086	530	1,472	851	10,390	20,454

Source: NJTPA NJTRME travel demand estimates for 2018

Table 8: 2018 Travel Demand from South Harrison catchment area to NYC boroughs

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
South Harrison	5,588	9,794	2,508	374	703	556	931

Source: NJTPA NJRTME travel demand estimates for 2018

Employment Locations

Table 9: Work locations of South Harrison catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
South Harrison	10,768	2,334	103	59	274	107	2,227	4,365

Source: Census Transportation Planning Products – Residence and Workplace flows

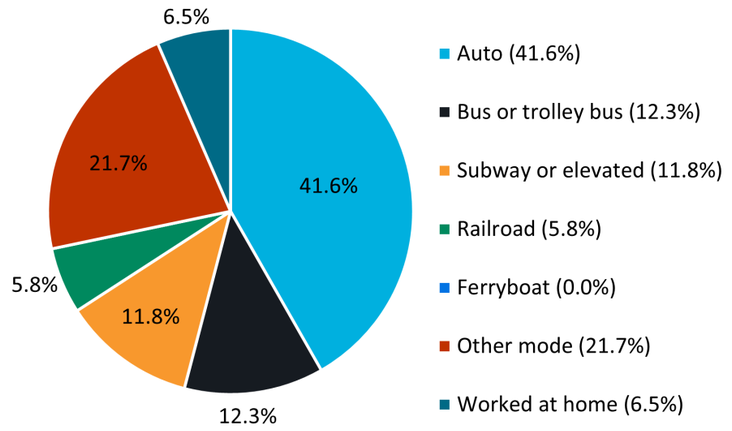
Table 10: Work locations of South Harrison catchment area to New York City

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
South Harrison	1,012	1,894	587	74	443	331	24

Source: Census Transportation Planning Products – Residence and Workplace flows

Commutation by Mode

The CTPP data provides a breakdown of mode of transportation for people traveling from home to work locations for existing commuters and is based on the responses to 2012-2016 ACS. **Figure 5** shows the shares of different modes used by persons residing in the South Harrison ferry catchment area who work in the other ferry site catchment areas, the rest of Hudson County and New York City.



Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 5: Share of commutation modes for South Harrison

South Kearny

Demographics

Table 11: Sociodemographic data for South Kearny catchment area

	2008-2012 ACS	2014-2018 ACS	Annual Growth Rate 2012-2018
Population			
South Kearny	19,558	18,842	(0.62%)
Hudson County	636,194	668,631	0.83%
Labor Force			
South Kearny	16,641	15,526	(1.15%)
Hudson County	520,536	544,263	0.75%
Total Employed			
South Kearny	7,038	7,355	0.74%
Hudson County	324,150	352,378	1.40%
Median Income (2019 USD)			
South Kearny	$42,063	$38,304	(1.55%)
Hudson County	$70,994	$72,819	0.42%

Source: NJTPA NJRTME travel demand estimates for 2018

2018 Travel Demand

Table 12: 2018 Travel Demand from South Kearny catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
South Kearny	10,419	5,198	316	94	330	118	2,198	3,178

Source: NJTPA NJRTME travel demand estimates for 2018

Table 13: 2018 Travel Demand from South Kearny catchment area to NYC boroughs

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
South Kearny	941	1,442	361	45	125	130	134

Source: NJTPA NJRTME travel demand estimates for 2018

Employment Locations

Table 14: Work locations of South Kearny catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
South Kearny	1,482	1,024	30	20	210	15	396	483

Source: Census Transportation Planning Products – Residence and Workplace flows

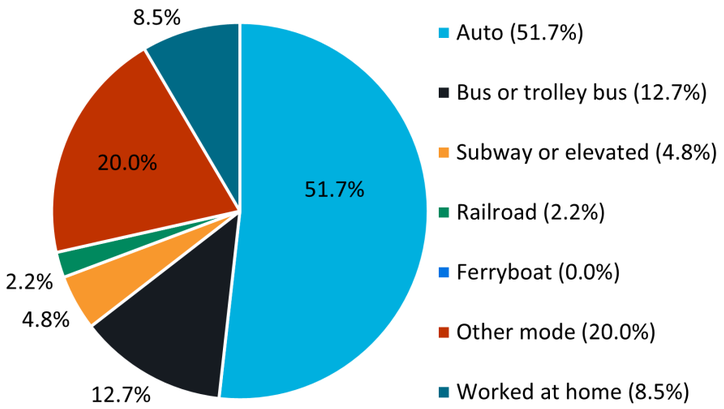
Table 15: Work locations of South Kearny catchment area to New York City

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
South Kearny	87	220	108	20	14	24	10

Source: Census Transportation Planning Products – Residence and Workplace flows

Commutation by Mode

The CTPP data provides breakdown of mode of transportation for people traveling from home to work locations for existing commuters and is based on the responses to 2012-2016 ACS. **Figure 6** shows the shares of different modes used by persons residing in the South Kearny ferry catchment area who work in the other ferry site catchment areas, the rest of Hudson County and New York City



Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 6: Share of commutation modes for South Kearny

Bayfront

Demographics

Table 16: Sociodemographic data for Bayfront catchment area

	2008-2012 ACS	2014-2018 ACS	Annual Growth Rate 2012-2018
Population			
Bayfront	72,025	76,596	1.03%
Hudson County	636,194	668,631	0.83%
Labor Force			
Bayfront	57,008	59,817	0.80%
Hudson County	520,536	544,263	0.75%
Total Employed			
Bayfront	32,279	34,891	1.31%
Hudson County	324,150	352,378	1.40%
Median Income (2019 USD)			
Bayfront	$54,176	$50,471	(1.17%)
Hudson County	$70,994	$72,819	0.42%

Source: NJTPA NJRTME travel demand estimates for 2018

2018 Travel Demand

Table 17: 2018 Travel Demand from Bayfront catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
Bayfront	3,497	1,592	35,697	6,716	3,826	1,075	35,744	16,707

Source: NJTPA NJRTME travel demand estimates for 2018

Table 18: 2018 Travel Demand from Bayfront catchment area to New York City boroughs

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
Bayfront	5,686	7,054	1,227	228	1,097	750	666

Source: NJTPA NJRTME travel demand estimates for 2018

Employment Locations

Table 19: Work locations of Bayfront catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
Bayfront	594	580	3,516	890	841	252	7,510	4,424

Source: Census Transportation Planning Products – Residence and Workplace flows

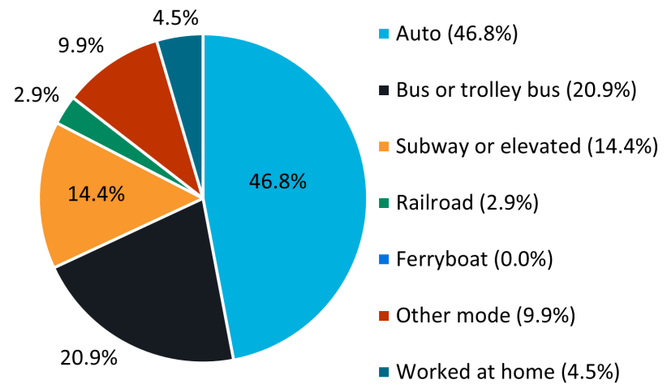
Table 20: Work locations of Bayfront catchment area to New York City

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
Bayfront	1,088	2,166	471	118	288	234	59

Source: Census Transportation Planning Products – Residence and Workplace flows

Commutation by Mode

The CTPP data provides breakdown of mode of transportation for people traveling from home to work locations for existing commuters and is based on the responses to 2012-2016 ACS. **Figure 7** shows the shares of different modes used by persons residing in the Bayfront ferry catchment area who work in the other ferry site catchment areas, the rest of Hudson County and New York City.



Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 7: Share of commutation modes for Bayfront

West Bayonne

Demographics

Table 21: Sociodemographic data for West Bayonne catchment area

	2008-2012 ACS	2014-2018 ACS	Annual Growth Rate 2012-2018
Population			
West Bayonne	63,164	65,300	0.56%
Hudson County	636,194	668,631	0.83%
Labor Force			
West Bayonne	51,702	51,570	(0.04%)
Hudson County	520,536	544,263	0.75%
Total Employed			
West Bayonne	30,651	30,842	0.10%
Hudson County	324,150	352,378	1.40%
Median Income (2019 USD)			
West Bayonne	$63,899	$61,075	(0.75%)
Hudson County	$70,994	$72,819	0.42%

Source: NJTPA NJRTME travel demand estimates for 2018

2018 Travel Demand

Table 22: 2018 Travel Demand from West Bayonne catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
West Bayonne	1,885	786	15,043	51,266	2,193	762	16,229	17,176

Source: NJTPA NJRTME travel demand estimates for 2018

Table 23: 2018 Travel Demand from West Bayonne catchment area to NYC boroughs

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
West Bayonne	5,014	7,410	979	120	726	529	2,397

Source: NJTPA NJRTME travel demand estimates for 2018

Employment Locations

Table 24: Work locations of West Bayonne catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
West Bayonne	466	214	710	5,734	686	139	4,986	3,153

Source: Census Transportation Planning Products – Residence and Workplace flows

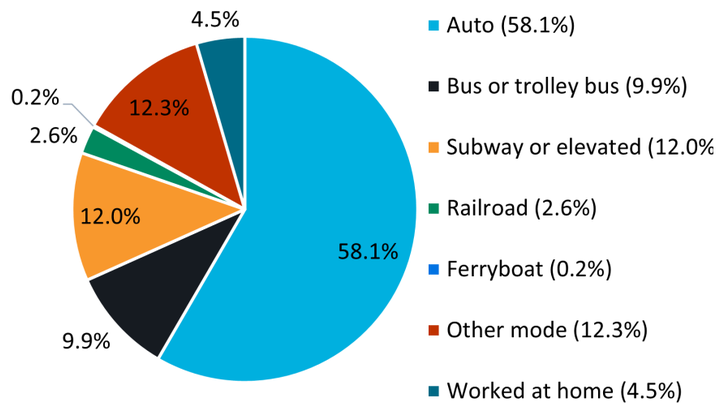
Table 25: Work locations of West Bayonne catchment area to New York City

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
West Bayonne	914	1,322	319	80	159	211	148

Source: Census Transportation Planning Products – Residence and Workplace flows

Commutation by Mode

The CTPP data provides breakdown of mode of transportation for people traveling from home to work locations for existing commuters and is based on the responses to 2012-2016 ACS. **Figure 8** shows the shares of different modes used by persons residing in the West Bayonne ferry catchment area who work in the other ferry site catchment areas, the rest of Hudson County and New York City.



Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 8: Share of commutation modes for West Bayonne

Hoboken

Demographics

Table 26: Sociodemographic data for Hoboken catchment area

	2008-2012 ACS	2014-2018 ACS	Annual Growth Rate 2012-2018
Population			
Hoboken	116,963	119,462	0.35%
Hudson County	636,194	668,631	0.83%
Labor Force			
Hoboken	96,425	99,231	0.48%
Hudson County	520,536	544,263	0.75%
Total Employed			
Hoboken	65,911	69,219	0.82%
Hudson County	324,150	352,378	1.40%
Median Income (2019 USD)			
Hoboken	$90,967	$98,160	1.28%
Hudson County	$70,994	$72,819	0.42%

Source: NJTPA NJRTME travel demand estimates for 2018

2018 Travel Demand

Table 27: 2018 Travel Demand from Hoboken catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
Hoboken	2,298	648	2,173	1,102	51,759	4,371	60,313	47,728

Source: NJTPA NJRTME travel demand estimates for 2018

Table 28: 2018 Travel Demand from Hoboken catchment area to New York City boroughs

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
Hoboken	13,825	24,648	4,607	738	2,534	1,104	273

Source: NJTPA NJRTME travel demand estimates for 2018

Employment Locations

Table 29: Work locations of Hoboken catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
Hoboken	886	302	720	189	7,142	661	9,277	20,671

Source: Census Transportation Planning Products – Residence and Workplace flows

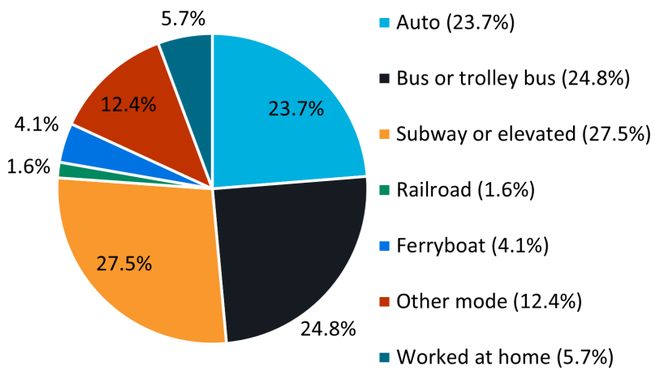
Table 30: Work locations of Hoboken catchment area to New York City

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
Hoboken	4,853	12,962	1,504	242	679	322	109

Source: Census Transportation Planning Products – Residence and Workplace flows

Commutation by Mode

The CTPP data provides breakdown of mode of transportation for people traveling from home to work locations for existing commuters and is based on the responses to 2012-2016 ACS. **Figure 9** shows the shares of different modes used by persons residing in the Hoboken ferry catchment area who work in the other ferry site catchment areas, the rest of Hudson County and New York City



Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 9: Share of commutation modes for Hoboken

West New York

Demographics

Table 31: Sociodemographic data for West New York catchment area

	2008-2012 ACS	2014-2018 ACS	Annual Growth Rate 2012-2018
Population			
West New York	103,641	106,674	0.48%
Hudson County	636,194	668,631	0.83%
Labor Force			
West New York	84,121	87,375	0.63%
Hudson County	520,536	544,263	0.75%
Total Employed			
West New York	51,532	56,224	1.46%
Hudson County	324,150	352,378	1.40%
Median Income (2019 USD)			
West New York	$64,202	$64,342	0.04%
Hudson County	$70,994	$72,819	0.42%

Source: NJTPA NJRTME travel demand estimates for 2018

2018 Travel Demand

Table 32: 2018 Travel Demand from West New York catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
West New York	1,671	284	752	624	7,100	59,046	38,355	24,901

Source: NJTPA NJRTME travel demand estimates for 2018

Table 33: 2018 Travel Demand from West New York catchment area to NYC boroughs

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
West New York	3,987	12,637	5,903	1,121	598	473	181

Source: NJTPA NJRTME travel demand estimates for 2018

Employment Locations

Table 34: Work locations of West New York catchment area to major destinations

	South Harrison	South Kearny	Bayfront	West Bayonne	Hoboken	West New York	Rest of Hudson County	New York City
West New York	473	314	313	204	1,292	7,520	8,687	10,329

Source: Census Transportation Planning Products – Residence and Workplace flows

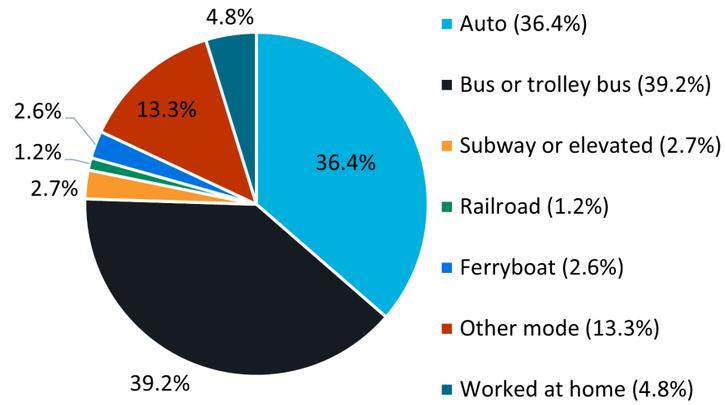
Table 35: Work locations of West New York catchment area to New York City

	Manhattan south of 14th St	Manhattan 14th-59th St	Manhattan north of 59th St and Islands	Bronx	Brooklyn	Queens	Staten Island
West New York	1,998	5,950	1,412	207	389	333	40

Source: Census Transportation Planning Products – Residence and Workplace flows

Commutation by Mode

The CTPP data provides breakdown of mode of transportation for people traveling from home to work locations for existing commuters and is based on the responses to 2012-2016 ACS. **Figure 10** shows the shares of different modes used by persons residing in the West New York ferry catchment area who work in the other ferry site catchment areas, the rest of Hudson County and New York



Source: Census Transportation Planning Products – Residence and Workplace flows

Figure 10: Share of commutation modes for West New York

Site Data

Data was collected on the physical attributes of the six potential areas for ferry service, including current land use and environmental conditions, characteristics of adjacent bodies of water, and local weather conditions, to determine the feasibility and narrow down the suggested area of a ferry landing site along the waterfront.

Land Use

Newark Bay Land Uses

Bayonne

Bayonne's Newark Bay waterfront is characterized by single family homes and parks, with several of larger former industrial sites near the southern tip of the peninsula.

- Dennis P. Collins Park (Block 392, Lots 1-15, Block 383, Lots 1-8, Block 384, Lots 1 & 2, Block 385, Lots 1-6, Block 386, Lots 1-4, Block 387, Lots 1 & 2, Block 388, Lots 1 & 2, Block 389, Lot 2) - large park at the southern tip of Bayonne which stretches along the Kill Van Kull waterfront. Ultimately, the City of Bayonne's vision is to connect the park via waterfront walkway to the Texaco site to the west and to the Hudson River Waterfront Walkway to the east, linking the Hudson River and Newark Bay waterfronts.
- Bergen Point (Block 360, Lot 2, Block 390, Lot 1, Block 391, Lot 1, Redevelopment Area)- large (approximately 70 acres) site of former Texaco facility, targeted for redevelopment through City adopted redevelopment plan. Planned residential and commercial development fell through. Likely to be redeveloped with commercial warehouse facility, potentially film studio.
- 219 West 5th Street (Block 301.01, Lot 1, Redevelopment Area) - sold in 2019 for $4.55 million to Bayonne Luxury Waterwalk, LLC - potential for residential development. Designated by Bayonne City Council as Area in Need of Redevelopment, Bayonne Luxury Waterwalk later designated as redeveloper of the site.
- Best Foods Site (Block 333.01, Lots 4, 5, 6, 7, Block 310, Lots 3 and 4, Redevelopment Area) - partially vacant industrial site, 188,000 sq. ft. Amazon delivery station opening late 2020.
- Bayview/A&P Redevelopment site (Block 47, Lot 1, Block 300, Lots 1, 2, 3, and 6, Block 301.01, Lots 2 and 4, Redevelopment Area)- Likely to be redeveloped with mixed use, multi-family residential development with retail and active waterfront, potentially some on-site parking. Remnants of historic pier could be reconstructed.
- Existing recreational marina at Boatworks at Bayonne Townhouse Condominium Development (Block 47, Lot 8, R-3 Medium Density Residential Zone)
- Robbins Reef Yacht Club (Block 261, Lot 14, Block 21, Lot 17, R-2 Detached/Attached Residential Zone)
- City Park at 16th Street (Block 21, Lot 13, R-2 Detached/Attached Residential Zone)
- Veterans Park at 25th Street (Block 21, Lot 2, R-2 Detached/Attached Residential Zone)

Jersey City

Jersey City's Newark Bay waterfront is occupied by NJ Route 440, an athletic complex, and the low-rise residential development at Society Hill.

Hackensack River Land Uses

Jersey City

Jersey City's Hackensack River waterfront has a mix of commercial and recreational/open space uses, with a few industrial sites, primarily warehouses, in the vicinity of the Pulaski Skyway.

- Bayfront (Block 24601, Lots 1-12, Block 21901, Lots 5-8, Redevelopment Area) - Bayfront is a 95-acre former industrial site on Newark Bay. There is a potential that Jersey City Municipal Utilities Authority (Block 21901, Lots 3, 4, 9, and 10) will move to another location and vacate their lots to the redevelopment as well. The chromium contamination at the site has been remediated. Jersey City purchased the property through a bond issue, and has issued an RFQ to partner with a developer to redevelop the site as a mixed-use community with as many as 8,000 residential units. Jersey City is also advocating for an extension of the Hudson-Bergen Light Rail extension to the site. The RFQ calls for the construction of a new bulkhead on the Hackensack River with public access for recreational purposes.
- 405 Route 440 (Block 24602, Lot 1, Waterfront Planned Development Zone) On this site adjacent to the much larger Bayfront Redevelopment Area, the Jersey City Planning Board in October 2020 approved a plan for an eight-story residential building with 158 units and 108 parking spaces.
- Hudson Mall (Block 16001, Lots 1-5 Waterfront Planned Development Zone/ Marine Industrial Redevelopment Area) Collection of retail/restaurants in enclosed indoor mall, standalone big box and small format buildings. Undeveloped land with vegetation closer alongside Newark Bay. Potential to be reconfigured/re-imagined/ redeveloped in the future, potential to provide public access along waterfront with walkway. Combined sewer outfall at the site.
- 1033 Communipaw Avenue site (Block 16001, Lot 2, Block 18001, Lots 1-6, Redevelopment Area) – designated as Area in Need of Redevelopment by Jersey City Redevelopment Authority. Adjacent to NJ Route 1&9 Truck bridge. Includes City, County and private land. Redevelopment plan calls for extension of Clendenny Avenue right of way to the waterfront, 13.8 acre park and waterfront walkway on Block 16001, Lot 2 closest to waterfront, rest of site to be developed with warehouse/industrial/retail flex space with parking and loading areas. Close to Lincoln Park.
- Skyway Park (Block 11701, Lot 5, Block 11702, Lots 4 & 5, Block 11706, Lots 1 & 2, Block 11701, Lots 1 & 2, Hackensack River Edge Redevelopment Area) Former PJP landfill, has been capped and purchased by City. In the process of being redeveloped into public park, with views of and access to the Hackensack River. Will include seating areas, native plantings, grove of trees as memorial to COVID-19 victims.
- Hudson Generating Station (Block 3101, Lots 21-26, 36, 37, 39, 40-42, 44, 45, Block 7402, Lots 23, 24, 33-35, Redevelopment Area) - a former PSE&G coal and natural gas power plant on a 240 acre site. NJSEA passed Van Keuren Avenue Redevelopment Plan for site. To be redeveloped as warehouse development with 4 warehouses, loading and parking areas. Total building coverage/ gross floor area 745,960 sq. ft. In application and approval process with NJSEA, Hudson County, Jersey City Planning Boards.
- Essex-Hudson Greenway: Open Space

Institute has reached a preliminary agreement with Norfolk Southern Railway to convert former railroad right-of-way into 9 mile multi-use off-road trail linking Hudson and Essex Counties

Kearny

Kearny's Hackensack River waterfront comprises industrial sites, some of which are in the process of redevelopment. A few waterborne transportation uses exist, with more possible.

- Kearny Point (Block 294, Lot 20, SKI-S South Kearny Industrial South Zone)- former Federal Shipbuilding and Drydock Company 130 acre site is being transformed into an industrial park by Hugo Neu Corporation with 2 million sq. ft. of office, co-working, light industrial, and warehousing space. Combination of new warehouse construction and rehabilitation/ adaptive reuse of existing buildings. Two large existing boat basins, Master Plan calls for development of kayak launch and marina at south basin. In need of dredging for expanded maritime use.
- Passaic River Yacht Club (Block 298, Lots 4 & 4.01, SKI-S South Kearny Industrial South Zone) - recreational boating
- Kuehne Chemical Company (Block 298, Lots 10 & 10.01, SKI-N South Kearny Industrial North Zone) - manufacturing and storage of bleach utilizing chlorine gas and other chemicals, dock for barge transportation.

Passaic River Land Uses

Kearny

South Kearny peninsula consists of industrial uses, many of which are active. Western Kearny's Passaic River waterfront includes a large commercial and residential development near East Newark border, with park/open space north to Bergen County border.

- Warehouse Distribution Center (Block 288, Lots 1-3, 3.01, SKI-S South Kearny Industrial South Zone) - former industrial site to be developed with a 415,000 sq. ft. warehouse and distribution center, no maritime use planned.
- Spectraserv (Block 289, Lots 10, 10.01, 11 & 11.01, SKI-S South Kearny Industrial South Zone) - waste management, transfers waste from facilities to designated transfer stations. Transports liquid residuals via two barges which operate at the site.
- The Bridge by Vermella (Block 1, Lots 2.01-11, MXD Mixed Use Zone) - July 2020 Kearny Planning Board hearing to redevelop site with three buildings including 289 residential units, 10,600 sq. ft. of retail, 431 parking spaces, and 12,300 sq. ft. clubhouse. Walkway along the Passaic River to be included. Riverbank Park (Block 1, Lots 16-39, Block 89, Lots 1 & 4, R-1 One-Family Residential Zone) park with numerous amenities which runs along and provides access to the Passaic River. Includes Riverbank Trail along the length of the river.
- Boat launch (Block 1, Lot 16, R-1 One-Family Residential Zone) - recreational boating
- Kearny Boathouse - (Block 89, Lots 5 & 6, C-1 Office Zone)- recreational boating, potential future redevelopment for a gas station.

Harrison

Formerly, Harrison's Passaic River waterfront was occupied by industrial uses. Some have been redeveloped as housing, while most are currently vacant. The Town's Waterfront Redevelopment Plan is designating most of these lots for open park space.

- Block 143, Lot 7.01 (Redevelopment Area)- large vacant site owned by PSE&G. Harrison Waterfront Redevelopment Plan calls for park/open space on portion of this site in the long term.
- Block 78, Lot 1 (Redevelopment Area)- large vacant site owned by PSE&G. Harrison Waterfront Redevelopment Plan calls for park/open space on waterfront portion of this site in the long term.
- Block 86, Lot 1 (Redevelopment Area)- Hartz Mountain owned property- type of trucking facility with a small dock. Harrison's Waterfront Redevelopment Plan calls for park/open space at this site in the long term.
- First and Bergen (Block 71, Lots 1.01 & 12, Block 71, Lot 1.01, Redevelopment Area)- 5.4 acre site to be developed with two residential buildings with 552 total units. No maritime use planned.

East Newark

East Newark's formerly industrial waterfront is partially vacant. Between the Clay Street Bridge and Interstate 280, Block 18, Lots 1-6 are occupied by the Eastern Concrete Materials plant. North of the Clay Street Bridge is a large former industrial lot owned by the BASF Corporation, and to the north of that, a car storage lot which runs up to the border of Kearny. All of these lots are designated for redevelopment, and the Borough is looking to encourage new construction, potentially a hotel as stated in the Borough's Redevelopment Plan, though there is no prospective development at this time and no maritime use has been called for. The Redevelopment Plan requires public access through a waterfront walkway along the river front.

In December 2020, a draft Restoration Plan for the Passaic River developed by the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration as part of remediation efforts for contamination in the river, was released. The draft plan proposes a 5 acre park to be constructed on the former BASF site (Block 17, Lot 2). The shoreline would be stabilized at the site, and the park would include native landscaping, trees, and public access to the river through a waterfront walkway.

Environmental Conditions

Largely due to Hudson County's historical legacy as a center of industrial production, the county has numerous sites with confirmed contamination. Before the late 20th century, many industrial facilities were located adjacent to the county's waterways to facilitate the transportation of raw materials and finished products, and sometimes water was taken for use in the manufacturing processes themselves. In some cases, untreated, contaminated water was discharged directly into the adjacent waterways for disposal, which resulted in accumulations of contaminants and health hazards. Additionally, for many years, waste from the region's residents and businesses was dumped into regulated and unregulated landfills, particularly in the New Jersey Meadowlands, and often in direct contact with waterways. In recent years, dramatic progress has been made throughout the region to clean up contaminants and restore or redevelop former contaminated sites.

The Hudson County Ferry Service Expansion Study is examining the potential for new or additional passenger ferry service in Bayonne, Harrison, Hoboken, Jersey City, Kearny, and West New York. These municipalities had a combined total of 976 active sites with confirmed contamination, with 111 in Bayonne, 42 in Harrison, 114 in Hoboken, 513 in Jersey City, 144 in Kearny, and 52 in West New York. These municipalities have a total of 4,312 closed sites with remediated contamination, including 976 in Bayonne, 89 in Harrison, 336 in Hoboken, 2,148 in Jersey City, 504 in Kearny, and 259 in West New York. In these six municipalities, there are currently sites with an immediate environmental concern: 1 in Bayonne, 2 in Harrison, 1 in Hoboken, 4 in Jersey City, 4 in Kearny, and 1 in West New York. Hudson County currently has 4 sites on the US EPA's Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Superfund National Priorities List: PJP Landfill in Jersey City, and the Diamond Head Oil Refinery Div., Standard Chlorine, and Syncon Resins in Kearny. The Grand Street Mercury site in Hoboken was deleted from the list in 2007.

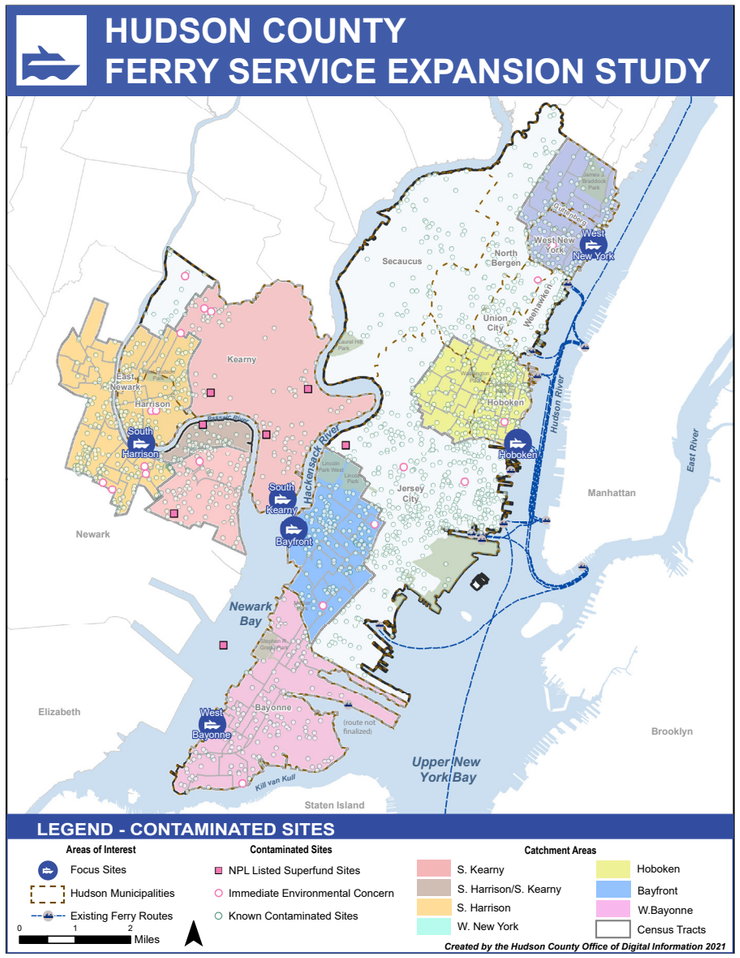


Figure 11: Environmental Conditions

The catchment areas for the conceptual ferry landings in Harrison and Kearny include portions of Newark. Newark has 618 active sites with confirmed contamination. There are 1,903 closed sites with remediated contamination in Newark. Newark has 12 sites with an immediate environmental concern. Newark has 4 sites on the CERCLA Superfund National Priorities List: Diamond Alkali Co., Pierson's Creek, Riverside Industrial Park, and White Chemical Corp.

Water Depth

A review of the design parameters for ferry vessels suitable for service from the proposed locations indicates a minimum depth of 10 feet at mean low water will be required for safe operation. As part of this study the NOAA Navigational Charts were reviewed for the project sites to review water depths and navigability. More recent data available from a survey performed of the Lower Passaic River by the USACE in January 2020 was also reviewed for the South Harrison site.

The review concluded that Kearny Point, Bayfront and Hoboken all have locations along the shoreline with adequate water depth in an area that could support a ferry landing without interfering with adjacent channels, while also being close enough to the shoreline to not require significant infrastructure over the water.

The area of South Harrison with adequate depth may be too close to the channel and may interfere with the channel side slope. In addition, while review of the survey by United States Army Corps of Engineers (USACE) indicates river depths greater than 11' to Newark Bay, the controlling depths of Point No Point Reach per NOAA charts do not exceed the required 10' depth. There is future dredging planned in the Passaic River as part of the Lower Passaic River Restoration Project (LPRRP) to remove contaminated sediment from the river and cap it. If a site in South Harrison is considered, it would be beneficial to coordinate the construction after the dredging of the Passaic River to ensure adequate depths and minimize impact on the remediation project. The landing could be installed prior to the dredging as long as the piles are designed to allow for the future river bottom change.

The identified area in West Bayonne at City Park at West 16th Street has adequate depth to support a ferry landing, however, a more detailed survey would be needed to confirm depths as the bathymetry shows an uneven river bottom. A pier will likely be required to reach navigable depths.

West New York has a shallow shoreline out to the Hudson River Channel, and it is most likely that yearly dredging will be required for this location. Port Imperial ferry landing is a half mile south of West New York and has a yearly dredging program.

Tidal Range

The waters of the Hudson River, Lower Passaic River, Lower Hackensack River and Newark Bay are influenced by semi-diurnal tides reaching a mean tidal range of 5 feet, with water levels typically between -2.5ft NAVD88 and +2.5ft NAVD88 in the harbor. This range is minimal and will not impact the feasibility of a ferry landing in any of the proposed locations.

Currents

Due to the tidal nature of the study areas, the

currents fluctuate throughout the day. Below is a table of the average flood and ebb speeds of the bodies of water encompassing the proposed ferry routes obtained from the NOAA Tides and Currents database. There is existing ferry service from NJ to NY through the Hudson River which is not deterred by the currents. The table also includes speeds of the East River, where a similar ferry operates, to further demonstrate that the currents should not impede operations. In addition, all proposed locations are in rivers and not subject to significant wave action.

These currents will not impact ferry operations and schedules in a significant manner.

Weather Conditions

Adverse weather and ice conditions can severely restrict the ability to conduct ferry operations in a safe, efficient, and financially viable manner. Hazardous weather is implicated in over 50% of ferry fatality incidents according to the Worldwide Ferry Safety Association statistical analysis. As conditions vary due to climate change influences, the effects may become even more severe. While ferry service performance is influenced to a degree by environmental factors, coastwise and inland waterway services are, to some extent, much less impacted. For the most part ferry services in New York Harbor can operate 365 days year with little disruption due to weather conditions and it is rare that a USCG notice impacts ferry operations.

Wind speed is the most important environmental factor for service cancellations. Excessive winds or those exceeding 60 knots may result in the suspension of service throughout New York Harbor. While these occurrences are rare, the decision to close is at the discretion USCG Sector New York Captain of the Port. Wind speeds 74 knots or above result in a mandatory shut down. Air temperature, the most important contributor for delays and largely due to the resulting icing, does impact service reliability more frequently. Ice floes or a cohesive sheet of ice floating in the water impacts the vessel's ability to make way. Ice can also impact the vessel's propulsion system and most often jet driven systems. There have been times in New York Harbor when consolidated pack ice has made it so difficult to make way the operators engage steel hulled tugs to lead or clear a path for the lighter aluminum hulled ferries. The following table summarizes typical weather conditions and their impact on ferry service.

Table 36: Currents of Site Adjacent Waters

Location	Average Speed (Flood) knots	Average Speed (Ebb) knots
Passaic River - Lincoln Highway Bridge	0.6	0.5
Hackensack River - Lincoln Highway Bridge	0.9	0.8
Newark Bay – South Reach	0.7	0.7
Kill Van Kull	1.9	1.9
Hudson River – Grant's Tomb	1.8	1.8
Hudson River – Entrance	1.4	1.4
East River	1.1-3.4 (1.9 avg)	0.6-4.6 (1.6 avg)

Source: NOAA Tides & Currents, https://tidesandcurrents.noaa.gov

Table 37: Weather Conditions and Resultant Impact on Ferry Operations

Condition	Impact
Rain without wind	No impact unless visibility reduced - then slow speed and possible schedule impact.
Snow without wind	No impact unless visibility reduced - then slow speed and possible schedule impact.
Fog	Some impact because visibility reduced - slow speed and possible schedule impact
High winds	60 knots may result in the suspension of service 74 knots or above results in a mandatory service shut down
Ice conditions	Depending on floe conditions slow speed and possible schedule impact.

EXISTING FERRY SERVICE

Information was collected on the existing ferry services operating in the NY/NJ region. This data and experience of the Consultant will be considered when analyzing the proposed ridership and routes associated with the selected sites.

Routes

The New York / New Jersey Harbor is serviced by several ferry operators who provide different types of routes. NY Waterway provides short routes across the Hudson River between New Jersey and New York. NYC Ferry provides mainly East River ferries that connect landings within New York City; most routes are short but a few have long connections. Seastreak provides connections to longer routes from Monmouth County to Manhattan. The Liberty Landing Ferry provides service across the Hudson with a connection to local historical and recreational destinations. NYCDOT has the largest ferry vessels in the harbor and provides a free connection from Staten Island to Manhattan.

Most of the ferries provide point to point service. NYC Ferry connects several landings on each route. .

Ridership

In 2019 passenger ferries in New York Harbor served an average of 120,000 daily trips. Nearly 70,000 were accounted for by the Staten Island Ferry, and nearly 16,000 by New York City Ferry. The non-subsidized inter-state services run by NY Waterway and Seastreak from Hoboken, Jersey City, Edgewater and Monmouth County served nearly 33,600 trips.

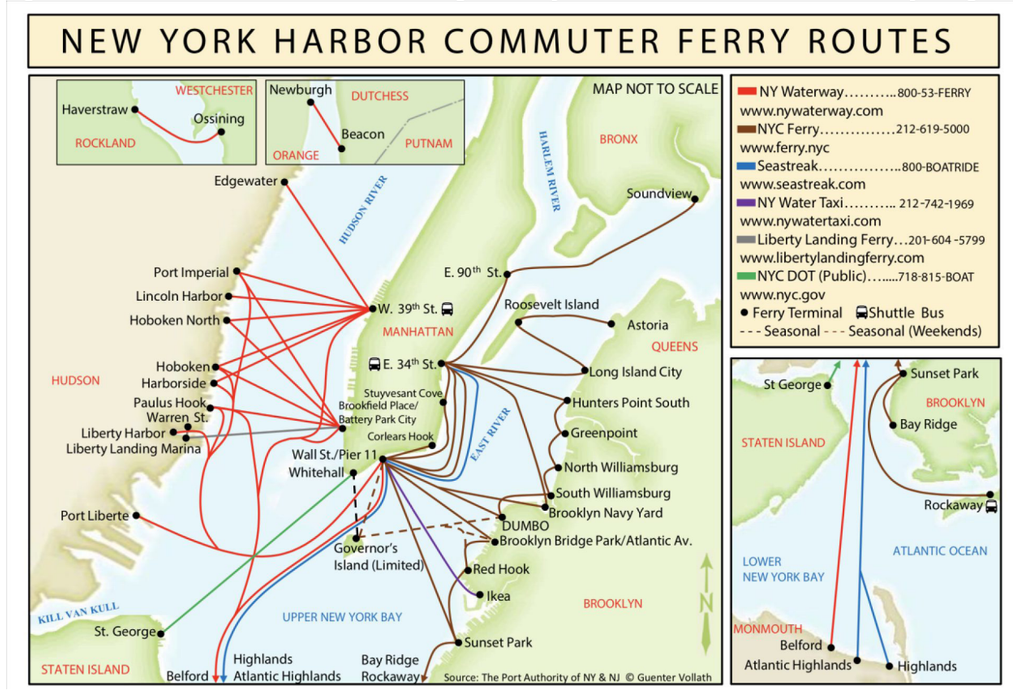
Vessel Specifications of Potential Craft

It is best to examine the existing vessels operating in Hudson County when looking at the specifications of potential ferry vessels for expanded or enhanced service. This is true for several reasons. First, the fleet of vessels operating from Hudson County origins have, for the most part, been specially designed for operation along the Hudson River and represent years of refinement. Second, and because of the standardization of the vessel design in New York Harbor, ferry landings have been designed to accommodate bow loading vessels with a particular deck height. Third, vessels are designed and inspected as per United States Coast Guard regulations and must maintain current USCG Certificates of Inspection consistent with the design. These Certificates are typically endorsed for coastwise and inland waterway operations. Finally, the ferries are thoughtfully designed and operated for minimal environmental impact so as to comply with all applicable local, state, and federal emissions regulations and wake standards for the present operations. In addition to the regulations there are other considerations an operator must consider when selecting a vessel including:

Figure 12: Regional Ferries: NYWW and NYC Ferry

- **Efficiency** – vessel design regardless of the hull type aims to minimize a vessel's resistance and its displacement to reduce operating expenses and particularly fuel burn.
- **Motion Sickness Incidence** – vessel design aims to minimize motion sickness incidence, which is a function of motion, rolling and slamming of the hull. The overall goal is to maintain passenger comfort.
- **Maneuverability** – the ability to maneuver in confined port areas, during strong winds and while underway.
- **Sea Keeping** – a vessel's ability to withstand and maintain speed during poor weather conditions and high waves.
- **Emissions** – increased regulations and public opinion has created an environment

Figure 13: Private and Public Passenger Ferry Routes in The New York City Region



Source: The Port Authority of NY&NJ

where more efficient, less polluting and alternative fuel vessels are not only demanded but required for ferry services. This particular consideration requires further examination.

The typical Hudson County vessel is bow loading, constructed of aluminum and has mechanical propulsion systems, either jet or propeller. They vary in the level of amenity available, but all offer heated cabins, comfortable seating, and are readily accessible to all riders regardless of their physical capabilities. The summary of vessel characteristics below provides the basic vessel details by class, either catamaran or monohull, necessary for a broad range of operations. The latter vessel type, taking two forms in Hudson County, are either large passenger capacity vessels (399 passengers or greater) that travel at relatively slow speeds or smaller low passenger capacity vessels (97 passengers) that nimbly ply the waters of New York Harbor at higher speeds. The catamarans, or multi-hull vessels, offer a blend of both higher passenger capacity (149 to 350 passengers) and speed on a more stable operating platform. Regardless of class, these bow loading vessels are designed to facilitate quick loading and discharging of passengers. Once an anomaly, these Hudson County type vessels have become the standard for the industry in New York Harbor and across the Nation. The details and images below illustrate the range of vessels suitable for any route under consideration as part of this study.

The large monohulls are typically found on high volume short distance operations. With lower per seat operating costs, services with the high capacity monohulls provide efficient mass transit-oriented operations during peak commuting hours. Typically, with two decks and open and enclosed seating areas, these vessels are suitable for most operations requiring capacity over speed. Low and slow is the phrase often used to describe these vessels and which have been the mainstay of Hudson County ferry operations for over three decades. It is estimated that the large monohulls have moved over 150 million commuters since their introduction in 1986.

Table 38: Typical 149 Passenger Catamaran Statistics

Feature	Description
Model	Catamaran
Type of Construction	Aluminum Catamaran
Length	78 feet
Beam	25 feet
Draft	5.5 feet
Air Draft	25 feet
Displacement	58 tons
Number and Type of Decks	1 enclosed, 1 open
Vessel Capacity Seated/ Standing	127 / 22
Loading Configuration	Bow loading
Engine	4 x CAT 3406E
Drive	4x Hamilton 362 Waterjets
Cruising Speed	24 knots

Figure 14: Typical 149 Passenger Catamaran

Table 39: Typical 399 Passenger Monohull Statistics

Feature	Description
Model	Monohull
Type of Construction	Aluminum Monohull
Length	97 feet
Beam	24 feet
Draft	7 feet
Air Draft	25 feet
Displacement	75 tons
Number and Type of Decks	1 enclosed, 1 open
Vessel Capacity Seated/Standing	300 / 100
Loading Configuration	Bow loading
Engine	2 x CAT C-18ACERT
Drive	2 propellers
Cruising Speed	16 knots

Figure 15: Typical 399 Passenger Monohull

Table 40: Typical 99 Passenger Monohull Statistics

Feature	Description
Model	Monohull
Type of Construction	Aluminum Monohull
Length	65 feet
Beam	18 feet
Draft	5 feet
Air Draft	17 feet
Displacement	47 tons
Number and Type of Decks	1 enclosed
Vessel Capacity Seated/Standing	72/25
Loading Configuration	Bow loading
Engine	3 x CAT 3406 -E
Drive	3 x Hamilton 362 Waterjets
Cruising Speed	28 knots

Figure 16: Typical 99 Passenger Monohull

When speed is necessary and required to achieve greater departure frequency over longer distance routes, high speed monohulls or catamarans are put into service. Generally, with lower passenger capacity and higher fuel consumption these vessels operate a greater per seat cost. The associated services or those operating from Hudson County today, typically demand a higher fare per trip. Higher speed vessels usually come with a corresponding higher construction and maintenance cost.

It is important to note that there is no specific vessel type and the design and construction of the vessel is a function of the route, service characteristics, operating costs, ridership projections and potential fare structure. As the routes are further refined and the other operating criteria determined the recommended vessel type and characteristics will evolve to meet the needs.

Alternative Fuel Vessels

There are a host of reasons why alternative fuel and propulsion systems should be explored including emissions, fuel savings and overall operating expense. Alternative fuels for marine transport can play a crucial role in carbon reduction and ultimately contribute towards climate change goals. Market penetration by alternative fuels have already begun with ship builders, engine manufacturers, and classification bodies introducing guidelines for greener vessels running on cleaner fuels. The latter can be attributed in large part to the MARPOL (International Convention for the Prevention of Pollution from Ships) regulations in place since the 1970s and progressively more stringent emission standards subsequently introduced by regulatory bodies such as the EPA. While the purpose of study is not a singular discussion on alternative fuels, it is worthwhile to briefly touch upon the options under use and study today. **Table 41** below introduces the many alternatives and the pros and cons of each.

While there are a myriad of alternative fuels and accompanying propulsion systems, the challenge with implementing a change of this nature does not just lie with the vessel construction and operation. Switching to a new technology for passenger vessels requires USCG approval and accompanying regulations. From the operator's perspective there needs to an accompanying commitment for the landside infrastructure and general availability of product.

With all that being said there is a promising alternative that is being explored in New York Harbor and that is diesel electric and battery hybrid propulsion technology. This particular technology offers several distinct environmental and operational advantages over a traditional diesel-transmission-shaft propulsion system. These advantages include, but are not limited to:

- Ability to operate silently on battery power alone
- Reduced fuel burn
- Reduced noise
- Reduced engine and driveline maintenance
- Improved low speed handling characteristics
- Reduced particulate emissions through reduced low load operation
- Optimized propeller sizing and selection
- Dedicated ship's service generators not needed

These advantages make a battery-hybrid propulsion system particularly well suited for the short to moderate length runs with varying speeds and periods of idling that are under consideration. Passenger class ferries operating primarily in New York Harbor commuter service typically make several short runs at cruising speed, broken up by loading periods during which the vessel's propulsion system is used to temporarily moor the vessel in a bow loading arrangement. The battery is charged while the engine is running mid-river. Then the battery is used for power at the landings. It is at the landings that the emissions benefits are most realized landside and in nearby neighborhoods. No on-going alternative fuel is needed, no place to plug in vessels. The one other advantage of this approach is that these propulsion systems can be retrofitted into existing vessels or employed during a new build.

Table 41: Alternative Fuels for Ferry Vessels

Fuels	Pros	Cons
Low-sulphur fuels	Comply with current regulation; presently availability	Still a fossil fuel; availability; future regulations will most likely prevent use of this alternative
Methanol/biomethanol	Recommended fuel dual fuel concept	Low flashpoint; toxic in contact with skin; vapor denser than air
Dimethyl ether	Non-toxic; degrades rapidly in atmosphere; accidental spills cannot poison water	Technology readiness level 5: at demonstration stage
Biodiesel	Dominant biofuel; can increase flash point of other fuels when blended, increasing safety	Degrades over time
Hydrogenation derived renewable diesel (HDRD)	Legally allowed to be used in existing diesel infrastructure and vehicles; good low temperature performance	Limited availability; only few players in the market
Algae biofuel	Potential to be produced on large scale; safe as diesel; drop-in fuel	Current cost is prohibitive for general use; availability limited; lower heating value
Liquefied petroleum gas (LPG)	Available in market; good supply infrastructure	Heavier than air; explosion safety hazard; premium product; not much experience on use as marine fuel
Liquefied natural gas (LNG)	Availability in market; government support	Cost of retrofitting; fuel storage volume; energy density 60% of diesel;
Biomethane	Chemically identically to LNG; most CO2 friendly fuel; better quality than fossil LNG	Scattered availability in Europe; costlier than LNG
Electricity	More efficient than diesel engines in energy conversion; can be used to power ships at berth reducing port side emissions	Low energy density; high capital cost
FT diesel	Non-toxic fuel (EPA)	Limited availability; not commercially viable
Pyrolysis oil	Commercially viable technology; potential substitute for residual oil	Not yet certified for use in marine diesel engines; energy content is half of diesel; potentially unstable; limited capability to blend with diesel
Hydrogen and fuel cell	Best energy to weight storage ratio of all fuels	Commercial engines not available; difficult and costly to produce, transport and store

Source: Alternative Fuels for Marine and Inland Waterways, Kamaljit Moirangthe, Edited by David Baxter 2016

CASE STUDIES

The Consultant Team examined two similar ferry service systems for background, insight, and ideas. The following summary profiles two ferry services in the Northeast, providing an overview of existing service features with the number of routes and type of service, size of the fleet, service delivery method, and basic ridership and revenue statistics. Each profile also includes a brief description of the evolution of the service and highlights the key points about system integration and funding. NYC Ferry was selected because it is a publicly operated multi-stop ferry in the New York Metropolitan region. This is similar to the potential ferry sites being investigated as part of this project. The MBTA Ferry is a publicly funded ferry service that primarily draws from commuters and competes with other regional transit modes (commuter rail and suburban bus routes) similar to the potential Hudson County ferry service.

NYC Ferry

Service Overview

In 2011, the New York City Economic Development Corporation (NYCEDC) released the Citywide Ferry Study, a comprehensive feasibility study that analyzed 40 potential locations for setting up a ferry system as an alternative transit option for residents of New York City neighborhoods, particularly along the East River. In June 2011, the NYCEDC launched a pilot ferry system that served seven stops on one route. It became instantly popular as an alternative to the New York Subway despite charging passengers $4 per one-way ticket as compared to the $2.50 subway fare. After Hurricane Sandy in 2012, NYCEDC added a temporary service between Rockaway, Queens and Pier 11/Wall Street in Manhattan. The Citywide Ferry Study was updated in 2013 following the success of the expanded ferry services. The benefits of the ferry system include improved economic development through greater transit accessibility to NYC residents, higher real estate values near transit stops, as well as some congestion relief to the NYC transportation network. Findings from the 2013 study served as the rationale behind expanding the NYC Ferry to extend services to all 5 boroughs of New York City. NYCEDC issued the contract to a private ferry operator, Hornblower Cruises, in early 2016. As of

Figure 17: NYC Ferry Network Map

Source: NYC Ferry https://www.ferry.nyc/routes-and-schedules/

Table 42: NYC Ferry Statistics

Feature	Description
Routes	5 + 1 (seasonal - Governor's Island)
Vessels	17 as of 2018, has since grown to 31 and will be 38 at full system buildout
Type of Services Offered	Multi-stop
Service Delivery Model	Public/Private
Ridership	4,101,874
Annual Operating Budget	$61.8M
Operating Cost per Passenger	$15.08
Funding Source	Fares, Local/State Subsidy

Source: National Transit Database 2018 statistics

2019 there were 5 routes and one seasonal route in operation, with two additional routes planned to start in 2021.

System Integration

Fare for a single, one-way trip is currently $2.75. Following the launch of the NYC Ferry system in 2016 the fares were reduced from $4 to the current fare. The fare is currently equal to the fare on the New York City Subway. Riders can transfer to other ferry routes within the system for free but must purchase separate tickets if transferring to another transit system within the city, including NYC Subway operated by the Metropolitan Transportation Authority (MTA). Ferry tickets can be purchased online on the NYC Ferry website, through a phone application, or in-person via a ticket vending machine. Each of the landings have connections to bus, train and bike-share transit options.

Funding

Including on-board concession revenue, the system's farebox recovery is 20%. When the system included only the East River Ferry and fares were $4 a trip, fares counted for 69% of operating costs As fares were reduced and the system expanded to include much longer routes, operating costs per passenger also increased, with the resulting decline in farebox recovery. Vessel acquisition, improvements to terminal facilities, and other capital projects have been funded by federal and state grants while operating expenses are covered by fares and local subsidies.

Takeaway

The NYC Ferry service demonstrates proof of concept in establishing a fast, reliable transportation option to improve transit accessibility and relieve congestion from other modes, while also integrating in with existing transportation system. The service serves as an example of the proactive role a local government can take in initiating and subsidizing new transportation service.

MBTA Ferry

Service Overview

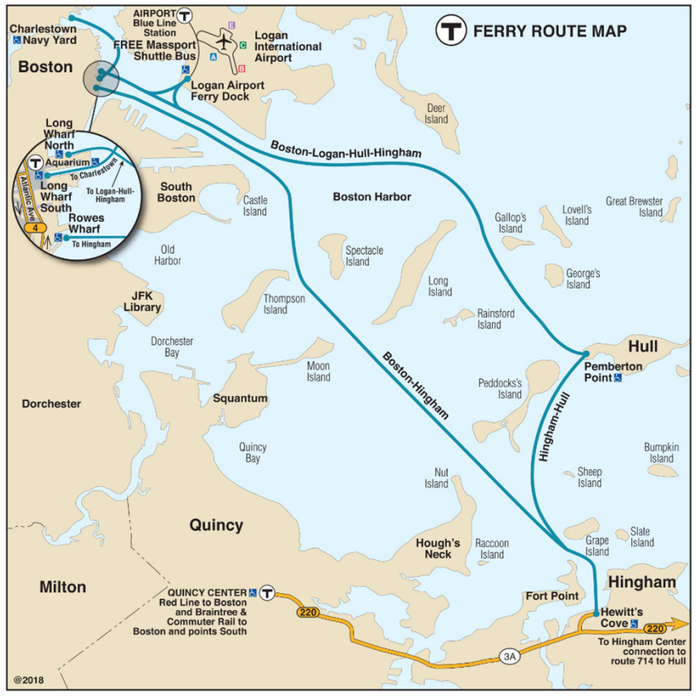
The Massachusetts Bay Transportation Authority (MBTA) ferry system provides water transportation in the Boston Harbor serving three routes between the suburbs of Boston and the urban core. The ferry routes operate between Rowes Wharf, Boston and Hingham, between Long Wharf (South) and Hingham with stops at Logan Airport and Hull, and between Long Wharf (South), Boston and Charlestown. The Hingham and Long Wharf terminals offer connections to tours to the Boston Harbor Islands National and State Parks and to ferry services to Salem, Massachusetts

and Winthrop, Massachusetts. The Salem and Winthrop routes are seasonal services that are operated by the municipalities, not by MBTA but are included on MBTA maps. Between 1960 to 1980, a few ferry private systems operated in the Boston Harbor, most of which were short-lived due to competition from other transit alternatives. Between 1986 and 2002, the MBTA gradually subsidized these ferry routes along with modifications in landing stations and the routes themselves. In 2013, the MBTA contracted Boston Harbor Cruises (BHC) to operate the service. As of 2016, the ferry system was the most reliable mode of service by the MBTA, with on-time performance typically above 95% and has a farebox recovery rate of 82%, the highest of all MBTA services.

System Integration

Fares for a single one-way trip are $3.70 or $9.75 depending on the route chosen. These rates are comparable to fares charged for commuter rail transit, but significantly higher than those charged for subway and local bus one-way trips. Transferring from the ferry to other modes within the system is free if one transfers to a cheaper transit option. If transferring to commuter rail, the commuter must pay the difference between the ferry ticket and the commuter rail ticket. Tickets can be purchased through the website online, phone application, ticket booths available at all ferry landings, and ticket vending machines at some select commuter rail stations as well.

Figure 18: MBTA Ferry Network Map



Source: https://www.mbta.com/schedules/ferry

Table 43: MBTA Ferry Statistics

Feature	Description
Routes	3 + 2 (seasonal)
Vessels	9
Type of Services Offered	Multi-stop
Service Delivery Model	Public/Private
Ridership	1,497,251
Annual Operating Budget	$13.4M
Operating Cost per Passenger	$8.94
Funding Source	Fares, Local/State Subsidy

Source: National Transit Database 2018 statistics

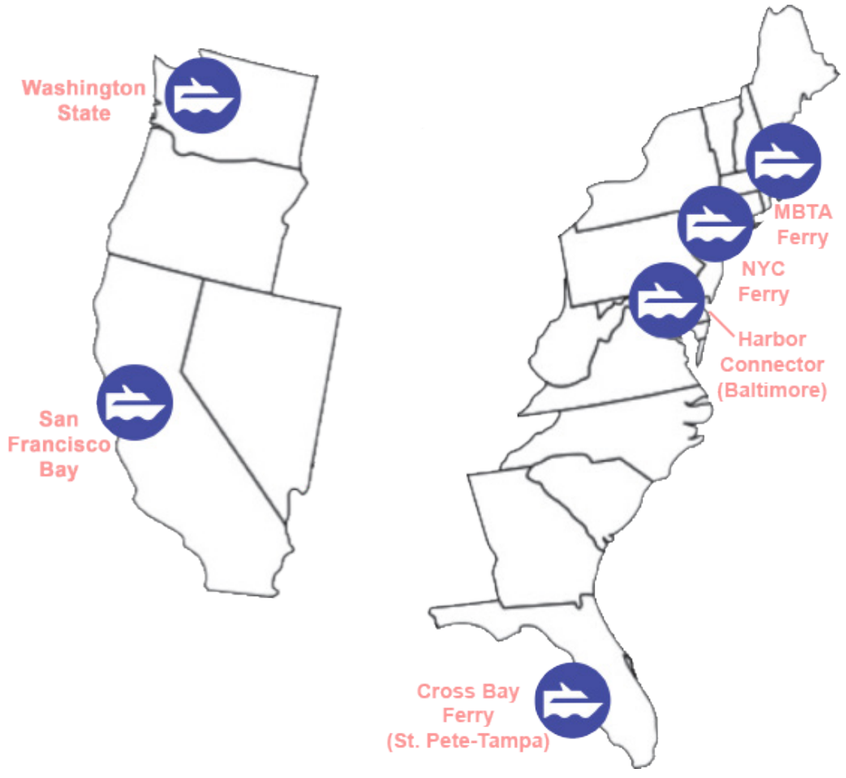
Funding

The MBTA ferry system has a high farebox recovery rate of 82%. The remaining operating budget is covered by local and state funding. The MBTA receives state funds and federal assistance to support its capital projects.

Takeaway

The MBTA ferry service demonstrates the importance of on-time performance, reliability and focusing on routes that provide high farebox recovery for sustainability of the system. Additionally, the service sees benefits from joint ticketing.

Figure 19: Case Studies and Best Practices Review



BEST PRACTICES

The planning team reviewed several existing studies including those provided by the County, additional resources provided by participants of the Study's Roundtable discussions and drew from their collective experience in maritime transportation planning and ridership modelling. A range of Best Practices for successful ferries were identified and noted below, along with examples of routes that implement them.

- **Comfort, Convenience, and Reliability**: These are key traits that attract riders to ferries based on repeated regional polling. Ferry service with these traits can attract riders away from more economical modes.
- **Short Routes have Lower Operating Costs**: By focusing on routes that cover short distances, less fuel is needed to cover each fare and more frequent service can be provided with a single vessel.
  - NYC Ferry multi-stop
  - Weehawken to Midtown vs Pier 11 schedules and fares ($9.00, 8 minute trip vs. $13.00 30 minute trip)
- **Multi-modal Coordination**: When service schedules are aligned it allows for quick connections with minimal waiting.
  - Staten Island Ferry and Staten Island Subway
  - Ossining & Beacon Ferries and Metro North
- **Single payment method/Joint Ticketing**: When tickets can cover ferry, bus, subway, train, or some combination of those, it makes the full ride much more affordable and accessible to more riders.
  - WETA Clipper Card (San Francisco Bay)
  - MBTA
- **Redundant Transportation Available**: Transit options that run parallel with the ferry can complement the service by covering off peak time periods and allow riders to return to their origins after the ferry operating hours.
  - NY Waterway and PATH
  - MBTA ferry and commuter rail
- **Only Operate at Commute Times**: Some ferries have been successful by only operating at peak commute times which then reduces operating costs.
  - Baltimore Harbor Connector
  - San Francisco Bay Ferry, South San Francisco Terminal
- **Attract Tourists**: Tourists will pay a high single use fee to a ride the ferry. Their contributions can help to subsidize daily commuter fares at a lower rate.
  - Baltimore Ferry Service is free to commuting destinations
  - Washington State Ferry multi-trip and monthly pass discounts
- **Fare Subsidies**: Fare subsidies can allow access to a greater number of users and those in underserved areas.
- **First/Last Mile**: Provide free buses to help expand the area that people can reach within a short /15-minute travel from the landing.
  - NY Waterway buses to/from 39th St Terminal
  - Cross Bay Ferry – St. Petersburg to Tampa
- **Parking Lot**: Free car parking at the landing can increase the volume of riders who will travel to the ferry landing.
  - Monmouth County ferries
  - MBTA Hingham and Hull sites
- **Transportation Development Incentive**: Transit hubs increase adjacent property values. This measurable and known increase could potentially be used to help fund the ferry by the local property owners/developers with a small square-footage tax.
- **Electric Ferry Vessel**: Electric ferries are new to the market. They provide reduced air emissions and lower operating costs due the price different of electricity and fuel. These vessels are a bit more expensive to purchase due to their unique nature.
  - Washington State currently implementing
  - MBTA considering for service expansion

These best practices are a list of things that have helped some ferries be successful. They are not all required to be used simultaneously but they are presented as a toolbox of items to consider. The intent of these best practices is not only to assist in determining locations that would best support ferry service, but also identifying additional characteristics that can be implemented and potential partnerships that can be established to improve the success of the service.

SUBSIDY CONSIDERATIONS

In the world of passenger ferries, the cross-Hudson and Monmouth County passenger ferry services in New York Harbor are unique. While the New York City Ferry service, Staten Island Ferry, and nearly all scheduled, year-round services throughout the US, (including services in Boston, San Francisco, Seattle, Vancouver, Portland (ME)) receive an operating subsidy, this is not the case for cross-Hudson services. The services between New Jersey and New York City operate entirely from the farebox, as a result of not utilizing public funding, they do not necessarily reflect public policy objectives.

The current unsubsidized system has been fairly stable for over a decade, with only minor changes in its reach. The fact that the current inter-state ferry network has not expanded for years suggests that the current service is reaching all markets that can be served profitably (with operating costs covered from farebox). As the Study is concerned with expanding ferry service in Hudson County, a key question is, should public policy focus on a public role beyond funding capital facilities? Can the arguments for public subsidies usually invoked for transit (user benefits, external benefits, economic development etc.) extend to the current system of private passenger ferries? Would various economic benefits also justify an expanded and subsidized ferry system in the New York City region?

A relatively recent example of such a service expansion based on a subsidized structure is the New York City Ferry started in June 2011. The service has greatly expanded and is a ridership success. As it is an example in the region of a subsidized service, its benefits and impacts (though not assessed here) are of obvious interest for anyone interested in expanding regional passenger ferry service.

The current system in New York Harbor: how is the public interest measured

In 2019 passenger ferries in New York Harbor served an average of 120,000 daily trips. Nearly 70,000 were accounted for by the Staten Island Ferry, and nearly 16,000 by New York City Ferry. The non-subsidized inter-state services run by NY Waterway and Seastreak from Hoboken, Jersey City, Weehawken, Edgewater, and Monmouth County carried 33,600 daily riders largely on the revenue generated by the fare box. The success of the New Jersey operations reflects a higher per trip cost and, sans subsidy, limits the availability of the ferry option for many Hudson County residents.

Does the public benefit of expanded service outweigh current ticket revenue? If the public benefit is greater than collected ticket revenue, there would be justification for subsiding the service's operations.

In a 2010 report, the Port Authority of New York and New Jersey (PANYNJ) examined the passenger ferry system in the region for the purpose of exploring a potential change in the role of the public sector vis-à-vis the market. The report identified a series of objectives and goals that could be seen as defining the public interest with respect to passenger ferry service in the Region. These included:

- Benefits generated by a ferry service that accrue to travelers who choose to use the ferry: These direct benefits include travel time savings; a less expensive trip, measured by decrease (or increase) in user out-of-pocket cost per trip; a more convenient trip; a more comfortable trip; a more reliable trip, typically measured by the variance of a trip's travel time or as the percent of time a vehicle meets on-time criteria; a safer trip (transit is safer than autos);
- Benefits to those travelers who do not ride the ferry, either choosing other transit modes or using automobiles: A shift of riders to ferries from crowded existing transit modes can offer a less congested travel option. Shifting some travelers to ferries from automobiles could result in less vehicles and highway congestion, speeding up road travel for those who remain on the roads. This can be measured by overall increase in average highway travel speed and consequent reduction in auto travel time;
- Benefits to the other transportation systems: By providing connectivity to other transit systems, ferries can add ridership to them and make them more cost effective, adding riders at little or no cost. By helping other transit systems shed their peak-period load, the ferry service can not only provide a more comfortable ride to those who ride other transit systems, but serve to make the transit system operate more effectively and reliably. An important example of this is the PATH system, which demonstrates the effectiveness of the load shedding capabilities of the Hoboken and Jersey City ferry. Without these operations, PATH service would need to accommodate additional riders on an already burdened service;
- Community and Environmental Impacts: Besides congestion benefits, any shift from autos to ferries would mean a reduction in vehicle-miles traveled by motor vehicles on highways resulting in a change in harmful vehicle emissions. A single large capacity ferry can replace ten commuter buses or nearly 400 private automobiles in a single trans Hudson crossing. With todays' new EPA standards for Tier 3 and 4 diesel engines the reduction in emissions is significant and obtainable;
- Local and regional economies: Ferries can play an important role in increasing access to undeveloped or underdeveloped waterfront (or waterfront-adjacent) land. This can be measured by real estate values or acres of developable land now accessible. Other economic development impacts could include increased access to jobs through expanded ferry services. Improving transit access in a local labor market will result in improved "matching" between employers and employees;
- Access to recreational opportunities: Ferry service has provided access to previously difficult to access locations, such as parks, beaches, sports venues; the willingness-to-pay for the recreational ferry service itself indicates a minimum value attached by users; and
- Emergency preparedness: The availability of the ferry fleet to respond to emergencies such as blackouts, terrorist threats or attacks, and other unforeseen events can be of immense value, most clearly demonstrated on September 11, 2001 during the attacks on the World Trade Center.

Assessment of the public interest related to passenger ferry service

An extensive analysis of the magnitude of potential benefits of expanding ferry service was completed in the context of the PANYNJ report. This involved transportation modeling using the NJ TRANSIT's North Jersey Transit Demand Forecasting Model

(NJTDFM) as well as the New York Metropolitan Transportation Council's New York Best Practice Model (NYBPM) to assess the existing services as well as several potential hypothetical routes. This then formed the mostly quantitative basis for some broad conclusions to be drawn about passenger ferry service in the Region and the types of benefits conveyed. The findings, still very relevant today, were the following:

- Direct benefits to ferry users can be substantial: Not surprisingly, several routes with significant ridership offer substantial travel time savings. This is the case for routes between Monmouth County (Highlands, Atlantic Highlands and Belford) and Pier 11, World Financial Center and East 34th Street. For Atlantic Highlands in particular, travel time savings between ferry and passenger rail is on the order of 40 to 64 minutes depending on final destination. Edgewater to West 38th Street confers a travel time saving of 20 minutes. For other routes, such as those originating in Hoboken, Lincoln Harbor and Weehawken, travel time advantages for ferry service are much more modest and tend to be in the 4-to-6-minute range;
- Safety benefits are positive for regional passenger ferry relative to auto use;
- Ferry users value the comfort, reliability, and general experience of the mode: While a precise measurement of the value of each factor is not possible here, a value can be inferred for a general mode preference based on the stated preference survey and other modeling work completed for the PANYNJ report. Here, the modeling suggested a monetary value roughly equal to $1 to $2 per trip;
- Indirect benefits to others are varied: In general, a detailed analysis of emission levels for regional ferries and passenger vehicles showed that ferries perform poorly in this area, and NYSERDA data suggests the regional fleet (though improving) generated more nitrogen oxide (NOx), particulate matter (PM) per passenger mile than autos;
- Indirect benefits to other transit users are significant in the case of users of the PATH service between Manhattan and the New Jersey cities of Newark, Jersey City and Hoboken. Specifically, the users of the Hoboken South and Jersey City routes can be seen as users who would very likely use PATH in the absence of passenger ferry service. These services account for roughly 20,000 trips per weekday, and even a proportion of this number would have significant impacts on PATH service, which is operating at close to capacity in the peak periods;
- Indirect benefits to road network users are modest: This is principally due to the fact that the actual number of auto trips diverted is generally small in absolute terms as well as relative to the capacity of the road network; and the capacity of the road network; and
- Economies of scale in service provision for passenger ferries are limited: One of the attractive aspects of passenger ferries are the relatively low capital costs involved in developing routes. However, combined with the point-to-point nature of the network analyzed, this also means that economies of scale are limited and quickly exhausted at relatively low level of service. Essentially, unlike other transit services, the return from increasing frequency diminishes fairly quickly due to the relatively small markets, while the cost (capital and operating) of increased frequency is relatively expensive compared to the operating costs associated with a route. The low levels of scale economies in turn reduces the potential for capitalizing on the marginal costs of serving additional transit users declining with route density (known as the "Mohring Effect").

Discussion and Conclusions

Passenger ferry service in New York Harbor has been in expansion for years, a process accelerated with the expansion of the New York City Ferry system since 2016. As a potential future consideration, would the net social benefits to increasing existing operating subsidies to either cross-Hudson or intra-Hudson services justify the investment?

Previous analysis suggests that the answer depends on the route and its characteristics. One issue is that passenger ferries in the region differ from other transit services in some fundamental ways: Economies of scale are limited, meaning that the rationales for operating subsidies are not as convincing as with other transit modes. Further, external benefits such as reduced road congestion are also limited, and emissions benefits are actually negative with the current emissions profile of the ferry fleet.[1]

The lack of economies of scale, combined with relatively price inelastic demand, suggests that once the immediate localized demand is served, significantly increasing ferry ridership on specific routes would require considerable subsidy, particularly when route distances (and operating costs) become more significant. Given the relatively low levels of external benefits for some of these routes, the return on the subsidies may not always be the most efficient use of transit expenditures. It may be that the expansion of ferry service in the region might best be served through the continued development of niche routes which, either due to densities of residential settlement near the waterfront or poor transit alternatives, can generate significant farebox revenues.

However, some markets exhibit different characteristics, notably fairly high elasticity to fares at rates that approximate those charged on unsubsidized routes. This suggests that subsidies for these routes would tend to generate a greater than proportional increase in ridership.

Another type of route with considerable external benefits includes those that relieve other transit services that are close to capacity. In the region, this is particularly the case with services from Hoboken and Jersey City that act as relief for the PATH system. For these routes, given the costs involved in increasing capacity on the cross-Hudson rail system, consideration of operating subsidies as overall demand increases make sense on efficiency grounds.

In short, strong arguments for supporting ferry service through operating support can be convincing: Relief of peak period crowding on the PATH system is a very real benefit, and one which suggests a selective operating subsidy to increase ridership on ferry services which are alternatives to this crowded service. Combined with the considerable direct benefits to users, these benefits alone suggest that the modest public expenditures provided to date for ferries in the region can be justified, and increasing such support to some levels of operating subsidy may as well depending on the route in question.

1. Diesel ferries do not have good emissions profiles so in order for ferries to reduce emissions they must remove a large number of vehicles from the road. Since a ferry in Hudson County could be expected to draw users from existing transit modes in addition to vehicles it is likely that this will result in a net increase in emissions. Ferries however do provide a benefit by reducing human exposure to these emissions as they occur over water as opposed to on city street and in neighborhoods.

REVIEW OF PROPOSED LANDING SITES

This study began with six proposed locations to assess and consider. From west to east these are south Harrison, South Kearny, Bayfront Redevelopment Area, Bayonne's Hackensack River coastline, Hoboken, and West New York.

This study will detail demand modeling of three sites. These six sites were reviewed and considered to determine which three locations best fit the goals, in order to continue with the detailed modeling. A range of constraints were looked at such as depth of channel and potential need for subsidy. The key differentiators are listed in **Table 44**.

This review of the sites eliminated West New York and Hoboken from the full modeling analysis.

West New York was noted to have very shallow water depths that would require either an extremely long pier or more likely year dredging. These are both high cost items that would make this site harder to maintain. It was also noted that the residents have close access to Port Imperial which is an existing ferry landing. The West New York residents take local buses to Port Imperial and have easy access to the ferry service. Ferry Service at this location would more likely take existing riders from Port Imperial rather than provide service to new population. The Port Imperial Ferry provides "last mile" bus service on NY side. Competing with this amenity would increase operating cost. West New York was noted as a challenging site to maintain that already has ferry service.

Hoboken is the only municipality in the study with a median income above the County average, as well as existing ferry service. While Hoboken

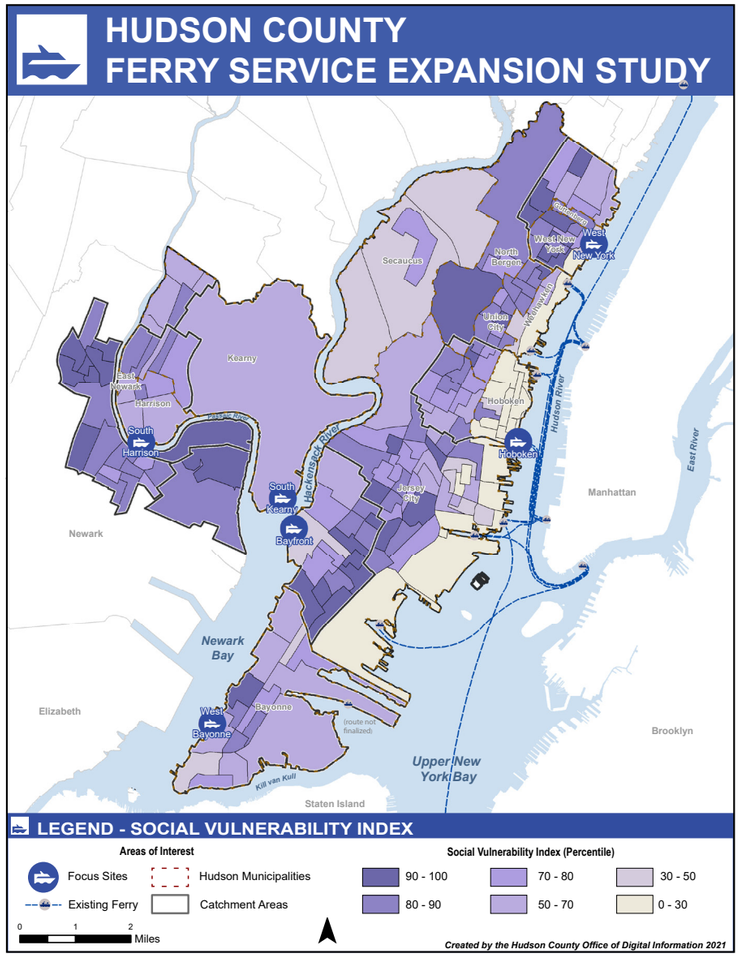


Figure 20: Proposed Ferry Sites with Social Vulnerability Index

Table 44 Site Selection Considerations

	South Harrison	South Kearny	Bayfront	Bayonne	Hoboken	West New York
Supports Environmental Justice	Yes	Yes	Yes	Yes	No	No
Sufficient Depth outside of Channel for Barge?	Probable, Additional investigation required for confirmation	Yes	Yes	Probable, Additional investigation required for confirmation	Yes	Yearly Dredging needed or $15M pier to build
Adjacent Ferry Competition	No	No	No	Yes, East Bayonne	Yes, many existing ferry options	Yes, Port Imperial

is well served by ferries, there is potential for new service between Hoboken and additional destinations, both proposed such as West 14th Street in Manhattan, Harlem at West 125th Street, East Bayonne and Carteret or existing, such as Edgewater, Weehawken, Staten Island and Highlands. With existing infrastructure in place, experience shows the feasibility of service expansion will be evaluated by private companies currently operating in the area. Based on the above findings, it was concluded that focusing further investigation at other locations would be the best use of study resources.

CONCLUSION

After reviewing main regional constraints related to the sites, ridership demand, and existing ferry practices, this study shows that Hudson County has potential for ferry expansion. The next step in the study will focus on the remaining four locations, which are south Harrison, South Kearny, Bayfront Redevelopment Area, and Bayonne's Newark Bay coastline.